

Neurocognitive Profile of Individuals having Depression with Suicidal Ideation

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ABSTRACT

Depression is characterized by a persistent state of sadness and disinterest in activities that one would normally find enjoyable, as well as an inability to function on a daily basis for at least two weeks. Reducing the overall number of suicide deaths and intentional self-harm incidents requires early detection of depression. Depression is frequently caused by suicide. Depression and suicidal thoughts have been found to be highly correlated. The purpose of the current study is to comprehend the neurocognitive profile of depressed individuals who have considered suicide. This cross-sectional study included 30 participants of both genders who were between the ages of 20 and 50. Further assessments of cognitive flexibility were conducted using tests for domains such as working memory, inhibition, set shifting, processing speed, and attention.

Overall, it can be concluded that while phonemic fluency, inhibition, and set shifting have been found to have an impact, processing speed, attention, working memory, and semantic fluency are all compromised in depression associated with suicidal ideation. We can draw the conclusion that depression is a significant health problem that must not be disregarded because it is a key indicator of suicide and has been shown to reduce engagement in day-to-day activities, both of which can result in a reduced quality of life.

Keywords: Depression, Suicidal Ideation, Neuropsychology, Cognitive Flexibility, Adults.

INTRODUCTION

A persistent state of sadness and disinterest in activities that one usually finds enjoyable are characteristics of depression, which is characterized by an inability to function on

a daily basis for at least two weeks. A person's feelings, thoughts, and behavior can be negatively impacted by depression, a common and dangerous medical condition. Depression affects more than 264 million people globally, of all ages. Melancholy and a loss of interest in once-enjoyed hobbies are examples of depressive symptoms. It can cause a person to perform worse at work and at home and lead to a variety of mental and physical problems. Depression and suicide have a lot in common. Depression can, in the worst situation, lead to self-harm. Reducing the overall number of intentional self-harm incidents and suicide deaths requires early detection of depression. Depression frequently results from suicide. There is a strong correlation between depression and suicidal thoughts. An ongoing sense of melancholy and disinterest in activities that one typically finds pleasurable or enjoyable are hallmarks of depression, a mental health illness. Among the more particular indications and symptoms are dysphoria, helplessness, hopelessness, guilt, distraction, physical complaints, poor focus, and sleep difficulties. Between 1.7 and 74 cases of depression per 1,000 people have been found to differ in various studies (Reddy et al., 1998). The tendency to harm oneself or to think thoughts that endanger one's life is known as suicidal behavior. Suicidal behavior can be described using a variety of terms in the literature on suicide research published today.

Women are more likely than men to experience depression, anxiety, or suicidal thoughts, and to engage in risky behaviors related to their health, such as substance abuse, violence, or antisocial behavior, as well as suicide. Women are more likely than men to experience stressful life events and depression risk factors, and they may also respond to these events differently. These two facts help to explain why women experience higher rates of depression. Depression is frequently caused by suicide. Depression and suicide are closely associated.

In the worst situation, self-harm can be brought on by depression. Reducing the overall number of suicide deaths and intentional self-harm incidents requires early detection of depression. Suicidal thoughts are a prevalent symptom of depression and are experienced by many individuals who are depressed or under stress. These are temporary and curable, but in some cases, they increase the person's risk of attempting suicide or succeeding in it. Depression and suicidal thoughts have been found to be highly correlated. Clinicians are frequently ready to treat clinical manifestations of major depression in patients as a sign of terminal illness, including suicidal ideation or a suicidal crisis.

NEUROPSYCHOLOGICAL FUNCTIONING IN DEPRESSION

Emotions are a critical part of the human experience; we laugh or we cry but sometimes emotions get out of hand. Sometimes the sadness we feel is not just the blues. Sometimes it's depression. As we know by now, depression is something more than just feeling kind of sad. It's actually a neurological condition that can affect our everyday life. So as many cognitive behavioural theorists say that due to the distortion of thoughts and judgment

people gets depressed. People with depression has tendency to view themselves and the environment in a negative way. Suicide has been linked to difficulties in utilizing cognitive processes such as problem solving, attention, cognitive control and emotional control which falls under the umbrella term called Executive functioning. It showed deficits mainly in executive functioning, attention and working memory. Studies show that deficits in cognitive processing would affect the way in which an individual deals with stressors (i.e. by using different methods of coping). Reduction in the ability to concentrate is common in depression as they get tired and become fatigue easily. Thus, sustain attention is negatively affected by them for concentration problem.

OBJECTIVES

Aim: To understand the Neurocognitive profile of Individuals having Depression with Suicidal Ideation.

METHODS

A cross sectional study designed was used where 30 individuals within the age range of 20-50 years of both genders, with minimum 8 years of education and average intellectual functioning were selected with a diagnosis of depression with Suicidal Ideation (SI) from Kolkata, West Bengal following purposive sampling technique. Individuals with mild to moderate depression were selected following ICD 10 diagnostic criteria. Those with the history of suicidal attempt and any psychological or any other medical problem were excluded from the study. Informed consent was taken from each participant and detailed background information were collected following Socio demographic schedule. Screening test such as HAM-D and SIS were administered. Further tests for domains like processing speed, attention, working memory, set shifting, inhibition tests were administered to assess cognitive flexibility were administered to assess cognitive flexibility.

Name of the Tools Used:

- Socio demographic and Clinical Data Sheet
- Hamilton Depression Scale
- Suicide Ideation Scale
- Digit Vigilance Test
- Digit Symbol Substitution Test
- Trail Making Test
- Verbal Working Memory N Back Test
- Controlled Oral Word Association
- Animal Names Test

- Stroop Test Neuropsychological Screening Test
- Modified-Wisconsin Card Scoring Test

Statistical Analysis

The data obtained were subjected to the following statistical treatment using statistical package for social sciences, version SPSS 25. Descriptive statistics (Mean & SD) were done.

RESULTS AND DISCUSSION

Table 1
Socio-Demographic Details of the Sample

Variables	Mean ± SD/N
Age	34 ± 9.21
Education Qualification	14.90±2.0

Table 2
Other Socio Demographic Details

Variables	Sub Category	Frequency / %
Gender	Male	20
	Female	10
Religion	Hindu	30
	Islam	0
Marital Status	Married	18
	Unmarried	11
	Widow	1
Occupation	Business	2
	Service	12
	Housewife	7
	Unemployed	1
	Student	8
Types of Residence	Urban	19
	Sub urban	8
	Rural	3
Socio Economic Status	High	1
	Middle	26
	Low	3

Variables	Sub Category	Frequency / %
Family Type	Nuclear	13
	Joint	14
	Extended	3

Table 3
Clinical Details of the Sample

Category	Ham D Mean \pm SD	SIS Mean \pm SD
Depression with Suicidal Ideation	13.5 \pm 1.408	8.5 \pm 3.25

Table 4
**Table discussing the Variables of Neuropsychological Test
for Depression with Suicidal Ideation**

Domains	Variables	Measures	Mean \pm SD
Processing Speed	DSST	Time	286.67 \pm 103.440
		Error	1.10 \pm 1.60
Attention	DVT	Time	510.40 \pm 146.72
		Error	34.17 \pm 30.64
	TMT 1	Time	60.80 \pm 19.14
	TMT 2	Time	119.27 \pm 45.59
Working Memory	N- Back 1	Hit	7.07 \pm 1.36
		Error	3.37 \pm 2.26
	N- Back 2	Hit	4.80 \pm 1.76
		Error	7 \pm 3.23
Executive Functioning	COWA	Number	21 \pm 6.81
	A N T	Number	10.43 \pm 3.76
	Stroop C Response	Total Time	79.17 \pm 22.56
		Error	.50 \pm 1.10
	Stroop C-W Response	Total Time	173.43 \pm 39.01
		Error	4.37 \pm 2.15
	WCST	Stroop Effect	74.80 \pm 24.68
		No. Of Correct Response	4.27 \pm 1.50
		Preservative	5.63 \pm 4.97
	Total Error	11.23 \pm 6.74	

Suicide is the 15th leading cause of death worldwide, accounting for 1.4% of all fatalities, according to the WHO World Health Organization. World Health Organization, Geneva, 2014, 2017. The suicide rate among men and women is rising. According to WHO Mental Health, low- and middle-income countries account for about 80% of all suicides. World Health Organization, Geneva, 2018). The age mean of the current study is 34. This may be because, in Modern Urban Indian Society, people typically begin taking on family-related responsibilities at this age range, which makes them more likely to experience anxiety about their own and their families' futures. In a similar vein, this also occurs at work, adding to the pressure to perform well. Additional sociodemographic information the majority of them are middle class in terms of socio-demographics, married, and come from nuclear families. They are mostly male and Hindu. The majority of them are in use. They are all from metropolitan areas. This may suggest that there is depression in the workplace. When compared to middle-aged adults, their cognitive abilities—particularly sustained attention—are frequently found to be subpar in addition to their emotional turmoil. For a variety of reasons, young adults are an advantageous or promising age to investigate the mechanisms and corresponding of emotion regulation.

Depression symptoms include low productivity, issues with morale, a lack of cooperation, risk factors, accidents, frequent absenteeism due to fatigue from work pressure, and occasionally alcohol and drug abuse. In recent years, the sensitive topic of suicide has drawn attention in the field of global public health. Apart from the death toll and decreased economic output for the community, friends and family also suffer from permanent psychological damage.

The best course of action is to prevent suicide because the majority of suicide cases are not treated or cannot be treated. Subedi et al., (2005). Dysregulation of interconnected neural networks involving the prefrontal cortex, amygdala, hippocampus, anterior cingulate cortex, and basal ganglia causes the cognitive symptoms of depression. Both a decrease in gray matter volume and a disruption in white matter connectivity are considered abnormalities. Relationships between emotion and cognition have been related to the hippocampus and prefrontal cortex. Even though it is highly controversial, there is a link between depression and the hippocampal region. The adaptive organization of goal-directed behavioral responses is supported by the prefrontal cortex (PFC) (JM Neuron, 2001) and its proper connectivity with other brain structures, such as the hippocampus (HPC) and the amygdale. This theory is supported by empirical evidence, which shows that working memory and cognitive flexibility—two PFC-dependent cognitive functions—are altered in patients with these disorders. Furthermore, it is believed that lower hippocampal activity is linked to both an increase in negative bias and the amygdala's incapacity to inhibit information. There is substantial evidence that their hippocampal, frontal cortex, amygdala, and nucleus accumbens brain mechanisms differ

from those of subjects without this condition (Koob and Volkow, 2010). It's possible that someone has SI or SA, has problems with the reward system or another brain system, but they shouldn't be treated like mentally ill patients who need to be restrained or disabled in order to protect themselves (Szasz, 2019).

In the present study, it has been found that for patients having depression with suicidal ideations; executive functioning domains like in processing speed, attention, working memory and the semantic fluency are impaired. However, the phonemic fluency, inhibition and set shifting has been found to be intact. It can be said that the result is interrelated. Patients in depression with suicidal ideation, their processing speed, attention, semantic fluency and working memory has been found to be impaired might be as Semantic Fluency has is related with working memory. In Animal Naming Test (ANT) they have to generate animal names by manipulating the information about animal category. There they have to shift their attention here but as the working memory is impaired the semantic fluency is automatically getting affected. The most common factors associated with suicidality include the presence of recurrent suicide ideation, hopelessness, a history of past suicide attempt(s), cognitive deficits e.g. poor problem solving (Rudd et al., 2006). For Attention in the present study, DVT has been used to measure attention in situations where time and error mean are higher, indicating a lower level of capacity for task focus. Vigilance, also known as sustained attention, is the capacity of observers to hold their attention on a subject and to stay aware of external stimuli for extended periods of time (Warm, 1984). As is well known, attention deficits are one kind of cognitive impairment that depression is linked to. A common symptom of depression is difficulty focusing. One possible explanation for this could be that they become tired easily while working on any task. Higher time in mean on TMT part A and B. TMT 2 is used for attention switching, and TMT 1 is used for visual attention. According to a study by Colquhoun and Baddeley (1964), people who suffer from depression do not exhibit attentional deficits.

The two main risk factors that are thought to be able to predict future suicide behavior are depression and suicidal ideation. On the other hand, inhibition, set shifting, and phonemic fluency are unaltered. Possibly due to the Phonemic Fluency COW - A test where individuals had to find words that start with the specified letter given. Response inhibition, working memory, categorical fluency, processing speed, and sustain attention are the domains in which the current study's findings are expressed. Cognitive rigidity and suicidal behaviors were closely related (Neuringer C. et al., 1964). Working memory, inhibition, and cognitive flexibility are thought to be the three main components of executive function (EF), according to Lehto JE et al., (2003). Planning, problem-solving, and reasoning are among the higher-order EF that emerge from their interaction (Collins A. et al., 2012). If these EF changed, it would be harder to engage in behaviors that are strongly associated with suicidality, like stopping ruminating and switching to more constructive

thought patterns or adaptable coping mechanisms (Beck JG. et.al; 2006). According to the results of the current study, people who are experiencing suicidal thoughts do not exhibit impairments in their inhibition or set shifting domain, which may be the reason why they are not making an attempt at suicide. Overall, it can be concluded that while phonemic fluency, inhibition, and set shifting have been found to be improved in depression with suicidal ideation, processing speed, attention, working memory, and semantic fluency are all compromised.

Implications for Social Policy and Actions: Depression and suicide are two of the world's most concerning phenomena. In the general population, depression and SI are quite common (Raj et al., 2019). About one-third of people who consider suicide actually try to kill themselves. Despite the fact that there are proven, efficient treatments for mental illnesses, over 75% of people in low- and middle-income nations do not receive care. The social stigma attached to mental illnesses, a lack of trained healthcare professionals, and a lack of funding for mental health services are all obstacles to providing effective care (Evans-Lacko S, et al; 2018). Abandonment and trauma are associated with severe mental illnesses, which may raise the survivors' risk of suicide. According to research, heritability and environmental factors combine to produce mental illness and suicide that run in families. Suicidal ideation and thoughts brought on by guilt and anger may remain a challenge for survivors of suicide (Chakraborty S, et al; 2018). Social awareness is required to identify and address these issues and to bring changes in community level.

Implication of Research for Practice: Depression is a serious health problem that should not be disregarded because it has been shown to reduce participation in daily activities and is a significant predictor of suicide, both of which can result in a lower quality of life. Therefore, it is necessary to identify mediating variables and factors that influence depression in order to prevent and manage perceived depression. The number of suicide attempts, which are typically linked to depression, is rising daily. This study sheds light on the neuropsychological factors that contribute to suicidal ideation in depressed individuals. Elderly people are less likely to report having suicidal thoughts. Moreover, individuals displaying mild depressive symptoms might also feel these feelings, which might not be apparent unless specifically questioned. More opportunistic screening techniques should be used for older adults displaying suicidal behavior. These techniques should focus on identifying and targeting members of high-risk groups while accounting for social, psychological, and medical aspects. High-risk groups include those with depressive disorders, a history of suicidal thoughts or attempts, physical illnesses, and social isolation. Initiatives to prevent suicide are rarely implemented with an emphasis on older adults (Halder & Manot, 2020) or children and adolescents (Ghosh & Halder, 2023). In order to improve social interactions, community integration, and support for prevention and a higher quality of life, interventions can be created with early identification in mind.

Unique Contribution to the Existing Literature: This study represented the understanding of potential role of neurocognitive abilities in suicide and suggest the intriguing possibility that how neurocognitive deficits will help us to understand that why people have suicidal ideation in depression. The brain's neural networks and pathways are thought to mediate the link between behavior and cognition. It is imperative to comprehend and recognize those who are experiencing suicidal ideation, as these thoughts can lead to suicidal acts. How they deal with the challenges of stifling thoughts of suicide or self-harming behaviors Particularly in young people, the shift from suicidal ideation to actual suicide frequently happens impulsively in response to intense psychosocial stressors. This is to help in identifying those people and for intervention planning.

Scope for Future Research: Another group where patients in depression who have attempted suicide for once could be studied. As because risk factors for suicidal ideation might be different from that of the risk factors for suicidal attempts. Further studying the personality between these groups like focusing mainly on course of suicidal ideation in special subgroups, such as cluster B personality disorders. Studies could be done also on other variables like on hopelessness, quality of sleep. Adults who get engage in suicidal behaviour may have regulation strategies to use when distressed. So, it's an important thing to highlight these by doing proper testing.

CONCLUSION

SI is not always connected to other significant behavioral disorders. In scientific literature, dying is the preferred outcome. Nobody wants to end their life; instead, they want to stop living their life in the same way. If they are unable to find other coping strategies, their only remaining choice is to pass away in order to put an end to their suffering. To show that fostering resilience and wellbeing can help turn the maladaptive schemas of individuals with SI into functional schemas, more research is required (Lopez-Ramirez E et al; 2023). It can be said suicidal ideation is very common in depressed patients. According to the current study, cognitive deficits in the executive function domain—which includes sustained attention, working memory, processing speed, response inhibition, and category fluency—could distinguish patients with depression with and without suicidal ideation. It can be claimed that people with executive functioning deficiencies, such as those who struggle with shifting, may find it difficult to stop thinking about harming themselves or to adopt other coping mechanisms that are more adaptive and positive. Support groups have shown to be helpful because individuals feel that they are the only ones who can relate to them, which promotes emotional healing and comfort. Support groups also assist them in gaining a more comprehensive understanding of their issue and potential solutions for adaptive problem-solving. Through these resources, people can get practical

advice on managing their real-world responsibilities and creating reasonable objectives for their own lives (Hibberd R, et al; 2010).

REFERENCES

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders American Psychiatric Association, (2013). DSM-5. 5th ed. DSM-5.
- Bagby RM, Ryder AG, Schuller DR, Marshall MB. (2004) The Hamilton Depression Rating Scale: has the gold standard become a lead weight? *Am J Psychiatry*. Dec;161(12):2163-77. doi: 10.1176/appi.ajp.161.12.2163. PMID: 15569884.
- Beck JG, Gudmundsdottir B, Palyo SA, Miller LM, Grant DM. (2006). Rebound effects following deliberate thought suppression: does PTSD make a difference? *Behav Ther*.
- Chakraborty S, Halder S, (2018). Psychological sequelae in suicide survivors: A brief overview. *Indian Journal of Social Psychiatry* 34 (2), 105- 110.
- Collins A, Koechlin E. (2012) Reasoning, learning, and creativity: frontal lobe function and human decision-making. *PLoS Biol*.
- Evans-Lacko S, Aguilar-Gaxiola S, Al-Hamzawi A, et al. Socio-economic variations in the mental health treatment gap for people with anxiety, mood, and substance use disorders: results from the WHO World Mental Health (WMH) surveys. *Psychol Med*. 2018;48(9):1560-1571.
- Franklin JC, Ribeiro JD, Fox KR, Bentley KH, Kleiman EM, Huang X, Musacchio KM, Jaroszewski AC, Chang BP, Nock MK. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychol Bull*.Feb143(2):187-232.
- Ghosh, N. & Halder, S. (2023) Understanding Presence and Nature of Loneliness of Adolescents in Kolkata: An Exploratory Study. *Journal Of Psychosocial Research* 18(2):335 – 344 Doi:10.32381/Jpr.2023.18.02.16
- Halder S, & Manot S. (2020) Identifying suicidal risk and its association with depression in the elderly population. *J Geriatr Ment Health* 7 (1), 29-32.
- Hibberd R, Elwood L, Galovski T. (2010). Risk and protective factors for posttraumatic stress disorder, prolonged grief, and depression in survivors of the violent death of a loved one *J Loss Traum*.; 15:426–47.
- Marzuk, P. M., Hartwell, N., Leon, A. C. & Portera, L. (2005). Executive functioning in depressed patients with suicidal ideation. *Acta Psychiatr Scand* 112, 294–301.
- Koob, G. F., and Volkow, N. D. (2010). Neurocircuitry of addiction. *Neuropsychopharmacology* 35, 217–238. doi: 10.1038/npp.2009.110.
- Lopez-Ramirez E, Perez-Santiago AD, Sanchez-Medina MA, Matias-Perez D and García-Montalvo IA. (2023). Neural bases of suicidal ideation and depression in young college students. *Front. Psychol*. 14:1141591.
- Lehto JE, Juujärvi P, Kooistra L, Pulkkinen L. (2003) Dimensions of executive functioning: evidence from children. *Br J Dev Psychol*.

- Luxton DD, Rudd MD, Reger MA, Gahm GA. (2011) Arch Suicide Res. 15(3):250-8. doi: 10.1080/13811118.2011.589720. PMID: 21827314.
- Neuringer C: (1964). Rigid thinking in suicidal individuals. *J Consult Psychol*; 28:54–58
- Nelson,H.(1976). A modified card sorting test sensitive to frontal lobe defects. *Cortex*, 12, 313-324.
- Reddy VM, Chandrashekar CR. Prevalence of mental and behavioural disorders in India: a meta-analysis. *Indian J Psychiatry*. 1998 Apr; 40(2): 149-57.
- Raj, S., Sachdeva, S. A., Jha, R., Sharad, S., Singh, T., Arya, Y. K., et al. (2019). Effectiveness of mindfulness based cognitive behavior therapy on life satisfaction, and life orientation of adolescents with depression and suicidal ideation. *Asian J. Psychiatr*. 39, 58–62.
- Szasz, T. (2019). *Psychiatry: The Science of Lies*. Syracuse University Press.
- Smith, EE, & Jonides, J. Storage and executive processes in the frontal lobes. *Science*,1999, 283(5408), 1657–1661. <https://doi.org/10.1126/science.283.5408.1657>.
- Subedi N, Chataut TP, Pradhan A (2015) A study of suicidal deaths in central Nepal.
- World Health Organization. Preventing Suicide: A Global Imperative. Geneva, Switzerland. 2014. www.who.int (Accessed on April 24, 2018).

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