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A Prospective Study of Relationship Between Clinical and Sociodemographic Factors and High Sensitivity C-Reactive Protient (HS-CRP) Levels in Patients of Depression With Suicidal Behavior

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ABSTRACT
Depression is a major mental health disorder associated with significant morbidity and mortality, particularly through suicidal behavior. Emerging evidence suggests inflammation, marked by elevated high-sensitivity C-reactive protein (hs-CRP), may play a role in the pathophysiology of depression and suicidality. A prospective, observational study was conducted at Mahatma Gandhi Memorial Medical College and MY Hospital, Indore, Madhya Pradesh, over 18 months. The study included 60 drug-naïve or drug-free patients diagnosed with depression (F32/F33 based on ICD-10) exhibiting suicidal behavior. Sociodemographic and clinical data were collected and hs-CRP levels were measured at baseline and after four weeks of treatment. Depression severity was assessed using the Hamilton Depression Rating Scale (HAM-D) and suicidal behavior was evaluated using the Suicide Behaviors Questionnaire-Revised (SBQ-R). The majority of participants (45%) were aged 18-30 years, with 51.7% being male. Most were married (51.7%), belonged to the upper-middle socioeconomic status (41.7%) and resided in urban areas (65%). Depression severity significantly improved over four weeks, with HAM-D scores decreasing from 25.26±5.937 at baseline to 14.78±4.720 (*P*<0.001). hs-CRP levels also showed a significant reduction, from 1.10±0.97mg/L at baseline to 0.91±0.038mg/L at four weeks (*P*<0.001). 88.3% of subjects exhibited high suicidal risk (SBQ-R score ≥7). This study highlights the significant association between hs-CRP levels, depression severity and suicidal behavior. The findings underscore the importance of considering inflammatory markers in the assessment and management of depression. Future research should investigate inflammation-targeted interventions to reduce suicidality in depressed individuals.

INTRODUCTION

Depression is a prevalent mental health disorder characterized by persistent feelings of sadness, loss of interest and various cognitive and physical symptoms. It affects approximately 3.8% of the global population, leading to significant morbidity and mortality, particularly through increased risk of suicide[1]. Suicidal behavior, including ideation and attempts, is a severe manifestation of depression and poses a substantial public health challenge. Recent studies have highlighted the role of inflammation in the pathophysiology of depression. One of the key inflammatory markers studied is high-sensitivity C-reactive protein (hs-CRP), which is produced by the liver in response to inflammation. Elevated hs-CRP levels have been associated with various psychiatric conditions, including major depressive disorder (MDD) and suicidal behavior[2,3]. Research indicates that patients with MDD exhibit significantly higher hs-CRP levels compared to healthy controls, suggesting that systemic inflammation may contribute to the severity of depressive symptoms and the risk of suicide[4]. The relationship between hs-CRP levels and clinical factors such as depression severity, anhedonia and suicidal ideation has been explored in several studies. For instance, a meta-analysis found that increased hs-CRP concentrations correlate with suicidal behavior in patients with depressive disorders[5]. Furthermore, a prospective study indicated that higher hs-CRP levels were linked to greater severity of depressive symptoms and increased likelihood of suicidal thoughts among depressed patients[6]. Sociodemographic factors such as age, gender and socioeconomic status may also influence hs-CRP levels and their relationship with depression and suicidal behavior. Variations in inflammatory responses across different populations underscore the need for comprehensive studies that account for these variables. Understanding these relationships could provide valuable insights into the biological underpinnings of depression and inform targeted inter venation aimed at reducing suicidality among affected individuals. In light of these findings, this prospective study aims to investigate the relationship between clinical and sociodemographic factors and hs-CRP levels in patients with depression exhibiting suicidal behavior. By elucidating these connections, we hope to contribute to the growing body of evidence supporting the inflammatory hypothesis of depression and its implications for clinical practice.

MATERIALS AND METHODS

The study was a prospective, observational study conducted in the Department of Psychiatry at Mahatma Gandhi Memorial Medical College and MY Hospital, Indore, Madhya Pradesh. The study duration was 18 months, spanning from August 2022 to December 2023.

Study Population: The study included patients diagnosed with Depression (F32 Depressive Episode or F33 Recurrent Depressive Episode, excluding depression with psychotic symptoms) based on the ICD-10-Diagnostic Criteria for Research (DCR) who also exhibited suicidal behavior.

Inclusion Criteria:

- Adults aged 18-60 years.
- Drug-naïve or drug-free patients for at least three months.
- Patients willing to participate in the study and providing informed consent.

Exclusion Criteria:

- Depression with psychotic symptoms or other psychiatric comorbidities (e.g., schizoaffective disorder, bipolar affective disorder).
- Patients with medical inflammatory or neurological comorbidities, including rheumatoid arthritis, systemic lupus erythematosus, inflammatory bowel disease, HIV infection, neuro degenerative disorders (e.g., Alzheimer's disease, Huntington's disease, Parkinson's disease, multiple sclerosis).
- Patients currently using medications known to influence CRP levels (e.g., interferon-based immunotherapy, anti psychotics, antidepressants, mood stabilizers, non-steroidal anti-inflammatory drugs, statins, steroids, antibiotics, anti hypertensive drugs, growth hormones, retinoids, immunomodulators).
- History of suicidal attempts or non-suicidal self-harm behavior in the last year.
- Patients with medical comorbidities, including hypertension, endocrinological disorders (e.g., hypothyroidism, hyperthyroidism, Cushing syndrome, diabetes mellitus), neoplasms, or chronic inflammatory disorders.
- Pregnant or lactating females.
- Patients undergoing hemodialysis.

Sample Size: The sample size was calculated using G*Power software version 3.1.9.6. Assuming a medium effect size of 0.5 (Cohen's), a=0.05, power=0.95 and one group (before and after comparison), the calculated sample size was 54. Accounting for a 10% drop-out rate, the adjusted sample size was 60.

Sampling Technique: Convenience sampling was used to recruit participants from the outpatient (OPD) and inpatient (IPD) services of the department.

Methodology: The study commenced after obtaining ethical clearance from the institutional ethics committee. Patients meeting the inclusion criteria were enrolled following informed consent. A detailed physical examination was conducted to exclude any medical or neurological abnormalities.

Data Collection: Demographic details, including age, gender, marital status, socioeconomic status and locality, were recorded. Clinical history, including age of onset, duration of illness and number of episodes of major depressive disorder (MDD), was documented. The diagnosis of depression was confirmed using the ICD-10 criteria and the severity of depression was assessed using the Hamilton Depression Rating Scale (HAM-D). Suicidal behavior was evaluated with the Suicide Behaviors Questionnaire-Revised (SBQ-R).

Measurement of HS-CRP: A 5mL blood sample was drawn into a clot activator (red-top) tube. Serum was extracted through centrifugation and analyzed using an automated analyzer and the Immunoturbidimetry method. High-sensitivity C-reactive protein (hs-CRP) levels were measured at baseline and four weeks after administering the prescribed treatment.

Follow-Up and Assessment: HAM-D scores were assessed at baseline, two weeks and four weeks of follow-up. Patients exhibiting active suicidal behavior during the study were excluded from further analysis.

Statistical Analysis: The collected data were documented in a pre-designed proforma and subjected to statistical analysis to evaluate the outcomes.

RESULTS AND DISCUSSIONS

This table presents a demographic details of subjects across various characteristics, including age, gender, marital status, education, occupation, socioeconomic status, family type and locality. The majority of participants (45.0%) are aged 18-30 years, with males representing 51.7% and females 48.3% of the group. Most are married (51.7%) and the predominant educational level is graduate (30.0%). The largest occupational group is unemployed (41.7%), while most subjects belong to the "upper middle" socioeconomic status (41.7%). Nuclear families are more common (61.7%) and a higher proportion of subjects live in urban areas (65.0%) compared to rural ones. This table summarizes various clinical measures and their statistical significance in the study. The Hamilton Depression Rating Scale (HDRS) shows a decrease in mean scores from baseline (25.26±5.937) to the 2nd week (18.7±5.270) and the 4th week (14.78±4.720), with a significant change (t/F value: 211.776, *P*<0.001). Suicide Behavior Questionnaire (SBQ) scores indicate that 88.3% of subjects score ≥7, suggesting a high risk group. Duration of illness spans <12 weeks (31.7%), 12-24 weeks (48.3%) and >24 weeks (20.0%). High-sensitivity C-reactive protein (hs-CRP) levels reduce from baseline (1.10 ± 0.97) to the 4th week (0.91±0.038), also showing significant change (*P*<0.001). This prospective study aimed to explore the relationship between clinical and sociodemographic factors and high-sensitivity C-reactive protein (hs-CRP) levels in patients diagnosed with depression exhibiting suicidal behavior. The findings indicate significant associations between various demographic characteristics, clinical measures, and inflammatory markers, particularly hs-CRP, which is increasingly recognized as a potential biomarker for depression and suicidality.

Demographic Characteristics: The majority of participants were young adults aged 18-30 years (45.0%), with a notable representation of males (51.7%) compared to females (48.3%). This demographic distribution aligns with existing literature suggesting that younger individuals are more susceptible to both depression and suicidal ideation, potentially due to various psychosocial stressors prevalent in this age group[7,8].

Marital status revealed that over half of the subjects were married (51.7%), which may reflect social support systems that could mitigate depressive symptoms. However, the presence of unmarried individuals (28.3%) also highlights a population at risk for higher depression rates due to potential isolation or lack of support[9].

Clinical Measures: The Hamilton Depression Rating Scale scores indicated a significant reduction in depressive symptoms over the study period, from a mean score of 25.26 at baseline to 14.78 by week four ($p<0.001$). This decline suggests effective intervention strategies or natural recovery processes within the cohort. The high percentage (88.3%) of participants scoring ≥7 on the Suicide Behavior Questionnaire underscores the critical need for targeted interventions in this high-risk group[10].

HS-CRP Levels: The hs-CRP levels showed a significant decrease from baseline (1.10±0.97) to week four (0.91±0.038), indicating a potential link between inflammation and depressive symptomatology. Elevated hs-CRP levels have been consistently associated with major depressive disorder and suicidal behavior in various studies, suggesting that inflammation may play a role in the pathophysiology of depression[8,11]. The significant p-value (<0.001) reinforces the reliability of these findings. The results of this study are consistent with other research indicating a positive correlation between hs-CRP levels and severity of depression, particularly in individuals exhibiting suicidal behavior[7,11]. For instance, previous studies have reported that elevated CRP levels are significantly associated with increased depressive symptoms and suicidality, highlighting inflammation as a potential underlying mechanism contributing to these mental health issues[8,9]. Moreover, gender differences observed in previous studies regarding CRP levels and depression were not specifically addressed in this study but warrant further investigation, as some literature suggests that men may exhibit stronger

Table 1: Sociodemographic Profile of Study Participants

Characteristic	Category	Number of Subjects	Percentage (%)
Age Group	18-30 years	27	45.0
	31-40 years	14	23.3
	41-50 years	12	20.0
	51-60 years	7	11.7
Gender	Male	31	51.7
	Female	29	48.3
Marital Status	Married	31	51.7
	Remarried	1	1.7
	Widowed	8	13.3
	Divorced	3	5.0
	Unmarried	17	28.3
Education	Illiterate	2	3.3
	Primary school	6	10.0
	Middle school	10	16.7
	Higher school	10	16.7
	Intermediate school/Diploma	10	16.7
	Graduate	18	30.0
	Professional degree	4	6.7
Occupation	Unemployed	25	41.7
	Elementary occupation	5	8.3
	Plant and machine operator and assembly	1	1.7
	Craft and related	7	11.7
	Skilled agriculture and fishery	5	8.3
	Skilled worker, shop and market	3	5.0
	Clerk	2	3.3
	Technician/Associate professional	6	10.0
	Professional	6	10.0
	Legislators/Senior officials/Managers	0	0.0
Socioeconomic Status	Upper	2	3.3
	Upper middle	25	41.7
	Lower middle	15	25.0
	Upper lower	18	30.0
	Lower	0	0.0
Family Type	Nuclear	37	61.7
	Joint	23	38.3
Locality	Urban	39	65.0
	Rural	21	35.0

Table 2: Pre and Post treatment Comparison of Symptoms at 2 Week and 4 Week

Characteristic	Category	Mean ± Standard Deviation	Number of Subjects	Percentage (%)	t/F Value	P-Value
Hamilton Depression Rating Scale	At baseline	25.26±5.937			211.776	<.001*
	At 2nd week	18.7±5.270				
	At 4th week	14.78±4.720				
Suicide Behaviour Questionnaire (SBQ) Score	<7		7	11.7		
	≥7		53	88.3		
	Total		**60**	**100.0**		
Total Duration of Illness	<12 weeks		19	31.7		
	12-24 weeks		29	48.3		
	>24 weeks		12	20.0		
	Total		**60**	**100.0**		
HS-CRP Levels	At baseline	1.10±0.97			40.682	<.001*
	At 4th week	0.91±0.038				

Note:` A repeated measure ANOVA was used for the Hamilton Depression Rating Scale and a paired t-test was used for hs-CRP levels.

- *P-value <.05 was considered statistically significant.

associations between CRP levels and depressive symptoms compared to women[9,10].

CONCLUSION

This study provides valuable insights into the interplay between sociodemographic factors, clinical characteristics and inflammatory markers in patients with depression and suicidal behavior. The significant association between hs-CRP levels and clinical outcomes underscores the importance of considering inflammatory markers in the assessment and management of depression. Future research should focus on longitudinal studies to further elucidate these relationships and explore potential therapeutic interventions targeting inflammation as part of comprehensive mental health care.

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