Post-Stroke Depression in Jordan: Prevalence Correlates and Predictors

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Background: Post-stroke depression is among the most frequent neuropsychiatric complications of stroke, and it is associated with poor prognosis and outcomes. This study aimed to assess the prevalence of depression; its correlates, and predictors among patients with stroke in Jordan. *Methods:* A cross-sectional, descriptive correlation design was used among 198 patients with stroke admitted to 9 hospitals all over Jordan. Depression was assessed using the validated hospital depression subscale (HDS) of the Hospital Anxiety and Depression scale. *Results:* Study patients (mean age 56.62 years [SD = 14.2], 53% were males) experienced high prevalence of depression (76%); of these, 51.6% were categorized as higher depression category (a case of depression; HDS = 11-21). Factors that correspondingly predicted higher depression categories were low level of education (odds ratio [OR] = 3.347, 95% confidence interval [CI] = 2.920-23.949, $P < .001$), having a preparatory level of education (OR = 8.363, 95% CI = 1.24-9.034, $P = .017$), having comorbid chronic diseases (OR = .401, 95% CI = .190-.847), being a smoker (OR = 2.488, 95% CI = 1.105-5.604, $P = .028$), patients who reported inability to perform daily activities by themselves (OR = 3.688, 95% CI = 1.746-7.790, $P = .001$), and patients with comorbid dysphasia (OR = 12.884, 95% CI = 4.846-34.25, $P < .001$). *Conclusions:* Post-stroke depression is a significant health problem among Jordanian patients with stroke and warrants serious attention. Clinicians need to consider these important predictors when assessing and managing depression among patients at risk. **Key Words:** Post stroke—depression—prevalence—chronically ill—Jordan.

Introduction

Globally, stroke and ischemic heart disease were the foremost 2 causes of death and premature mortality in 2015.[1,2] The recent improvements in medical health care increase life expectancy and decrease stroke mortality. Worldwide, mortality rates associated with stroke were decreased by 21.0%, since 2005.[2] However, they increase the number of stroke survivors who live with the consequences of stroke such as disabilities that affect their quality of life and put increased demands on healthcare systems.[3] It has been well acknowledged that stroke is one of the largest causes of serious long-term mental and physical disabilities.[1]

Depression ranks first among all illnesses that cause disability.[4] In particular, post-stroke depression (PSD) is among the most frequent neuropsychiatric complications of stroke, with a reported prevalence varying widely and ranging from 25% to 79%, either in the early or in the late stage following stroke.[5,6] This percentage was found to be higher in developing countries, compared with the developed ones, which bear a disproportionate larger

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burden of stroke while owning fewer resources.[7] Lack of modern treatment and rehabilitation facilities may play an important role in increasing the frequency of depression in developing countries.[8-10]

Besides its high prevalence, PSD has been associated with a poor prognosis. Depressive symptoms increased the risk of stroke morbidity and mortality.[11] Patients with depression have more severe deficits in activities of daily living, a worse functional outcome, and more severe cognitive deficits.[12,13] Depression is considered as the strongest predictor of quality of life in stroke survivors and is associated with a significant increase in total healthcare expenditure.[14,15] Furthermore, high depressive symptoms have been associated with increased risk of stroke.[16]

Identifying factors that predict PSD rates and categories is vital. Studies revealed that depression levels were stable during the 18 months after first-ever stroke.[17] However, depression scores were significantly higher among patients who had lower physical functioning in the acute phase, disability after stroke, history of depression before stroke, cognitive impairment, lack of social or family support, suffering anxiety, and unemployment of patients at the time of stroke. Specific patient characteristics, like age and gender, were not shown to predict depression. In addition, there were no associations between depression and other variables like the stroke subtype, lesion location, or laterality.[5,9,18,19] Antidepressant medication may not always be suitable to treat depression after stroke, because of drug interactions, side effects, and poor compliance. Therefore, psychological treatments should be considered.[13] Physicians and other healthcare providers are usually aware of the emotional constituents of their stroke patients' illnesses, but the emotional and psychosocial dimensions of patients' illness are usually ignored because of physicians' lack of time to effectively asses and manage these aspects.[20,21]

The incidence of stroke in the Middle East is lower than that in most developed countries, mainly because of the younger population. However, the younger population in the Middle East predicted that in the future, the impact of stroke will become an increased burden, and stroke will increasingly become a major health problem.[22] Thus, more specific data on the epidemiology of stroke and related issues in the Middle East are needed.

To the year of 2020, epidemiologies of mental health disorders and psychosocial behaviors in relation to chronic illnesses are scientific research priorities for medical and pharmaceutical sciences in Jordan.[23] In Jordan, the body of knowledge regarding depression among stroke patients and its associated factors, which is the essence of their physical and psychological wellness, is still scarce. Therefore, this study was aimed to determine the prevalence of depression among patients with stroke in Jordan; to assess associations between demographic, socioeconomic, and clinical factors with PSD among Jordanian patients with stroke; and to determine predictors of PSD among Jordanian patients with stroke.

Material and Methods

A cross-sectional prospective design was used with a convenience sample of 198 Jordanian patients who were recruited from multi-hospitals evenly distributed throughout Jordan. Nine major hospitals representing the 3 major health sectors in Jordan, military, governmental, and educational (university teaching hospitals), were involved. Hospitals affiliated with these health sectors were divided according to their geographical area into 3 strata: the North, the Middle, and the South. Three hospitals representing the 3 major sectors were then randomly selected from each stratum. Data collection occurred between April and June 2017.

All patients experiencing a first or subsequent ischemic or hemorrhagic stroke were included in the study. Stroke diagnosis was confirmed by a senior neurology specialist using computed tomography or magnetic resonance imaging. Inclusion criteria included patients diagnosed with stroke, 18 years or older, and willing to provide written informed consent. The exclusion criteria were patients diagnosed with subarachnoid hemorrhage or reversible neurovascular status (transient ischemic attack, because of differences concerning etiology, risk factors, and management); patients diagnosed with a mental illness or major psychiatric illness (such as dementia, confusion, psychosis, and depression); patients with a history of taking psychotropic agents; patients having major hearing or visual difficulties; patients having a life-threatening or associated major illness (such as renal failure or cancer); and patients having speech impairment (such as aphasia). Ethical approval for the study was obtained from the ethical committees at the selected hospitals before conducting the study. A written informed consent was obtained from all patients after they were fully informed about the study purpose and objectives. All patients were assigned a code number to ensure confidentiality.

Face-to-face interview using a structured questionnaire was used to collect data. The interviews were conducted by 3 trained research nurses (1 from each geographical area) who are registered nurses and had at least 10 years' experience in providing care for stroke patients. Those nurses attended a 4-day training program concerning the study purpose, questionnaire, protocol, and strategies for conducting interviews. A pilot study with 15 patients (5 patients from each stratum) was conducted with the attendance of 1 of the 3 principal researchers to assure the consistency in conducting the interviews. The patients' medical records were reviewed by the research nurse and the research coordinator (the head nurse of the neurointensive care units or the head nurse of the medical floor) to confirm diagnosis and determine patient eligibility. Eligible patients were

approached by the research nurse and received a full explanation of the study, and then a written informed consent was obtained from all patients. Patients' medical records were searched for information concerning comorbidities, surgical history, and drug history.

A 2-part questionnaire was used to collect data. Part 1 included information related to patient socio-demographic characteristics (i.e., age, gender, marital status), personal characteristics (i.e., medical history, surgical history, residential status, and smoking), and stroke-related complications, such as the presence of dysphasia, visual problems, and ability to perform activity of daily living (without any help). Part 2 included the depression subscale of the Hospital Anxiety and Depression Scale (HAD). Numerically, The HAD is a self-assessment scale designed to assess the levels of anxiety and depression among non-psychiatric patients who are treated in medical and surgical departments at general hospital settings, to facilitate the detection and management of emotional disorder in patients. The HAD scale is composed of 14 items: 7 items reflecting anxiety (hospital anxiety subscale) and 7 items reflecting depression (hospital depression subscale [HDS]). Each item was rated on a 4-point Likert-type (from 0 to 3) response category. The possible scores in each subscale were computed by summing the corresponding items, with maximum scores of 21 for each subscale. A score of 0-7 on either subscale is considered as normal (none-case), 8-10 as a borderline case (doubtful case), and 11-21 as a case (definite case).[21] Bjelland et al[24] have reported that the HAD questionnaire is a valid measure with correlations between the 2 subscales varying from .40 to .74 (mean.56) and Cronbach alpha for anxiety of .83 and .82 for the depression subscale.[24] Since it was published in 1983, the HAD has been used extensively as a clinically meaningful screening tool for psychological changes during the course of disease and to evaluate the effectiveness of psychotherapeutic and psychopharmacological interventions. Translated versions are available in many languages including Arabic. The Arabic version of the HADS has been in use since 1987 and has been validated in different hospital settings such as emergency care and hospitalized patients.[20,25]

Data Analysis

Descriptive statistics were calculated for the sample demographics (i.e., age, gender, and marital status) and sample characteristics (i.e., depression total scores, residential status, and smoking). Categorical variables (i.e., prevalence of depression, depression categories, and gender) were presented as percentages and number of cases. However, central tendency measures (means) and the dispersion measures (standard deviation [SD]) were used to express the quantitative variables (i.e., age and depression total scores). Statistical comparisons between different groups were carried out using t tests and χ^2. Univariate analysis was performed to determine factors that were significantly associated with depression categories. Relationships between depression categories among stroke patients and their characteristics were examined using Pearson's correlation coefficient for continuous variables; Epsilon squared, and Glass rank bi-serial for categorical variables.[26] Ordinal logistic regression was used to determine significant predictor of depression categories. To guarantee meeting all assumptions for analysis used, preliminary data screening was done for all the study variables, based on their levels, for normality, multicollinearity, and proportional odd. The assumptions required for all statistical tests used were reasonably well met. Statistical significance was established at $P < .05$. All data were analyzed using SPSS Statistics 21.0 software (Armonk, NY: IBM Corp).[27]

Results

The patients' mean age was 56.62 years (SD = 14.2), with the older age group higher than 55 constituting the highest percentage (53%). Almost 56% of the patients were males. About a quarter have a job; majority (78%) were married, resided in urban areas (54.5%), and lived with their own family (91%). Almost 70% of the patients had other comorbid diseases (Table 1).

Overall, 76.3% of the patients had some levels of depression (HDS ≥ 8); of these, 24.7% were borderline cases (HDS = 8-10) and 51.6% were categorized as a case (HDS = 11-21). About 78% of the older age group (>55 years) had some level of depression, and 60% of them were categorized as a case of depression, whereas a lower proportion of the age group 55 years or younger (42%) were categorized as a case of depression. No significant differences were found in the depression categories based on gender. Around 35% of the patients had diploma or above as their level of education; of those, 28% were categorized as a case. A great proportion (69%) of those who had lower educational levels (elementary or less) were categorized as a case. Among those who did not work (48%), around 59% were categorized as a case. Around 69% of the study patients had other comorbidities, like hypertension (HTN), diabetes mellitus (DM), and cardiovascular diseases (CVD); 83% of those had some level of depression and 62% of them were categorized as a case. Around 80% of the study patients had comorbid dysphasia, visual problems, and were unable to perform their daily living activity independently, and around 60% of them were categorized as a case. Socio-demographic and clinical characteristics of the study patients based on depression categories are presented in Table 1.

The mean score for depression was 10.48 (SD = 4.32, ranging from 0 to 21). There were no significant differences based on gender, t (196) = 1.79, p = .075. However, significant differences were found based on the pa-

Table 1. *Socio-demographic and clinical characteristics of the study patients according to the level of depression (N = 198)*

Characteristics	Normal (none case) n (%)	Borderline (doubtful case) n (%)	A case n (%)	Total n (%)	Test statistics
Age					
≤55	24 (25.8)	30 (32.3)	39 (41.9)	93 (47.0)	$\chi^2 = 7.44$
>55	23 (21.9)	19 (18.1)	64 (60.0)	105 (53.0)	$P < .05$
Gender					
Females	20 (22.7)	18 (20.5)	50 (56.8)	88 (44.4)	$\chi^2 = 2.11$
Males	27 (24.5)	31 (28.2)	52 (47.3)	110 (55.6)	$P > .05$
Education					
Elementary or less	8 (16.3)	7 (14.3)	34 (69.4)	49 (24.7)	$\chi^2 = 35.67$
Preparatory	6 (15.0)	6 (15.0)	28 (70.0)	40 (20.2)	$P = .001$
Secondary	9 (22.0)	11 (26.8)	21 (51.2)	41 (20.7)	
Diploma and above	24 (35.3)	25 (36.8)	19 (27.9)	68 (34.4)	
Job					
Work	18 (34.0)	21 (39.6)	14 (26.4)	53 (26.8)	$\chi^2 = 18.85$
Do not work	20 (21.1)	19 (20.0)	56 (58.9)	95 (48.0)	$P = .001$
Retired	9 (18.0)	9 (18.0)	32 (64.0)	50 (25.2)	
Marital status					
Single	5 (29.4)	4 (23.5)	8 (47.1)	17 (.86)	$\chi^2 = 1.70$
Married	38 (24.5)	39 (25.2)	78 (50.3)	155 (78.3)	$P > .05$
Divorce or widow	4 (15.4)	6 (23.1)	16 (61.5)	26 (13.1)	
Lives with					
Alone	3 (20.0)	5 (33.3)	7 (46.7)	15 (07.6)	$\chi^2 = 4.60$
My family	43 (23.9)	42 (23.3)	95 (52.8)	180 (91.0)	$P > .05$
My spouse family	1 (33.3)	2 (66.7)	0 (.0)	3 (01.4)	
Residential status					
Urban	27 (26.2)	29 (28.2)	47 (45.6)	108 (54.5)	$\chi^2 = 1.92$
Rural	20 (22.2)	20 (22.2)	50 (55.6)	90 (45.5)	$P > .05$
Smoking status					
Yes	13 (15.9)	27 (32.9)	42 (51.2)	82 (14.4)	$\chi^2 = 7.69$
Quite	31 (29.8)	20 (19.2)	53 (51.0)	104 (52.5)	$P > .05$
Never	3 (25.0)	2 (16.6)	7 (58.3)	12 (6.00)	
Duration since attack of stroke (mo)					
Up to 1	30 (23.3)	33 (25.6)	66 (51.1)	129 (65.2)	$\chi^2 = 4.75$
>1 to 3	3 (1.50)	8 (4.00)	9 (04.5)	20 (10.1)	$P > .05$
>3	14 (28.6)	8 (16.3)	27 (55.1)	49 (24.7)	
Medical history					
None	24 (39.3)	20 (32.8)	17 (27.9)	61 (30.8)	$\chi^2 = 26.77$
DM, HTN, CVD. . .	23 (16.8)	29 (21.2)	85 (62.0)	137 (69.2)	$P < .01$
Surgical history					
None	31 (25.0)	37 (29.8)	56 (45.2)	124 (62.6)	$\chi^2 = 6.29$
Yes	16 (21.6)	12 (16.2)	46 (62.2)	74 (37.4)	$P < .05$
Dysphasia					
Yes	19 (11.9)	42 (26.4)	98 (61.6)	159 (80.3)	$\chi^2 = 64.21$
No	28 (71.8)	7 (17.9)	4 (10.3)	39 (19.7)	$P < .001$
Ability to perform activity of daily living (without other's help)					
Able	31 (79.5)	8 (20.5)	0 (.0)	39 (19.7)	$\chi^2 = 88.96$
Disable	16 (10.1)	41 (25.8)	102 (64.1)	159 (80.3)	$P < .001$
Visual problems					
Yes	36 (22.0)	34 (20.7)	94 (57.3)	164 (82.8)	$\chi^2 = 13.75$
No	11 (32.4)	15 (44.1)	8 (23.5)	34 (17.2)	$P = .001$

Abbreviations: CVD, cardiovascular diseases; DM, diabetes mellitus; HTN, hypertension; *P*, significant level comparing statistical significance between the 3 depression categories.

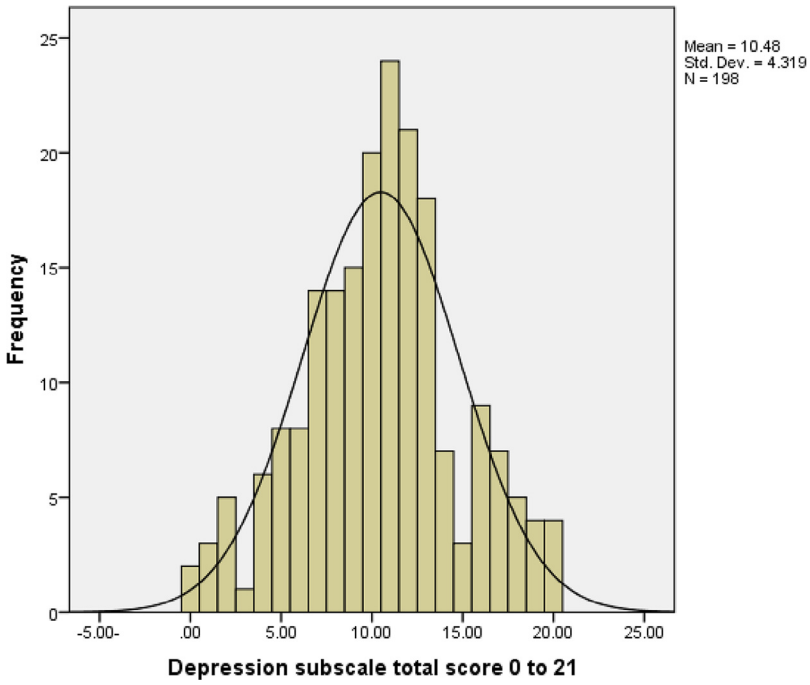

Figure 1. *Depression score among patients.*

tients' age group, as patients above the age of 55 years had higher mean scores of depression t (196) = –2.39, p = .018. Figure 1 shows the depression scores for the study patients.

Table 2 presents the correlation between depression score and characteristics of the study patients. Patients were more likely to be categorized with depression categories (borderline or case) if they were advanced in age, had less education, were not married, had no job, had comorbid diseases, had comorbid dysphasia and visual problems, and were unable to perform daily living activities independently. However, no significant correlations were found between depression categories and the rest of patients' characteristics.

Table 2. *Correlations between depression categories and patients' characteristics (N = 198)*

Characteristics	r	*P*. value
Age	.29	<.001
Gender (F = 1, M = 2)	–.13	.075
Educational status	–.39	<.001
Marital status (single, widowed, or divorced = 1, married = 2)	–.18	.011
Working (No = 1, Yes = 2)	–.31	<.001
Residential status	.089	.216
Duration since attack of stroke (mo)	.11	.142
Medical history (no = 1, yes = 2)	.32	<.001
Surgical history (no = 1, yes = 2)	.10	.180
Smoking status	.07	.340
Dysphasia	–.514	<.001
Ability to perform self-care activities	–.623	<.001
Visual problems	–.220	.002

To explore the predictors of depression levels (coded 1 = normal, 2 = borderline, and 3 = a case), an ordinal regression was performed. Independent variables were demographic and background characteristics age (coded 1: ≤55 and 2: >55 years), gender (coded 1 = female and 2 = male), marital status (coded 1 = single, 2 = married, and 3 = widowed or divorced), educational levels (coded 1 = elementary or less, 2 = preparatory, 3 = secondary, and 4 = diploma or above), work status (coded 1 = have no work or retired and 2 = work), smoking status (coded 1 = yes and 2 = never or quit), medical history (coded 1 = have no medical history and 2 = have a medical history of DM, HTN, CVD), how long since you got stroke (coded 1 = up to 1 month, 2 = more than 1-3 months and 3 = more than 3 months), have comorbid visual problems (coded 1 = yes and 2 = no), ability to perform activity of daily living without others' help (coded 1 = unable and 2 = able), and have comorbid dysphasia (coded 1 = yes and 2 = no). Data from 198 cases were included in this analysis.

Table 3 presents the ordinal logistic regression analysis of factors associated with depression. A test of full model (with depression levels as the predictor variable) compared with a constant only or null model was statistically significant, χ^2 (15) = 122.23, P < .001. The model had overall goodness of fit, Pearson χ^2 (281) = 300.9, P = .198, and Deviance χ^2 (281) = 240.19, P = .963. Parallel test was held, χ^2 (15) = 21.93, P = .11, thus proportional odds models were used. This model accounted for a significant percentage of variance in depression levels, and the strength of association between depression levels and

Table 3. *Predictors of depression among patients with stroke (N = 198)*

Characteristics	Wald	OR	95% CI for OR	*P* value
Age				
≤55	.112	1.140	.528-2.461	.738
>55	Ref			
Gender				
Females	.828	1.450	.652-3.227	.363
Males	Ref			
Education				
Elementary or less	15.654	8.363	2.920-23.95	<.001
Preparatory	5.687	3.347	1.240-9.034	.017
Secondary	3.401	2.375	.947-5.953	.065
Diploma and above	Ref			
Job status				
Do not work or retired	.501	.718	.287-1.797	.479
Work	Ref			
Marital status				
Single	.428	1.669	.393-7.077	.487
Married	.516	.701	.266-1.849	.472
Divorced or widowed	Ref			
Smoking status				
Yes	4.840	2.488	1.105-5.604	.028
Quite or never	Ref			
Duration since attack of stroke (mo)				
Up to 1	.541	1.335	.618-2.883	.462
>1-3	2.117	2.782	.701-11.043	.146
>3	Ref			
Medical history				
DM, HTN, CVD	5.731	.401	.190-.847	.017
None	Ref			
Dysphasia				
Yes	26.253	12.884	4.846-34.25	<.001
No	Ref			
Ability to perform activity of daily living (without other's help)				
Able	11.704	3.688	1.746-7.790	.001
Disable	Ref			
Visual problems				
Yes	.012	1.052	.423-20620	.912
No	Ref			

Abbreviations: CI, confidence interval; CVD, cardiovascular diseases; DM, diabetes mellitus; HTN, hypertension; OR, odd ratio; *P*, significant level; Ref, reference group.

the set of predictors was relatively strong with a Cox and Snell's $R^2 = .46$ and Nagelkerke's $R^2 = .53$. Patients who have lower levels of education (elementary or less, and preparatory), medical history of HTN, DM, CVD, smokers, those who cannot perform self-care activities by themselves, and those with dysphasia had significantly higher levels of depression (categorized as a case). Among those who had elementary or less level of education, the odds to have higher levels of depression was 3.347 (95% CI = 2.920-23.949) times that of those who had higher levels of education (diploma or above), with a statistically significant effect (Wald χ^2 (15) = 15.654, $P < .001$). Among those who had preparatory level of education, the odds to have a case level of depression was 8.363 (95% CI = 1.24-9.034) times that of those who had higher levels of education (diploma or above), with a statistically significant effect (Wald χ^2 (15) = 5.687, $P = .017$). However, no statistically significant effect to have higher level of depression among those who had a secondary level of education was found. The odds to have a case level of depression among those who had DM, HTN, and CVD was .401 (95% CI = .190-.847) times that of those who had no previous history of these diseases, a statistically significant effect was shown (Wald χ^2 (15) = 5.731, $P = .017$). The odds for smoker patients to have higher categories of depression was 2.488 (95% CI = 1.105-5.604) times that

of those who were non-smokers, with a statistically significant effect (Wald χ^2 (15) = 4.840, P = .028). The odds to have a higher depression category among patients who could not perform daily activities by themselves was 3.688 (95% CI = 1.746-7.790) times that of those independent from others in performing daily activities, with a statistically significant effect (Wald χ^2 (15) = 11.704, P = .001). Finally, the odds to have higher categories of depression among those with comorbid dysphasia was 12.884 (95% CI = 4.846-34.25) times that of those who had no comorbid dysphasia; a statistically significant effect was shown (Wald χ^2 (15) = 26.253, P < .001).

Discussion

Information about the prevalence and risk factors for depression among post-stroke patients is essential to develop strategies for prevention, early detection, and appropriate management, which result in improved outcomes. To the best of our knowledge, this is the first study to assess prevalence of depression and its correlates and predictors among post-stroke patients in Jordan. The study findings revealed that more than three-quarters (76%) of the study patients had some levels of depressive symptoms; of these, 52% had severe level of depression, which is consistent with previous studies.[8-10] In a systematic review and meta-analysis, Bartoli et al[28] reported that among all depressive disorders, the proportion of depression among stroke patients varied and ranged between 25% and 79%. This variation could be related to the fact that prevalence of depression in the developing countries is higher than in developed countries because of lack of modern therapeutic and rehabilitation facilities in these countries.[9,29] Another reason could be related to the high percentage of stroke survivors who were in the acute phase of stroke, around 75% of the study participants had stroke less than 3 months of the study entry. Previous studies reported that the highest rates of depression occurred in the initial months following a stroke, with a gradient of decline over 12-24 months.[30] In addition, these variations in prevalence may be because of the use of different assessment tools or different inclusion criteria.[28]

Depression following a stroke was found to be associated with poor prognosis, severe self-care deficits, severe cognitive deficits, poor quality of life, and increased mortality risk as compared with stroke patients without depression.[12,13] Depression in stroke survivors has been associated with a significant increase in total healthcare expenditure.[15] The high prevalence of depression detected in the current study, particularly the higher percentage of patients categorized as a case, emphasizes the importance of early detection to prevent serious depression before it begins. Providing treatment with antidepressant medications or non-pharmacological therapies like cognitive-behavioral therapy, such as problem-solving therapy (a type of psychotherapy, or talk therapy) that helps patients to identify and solve problems that interfere with their daily lives and contribute to depressive symptoms are recommended.[31] Rehabilitation interventions should be initiated as early as possible and within the first day after stroke. Rehabilitation is concerned not only with physical recovery but also with reintegration of the stroke survivors into social and working life. Therefore, community-based rehabilitation approach that includes regular follow-ups and community-based programs that promotes reintegration into the community is vitally important.[32] Unfortunately, follow-ups and community-based programs are currently not existing in Jordan.

The analysis revealed that age was positively correlated with depression, indicating that older patients had higher depression levels, particularly, patients over the age of 55 years, as they were more likely to be categorized as borderline and case. However, the participant's age group did not predict the higher categories of depression. A greater proportion of the study patients were males, which is consistent with the literature indicating that the incidence of stroke is higher in men than in women for all age classes.[33] However, there were no significant differences based on gender concerning the depression categories, which was consistent with previous studies.[5,9,18] Contrary to our findings, Barker-Collo[34] found that younger stroke survivors were at higher risk to develop depression at 3 months post stroke. Further, Islam et al[10] reported that female stroke patients had a higher mean depression score as well as higher incidence of mild, moderate, and severe depression. However, no association between age and depression was reported, although higher prevalence of severe depression was found in older patients.[10] According to Islam and colleagues, such findings could be related to the small sample size of their study. Therefore, clinicians need to provide great attention to each individual experience of stroke and assess depression among all patients regardless of age and gender.

Other socioeconomic characteristics were associated with depression. The participant's level of education was negatively correlated with depression level. Almost quarter of the study patients had elementary educational level or less, and such patients had higher prevalence of depression that was more likely to be categorized as a borderline or a case. Furthermore, patients who had the preparatory levels of education were more likely to have higher categories of depression. These results were in agreement with literature that illiterate stroke patients had higher levels of depression,[10,19] and having higher educational levels presented a protective role against it.[19] Contrary to our findings, Jiang et al[35] found no association between PSD and the level of education. Similarly, being not married (single, divorced, and widowed) and not employed were associated with higher level of depression. This finding is consisted with previous studies, which found that lack of social or family support and

being not employed at the time of stroke increase the risk of having PSD.[5,8-10] It is well-documented that modifiable risk factors of stroke include hypertension, exposure to cigarette smoking, diabetes, atrial fibrillation, and certain other cardiac conditions.[36] Our study findings showed that having comorbid diseases like diabetes mellitus, hypertension and cardiac diseases, or being a smoker might predict PSD, which is consistent with previous reports.[10] Patients with such comorbid conditions (and their caregivers) should be educated on the signs and symptoms of stroke and on the importance of regular monitoring and doctor visits. Patient education on the importance of quitting smoking and not being exposed to passive smoking is just as important. Severity of stroke and disability after the stroke incidence are major predictors of PSD. In the current study, around 80% of the patients had comorbid dysphasia, visual problems, and were unable to perform self-care activities. Such patients were more likely to develop PSD, which is similar to previous literature reporting that the prevalence of PSD in patients with minor stroke is lower because minor stroke is characterized by mild neurologic and physical disabilities.[9,10,37] Hence, although all stroke patients deserve to be given full, immediate, and continuous care, health-care professionals need to take extra attention in rating the type of depression, resulting disabilities, and in providing needed care accordingly.

Limitation

This study is limited in its design that assesses depression at a single point of time; further cohort studies are needed to assess the effect of time on PSD. The current study consisted of a representative sample that was collected from all over Jordan and might represent the entire stroke community and its result might be used as a base for these follow-up studies. This study used only 1 scale to assess depression, whereas using another scale might confirm better the categories of depression. Furthermore, such scale indicated only the quantity of depression and did not confirm clinical diagnosis of depression. This study used self-report questionnaires with rank-order scales for determining perceived depression using the interview method. Possible response bias may have been introduced into the results as patients may give socially desired responses to not "lose face." However, HDS is a reliable and valid scale used to quantify depressive responses. Despite these limitations, the study results confirm the high prevalence of depression among stroke survivors in Jordan and determined some of its associated factors and predictors. Further studies evaluate the association between stroke and depression, confirm the associated factors and predictors, and assess other variables, have the potential to deepen our understanding of PSD. In addition, further interventional studies are needed to prevent and manage PSD.

Conclusion

The alarming high prevalence of depression among stroke patients in Jordan emphasizes the need to develop policies aimed to assess and manage PSD and provide community-based follow-up and rehabilitation treatments. Clinicians should pay particular attention to patients with disability, as the risk of depression after stroke seems to be higher in these groups. Patients with advanced age, less educational level, being smoker, and those who have medical history of diabetes, hypertension, and cardiac diseases deserve close monitoring and consideration for preventive interventions to reduce the risk of depression and improve stroke survivors' outcomes. It is important to consider that the high proportion of case category of depression does not necessarily mean the presence of major depression. The HDS is an assessment tool that quantifies depressive symptoms without confirming a clinical diagnosis. Those patients who had the borderline or case categories of depression are in need for further assessment to confirm the diagnosis of depression.

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