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A Study of Suicidal Ideation risks in Stroke survivors

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Abstract
Background:
Stroke heightens suicide risk via post-stroke depression and physical disabilities. Globally, strokes affect 15 million annually, causing 5 million deaths and disabilities. Suicidal thoughts, more common in younger survivors, relate to depression, isolation, and socioeconomic factors. Research compares these thoughts between stroke patients and others, exploring influencing factors. **This study aimed** to investigate three primary objectives: comparing suicidal ideation between stroke patients and healthy individuals, evaluating variations in suicidal ideation across different types of stroke, and exploring the associations among sociodemographic factors, severity of physical disability, comorbid medical conditions in stroke patients, and the presence of suicidal thoughts**. Subject and methods:** The study encompassed two primary groups: the studied group comprised patients diagnosed with various types of cerebrovascular stroke (embolic, thrombotic ischemic, and hemorrhagic) affecting different brain regions (frontal, parietal, temporal, and occipital lobes), while the control group consisted of a matched sample from the general population in terms of age and sex. **Results:** The study compared demographic data between stroke patients and controls, revealing that the mean age was slightly higher in the stroke group (51.7 ± 9.2 years) than in the control group (50.1 ± 12.2 years), but this difference was not statistically significant ($p = 0.180$). **Conclusions:** A study of 320 stroke survivors highlighted significant correlations between demographics, stroke characteristics, and mental health vulnerabilities, particularly linking mood disorders and emotional instability to increased suicidal ideation severity. Marriage was identified as a protective factor, highlighting the crucial role of social support in post-stroke mental health.

Keywords: Stroke; Suicidal ideation; Sociodemographic factors

1.Introduction

One of the main risk factors for suicide is thought to be a stroke. Stroke is a major cause of disability and death worldwide. It is traditionally described as a neurological deficit attributed to an acute focal injury of the central nervous system caused by vascular cause, including cerebral infarction and hemorrhage whether intracerebral or subarachnoid hemorrhage [1].

The World Health Organization (WHO) estimates that 15 million people worldwide experience strokes each year, of which 5 million die and another 5 million become permanently incapacitated. According to Feingin et al. [2] suicidal ideation is the medical word for thoughts, wants, and plans to take one's own life. It can range from passive ideas to ideas specific plans and intent to take one's own life.

The detrimental effects of stroke on mental health are becoming well acknowledged. suicide thoughts have been linked to post-stroke depression, but other variables, such physical impairment, have been shown to independently raise the incidence of suicide ideation in stroke survivors. Following a stroke, poststroke depression is a frequent mood illness that may raise mortality. After a stroke, symptoms often appear three months later. Depression symptoms impact overall health and raise the risk of suicide, such as disturbed sleep, low mood, and decreased appetite [3].

The likelihood of suicidal thoughts in stroke survivors varies depending on a number of characteristics, including age, sex, socioeconomic status, and educational attainment. Suicide risk is five times higher in stroke patients under 55 than it is in the general population. Men are likely to experience suicide thoughts than women, which could be related to their earlier start ages [4].

Living alone, being socially isolated, having little education, and having a low income all have an impact on one's capacity for making decisions and raise the likelihood of attempting suicide [5].

This study aimed to investigate several aspects: firstly, to compare suicidal ideations

between stroke patients and healthy individuals; secondly, to assess variations in suicidal ideation across different types of stroke; and finally, to examine the relationships among sociodemographic factors, degree of physical disability, comorbid medical conditions in stroke patients, and the presence of suicidal ideations.

2.Subject and methods:

This study employed a comparative cross-sectional design conducted at the Neuropsychiatry Department of Benha University Hospital. The practical phase commenced upon protocol approval, data collection and recruitment of cases and control groups conducted from November 2023 to January 2024. The study encompassed two primary groups: the studied comprised patients diagnosed various types of cerebrovascular stroke (embolic, thrombotic ischemic, and hemorrhagic) affecting different brain regions (frontal, parietal, temporal, and occipital lobes), while the control consisted of a matched sample from the general population in terms of age and sex.

Sampling:

Participants selected using a convenience sampling technique, including all patients who met the specified criteria and agreed to participate. criteria encompassed patients aged 18 to 80 cerebrovascular stroke (ischemic or hemorrhagic), admitted to Benha University Hospital. Patients included regardless of the time elapsed since their stroke (up to one year), allowing for the study of suicidal ideation across acute (0-3 months) and chronic (>3 months) phases post-stroke. Exclusion criteria comprised uncooperative or aphasic patients, those unwilling to consent, individuals disturbed consciousness, any history of comorbid psychiatric disorders, or chronic disabling conditions (e.g., renal, liver, or heart failure). The control consisted of volunteers aged above 18 , without a history of stroke, matched by sex and subject to the same exclusion criteria as the patient group.

Operational design:

In the study, a total of 64 participants (24 cases and 40 controls) dropped out for various reasons: 20 did not attend their scheduled interviews, 15 withdrew during the interview process, and 29 excluded due to not meeting the study's criteria. Following further explanation and clarification of the research aims, 160 cases ultimately examined and assessed. Each participant underwent a comprehensive evaluation lasting at least one hour (ranging from 20 minutes to 2 hours, depending on individual circumstances). The control recruited from different sources, including hospital medical staff, relatives of cases, and friends or colleagues of the researchers. All control participants underwent thorough assessments, including history-taking, full neuropsychiatric and general examinations to rule out any neuropsychiatric, general medical, or neurological conditions. Additionally, they underwent psychometric assessments using the ICD-10 symptom checklist and Morey scale.

Statistical Analysis

The collected data underwent rigorous processing including revision, coding, and tabulation using IBM SPSS Statistics Version 25.0. Normality of data distribution assessed using the Kolmogorov-Smirnov test. Descriptive statistics such as mean, standard deviation (± SD), median, minimum, and maximum calculated for numerical data, while frequencies and percentages determined for non-numerical data. Analytical statistics included the Student's t-test for comparing means between two groups, Mann-Whitney test for non-parametric variables, and Kruskal-Wallis test for than two groups of non-parametric variables. The Chi-Square test and Fisher's exact test examined relationships between qualitative variables. Correlation analysis assessed the strength of relationships between quantitative variables. Ordinal regression analysis, using generalized linear models, predicted risk factors when the dependent variable categorical. Odds ratios (ORs) calculated to measure the relationship between exposure and outcome, where OR=1 indicated no effect, OR>1 indicated higher odds (risk), and OR<1 indicated lower odds (protective), 95% confidence intervals estimating precision. Results deemed at $p<0.05$, highly at $p<0.01$, and very highly at $p<0.001$, at a 95% confidence interval.

3.Results

According In the groups that were analyzed, the average age of the stroke patients was somewhat higher (51.7 ± 9.2) compared to the control group (50.1 ± 12.2), but this difference was not statistically significant ($p = 0.180$). Statistical analysis revealed no significant difference between the sexes, with 55% of stroke patients and 62.5 % of control subjects being male ($p = 0.212$). (Refer to Table 1)

The proportions of urban and rural inhabitants were comparable in both the stroke and control groups; 45% of the stroke group lived in urban regions and 55% in rural areas, while 43.1% of the control group lived in urban areas and 56.9% in rural areas. Statistically, there is no difference in group residence ($p = 0.822$).

In terms of marital status, almost 70% of people in both categories were married. People

who had a stroke were more likely to be single (10% vs. 6.9% in the control group) and to have lost a spouse (20% vs. 21.9% in the control group), but these differences were not statistically significant (p = 0.591).

The proportion of children in the control group was much greater than that in the stroke group (90 percent vs. 79.4 percent, p = 0.012). Nevertheless, there was no statistically significant difference (p = 0.379) in the median number of children between the two groups, which was 1-8.

While 78.1% of stroke patients and 69.3% of control subjects smoked cigarettes, respectively. The trend is shown by the marginally significant (p = 0.075), however it does not achieve statistical significance.

A greater percentage of technical patients experienced strokes, even though there was no correlation between education level and this outcome. (Referring to Table 2)

Stroke cases were mostly categorized as moderate (92.5%), minor (4.4%), and moderate to severe (3.1%). No cases of extremely severe strokes were included in the research since they did not meet the exclusion criteria. Compared to hemorrhagic strokes (20.6%), ischemic strokes were more common (79.4%). With a prevalence of 96.3%, the left middle cerebral artery is the most common site of initial strokes, impacting 51.3% of patients. The right middle cerebral artery (21.9%) and right frontal areas are less common, affecting 21.6% of patients. The incidence of strokes in the brainstem is 11.8%, whereas the incidence in the occipital areas is 1.3%. In terms of stroke duration, 46.9% were acute (lasting less than one month), 18.8% were subacute (lasting one to three months), and 34.4% were chronic (lasting three months or more). There was a standard deviation of 3.3 from the mean NIHSS of 9.4 and a median of 9 (ranging from 3 to 18). With a range of 0.1 to 9 months, the median examination duration was 1 month, and a standard deviation of 2.9 months, the average examination time was 2.5 months. Both tables are cited.

When comparing the psychiatric features of the stroke and control groups, it was shown that the stroke group had a greater prevalence of "substance abuse" (70.6% vs. 56.9% in controls, p = 0.011) and "emotion instability" (12.5% in stroke vs. 1.9% in controls, p < 0.001). "Mood disorder" is the only variable for which there are no statistically significant variations between the categories. Despite the high prevalence of "Anxiety disorders" in the stroke group, this did not reach a statistically significant level. Figure 5.

There was a significant difference between the control group and the stroke group on the mean Morey scale (3.8 ± 4.3 vs. 3.3 ± 4.6, p = 0.013). The control group had a significantly greater percentage of "mild" suicidal thoughts compared to the other groups (p = 0.029). Concerning "No degree," "Moderate," or "Severe" suicidal thoughts, however, there were no differences between the groups (p > 0.05 for each category). Importantly, whereas one person in the stroke group had serious suicide thoughts, no one in the control group did. (Schedule 6).

Table (1) Comparison of demographic data among studied groups

		Stroken=160	**Controln=160**	**Test**	**P**
Age ()	Mean ±SD	51.7±9.2	50.1±12.2	t=1.345	0.180
	Median (Range)	54(22-70)	54(20-71)		
Gender	Male	88(55%)	100(62.5%)	X^2= 1.857	0.212
	Female	72(45%)	60(37.5%)		
Residency	**Urban**	72(45%)	69(43.1%)	X^2= 0.114	0.822
	Rural	88(55%)	91(56.9%)		
Maritalstatus	**Married**	112(70%)	114(71.3%)	X^2= 1.078	0.591
	Single	16(10%)	11(6.9%)		
	Widow	32(20%)	35(21.9%)		
Children	**Yes**	127(79.4%)	144(90%)	X^2= 6.964	0.012*
	No	33(20.6%)	16(10%)		
Number ofoff springs	Median (Range)	3(1-8)	3(1-8)	Z= 0.879	0.379
Employment	yes	123 (76.8%)	126 (78.7%)	X^2=0.017	0.896
	No	37 (23.1%)	34 (21.2%)		
Specialhabits	**No smoking**	35(21.8%)	49(30.6%)	X^2= 3.164	0.075
	Smoking	125(78.1%)	111(69.3%)		

Table (2) Comparison of education among studied groups

Occupation	Stroke n=160		Control n=160		Test (X2)	p
Illiterate	19	11.9%	15	9.4%	0.527	0.468
Primary school	15	9.4%	10	6.3%	1.085	0.298
Secondary school	25	15.6%	20	12.5%	0.646	0.421
Technical graduate	60	37.5%	61	38.1%	0.013	0.908
Bachelor graduate	28	17.5%	35	21.9%	0.968	0.325
Master degree	10	6.3%	15	9.4%	1.085	0.298
PhD	3	1.9%	4	2.5%	0.146	0.702

Table (3) Comparison of occupation among studied groups

Occupation	Stroke n=160		Control n=160		Test (X2)	p
Unemployed	37	23.1%	34	21.3%	0.163	0.686
Student	2	1.3%	4	2.5%	0.679	0.410
Handcraft	49	30.6%	45	28.1%	0.241	0.623
business	4	2.5%	10	6.3%	2.689	0.101
employee	42	26.3%	38	23.8%	0.267	0.606
professional	26	16.3%	29	18.1%	0.198	0.657

No association found regarding occupation betweencases and controls.

Table (4) Stroke characteristics in the studied patients

		Stroke N=160
Severity of stroke	Minor	7(4.4%)
	Moderate	148(92.5%)
	Moderate to severe	5(3.1%)
	Very severe	0(0%)
Type of stroke	Ischemic	127(79.4%)
	Hemorrhagic	33(20.6%)
Frequency	First time	154(96.3%)
	Recurrent	6(3.8%)
Site of stroke	Right MCA	35(21.9%)
	Left MCA	82(51.3%)
	Brain stem	19(11.8%)
	Right frontal	22(21.6%)
	Occipital	2(1.3%)
Time of examination (month)	Mean ± SD	2.5±2.9
	Median (Range)	1(0.1-9)
Duration of illness	< 1 month	75(46.9%)
	1-3 months	30(18.8%)
	≥3months	55(34.4%)
NIHSS	Mean ± SD	9.4±3.3
	Median (range)	9(3-18)

Table (5) Comparison of the results of International Classification of Diseases 10th revision (ICD10) symptom check list among the studied groups.

		Stroke N=160	Control N=160	Test	P
Mood disorder	No	93(58.1%)	107(66.9%)	X2= 2.613	0.106
	Mild	38(23.8%)	28(17.5%)	X2= 1.909	0.167
	Moderate	22(13.8%)	19(11.9%)	X2= 0.252	0.616
	Severe	5(3.1%)	3(1.9%)	X2= 0.513	0.474
	Hypomania	2(1.3%)	3(1.9%)	X2= 0.203	0.652
Emotion instability	Yes	20(12.5%)	3(1.9%)	X2= 13.538	<0.001*
	No	140(87.5%)	157(98.1%)		

Substance abuse (Cannabis and Tramadol)	Yes	113 (70.6%)	91 (56.9%)	X2= 6.545	0.011*
	No	47 (29.4%)	69 (43.1%)		
Anxiety	Generalized	7(4.4%)	3(1.9%)	X2=1.652	0.199
	Panic	7(4.4%)	3(1.9%)	X2=1.652	0.199
	No	146(91.3%)	154(96.3%)	X2=3.413	0.065

X^2, Chi-Square test; * p <0.05 is considered significant. ICD 10 international classification of diseases tenth revision

Table (6) Comparison of results of suicidal ideation scale (Morey'sscale) in the studiedgroups

		Stroke N=160	Control N=160	Test	P
Morey's scale (Suicidal ideation scale)	Mean ± SD	3.8±4.3	3.3±4.6	Z= 2.495	0.013*
	Median (Range)	3(0-25)	2(0-19)		
Morey's scale degree	No	45(28.1%)	58(36.3%)	X2=32.420	0.120
	Mild	107(66.9%)	88(55%)	X2=34.739	0.029*
	Moderate	7(4.4%)	14(8.8%)	X2=32.497	0.114
	Severe	1(0.6%)	0(0%)	X2=31.003	0.317

Z, Mann-Whitney test; X2, Chi-Square test; * p<0.05

4.Discussion

As one of the most debilitating brain disorders, stroke causes both physical and mental problems [6].

There is evidence that patients experiencing a stroke are more likely to take their own lives. There is a correlation between a history of stroke and the prevalence of depressive disorders, particularly severe depression, and the development of both acute and delayed-onset suicidal intentions in stroke patients [7].

Stroke survivors are more likely to have suicidal thoughts and to take their own lives. The onset of suicide thoughts is often best indicated by the presence of poststroke depression, and more especially by significant depression. Persistent physical and cognitive disability after a stroke is associated with an increased incidence of suicide attempts and suicidal thoughts [8].

1. **Sociodemographic data and stroke characteristics**

((Table 1) There was no statistically significant difference between the groups in terms of mean age between the stroke and control groups (51.7 vs. 50.1). There was no statistically significant difference between the sexes in the distribution of the stroke patients (55% male) and the control group (62.5%).

Stroke was somewhat more common in male patients (53.3%) than in female patients (46.7%), according to the present research. And more over three quarters of stroke cases were older than 50 years old, with a mean age of 59 [9].

This research followed 222 people over the course of a few weeks in a hospital setting. Stroke severity was rated as mild in 55 patients (38.5%), moderate in 7 (53.8%), moderate to severe in 11 (7.7%), and severe in none of the patients. Among the adult patients, 84.1% had an ischemic stroke, whereas 15.8% suffered a hemorrhagic stroke [10].

2. **Diagnosed psychiatric disorders by ICD10 symptom check list in (studied groups) stroke patients and control group.**

(Table 5 shows that there is a statistically significant difference between the control and stroke groups with respect to "Emotion instability that appeared in favor of stroke patients" based on the results of the mental examinations. Out of the twenty patients, five of them had pseudobulbar symptoms.

Additionally, there was a significantly greater prevalence of "substance abuse" in the stroke group (70.6% vs. 56.9% in the control group, p = 0.011).

The fact that a stroke may alter not just your perception of the world but also your emotional state is one way it might be described. For the simple reason that many regions of your brain regulate your thoughts, feelings, and actions. Some patients may have extreme mood swings and heightened emotionality, which may be explained by emotionalism. In some cases, however, this significant incident may have triggered the development of this personality disorder. There was concordance between this finding with research showing that emotional problems such as dread, rage, emotional numbness, difficulty comprehending and regulating one's own feelings, and a loss of control over one's emotional expression are common after a stroke. Stroke survivors have obstacles to social reintegration due to emotional problems [11].

No significant differences were found between the groups in our research with respect to "Mood disorder" (Table 5). We excluded individuals with a history of mood disorders, which may explain the results. Those who have experienced depression before a stroke, at any point in their lives, have a 3.0 (95% CI 2.3-4.0) higher risk of developing post-stroke depression compared to those who did not [13].

Mood problems account for an astounding 38% of our cases; for example, a longitudinal research on the lived experiences of stroke survivors found that 25% of stroke patients suffer from depression after the event [14].

Also, compared to the control group, our study's anxiety prevalence was twice as high (4.4% GAD and the same percentage for phobias), albeit this difference was not statistically significant.

Concurrently, there is no way to directly compare the rates of anxiety disorders before and after stroke, although after a stroke they are somewhat more common than in the overall population [4]. Between 6 and 7 percent of English people (16–64 years old) suffer with GAD, making it the most common subtype. Between two and three percent of the population(16–64) suffers from a phobia.

3. Discussion the of suicidal ideation scale (Morey's scale) in (studied groups) stroke patients and control group.

(Table 6 shows that compared to the control group, the stroke group had substantially higher mean suicidal ideation scores (3.8±4.3 vs. 3.3±4.6, $p = 0.013$). "No degree" suicide thought was more common in the control group (36.3% vs. 28.1%, $p = 0.045$), whereas "Moderate" ideation was more common in the other group. Symptoms of depression, such as despair, and responses to stressful events might trigger suicidal thoughts or acts of self-harm.

A research that used countrywide survey data to assess the likelihood of suicide thoughts and attempts between stroke patients and the general population found results that were consistent with ours. Information collected at the individual level from 228,735 people (4,560 with a stroke and 224,175 without). There was a significant difference between the populations without and with stroke in the rates of suicidal thoughts and attempts (24.4% and 1.3%, respectively; $p < 0.001$). Research has shown that having a stroke might heighten the likelihood of suicidal thoughts and actions [15]. From a biological perspective, neuroinflammation, which occurs after a brain stroke and promotes the kynurenine pathway, leads to serotonin and melatonin depletion, and is therefore related with the etiopathogenesis of suicide [16]. Suicide risk may also be influenced by a patient's emotional temperament and personality features, which influence their social functioning and interpersonal connections [17].

We also found that the rates of depression and suicide ideation were higher among the groups we analyzed, which provides strong evidence that this is the case.

5.Conclusions:

Research that examined 320 individuals found intricate connections between demographics, stroke characteristics, and mental health risks in relation to suicidal thoughts among stroke survivors. It discovered a correlation between the intensity of suicide ideation, emotional instability, and mood disorders. The importance of social support for mental health after a stroke was highlighted when it was shown that being married protected against increased suicidal thoughts. In order to improve clinical treatment and educate public health initiatives for improved survivorship outcomes.

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