The Effect of Psychosocial Factors and Functional Independence on Poststroke Depressive Symptoms: A Cross-Sectional Study

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ABSTRACT

Background: Stroke is the second leading cause of death and a major cause of serious, long-term disability worldwide. The approximately 15 million people each year who experience stroke are at risk of developing depression. Poststroke depressive symptoms affect one third of survivors of stroke. Patients who develop poststroke depressive symptoms experience decreased functional independence, poor cognitive recovery, decreased quality of life, and increased mortality. Survivors of stroke use social support to deal with stress and defend against the adverse effects of negative stroke outcomes.

Purpose: This study was designed to examine the influence of perceived social support (emotional and informational, tangible, affectionate, and positive social interaction), stress level, and functional independence on depressive symptoms in survivors of stroke.

Methods: A cross-sectional observational study design in outpatient settings and rehabilitation centers was conducted. A convenience sample of 135 survivors of stroke completed the psychometrically valid instruments.

Results: Most of the sample had mild or moderate depressive symptoms (26% and 29%, respectively). The mean score for perceived social support was 77.53 (SD = 21.44) on the Medical Outcomes Study Social Support Survey. A negative association was found between depressive symptoms and the social support total score (r = −.65, p < .01). All of the social support subcategories were negatively associated with depressive symptoms. Hierarchical multiple linear regression showed that social support, stress level, and literacy were associated with depressive symptoms. Hierarchical multiple linear regression showed that the association between depressive symptoms and functional independence is partially mediated by social support.

Conclusions/Implications for Practice: Poststroke depressive symptoms are common among survivors of stroke. Social support may improve health by protecting these individuals from the negative outcomes of stroke and enhance their recovery. Future research is required to examine how related interventions improve social support in caregivers and reduce depressive symptoms in stroke survivors.

KEY WORDS: social support, poststroke depressive symptoms, functional independence, stress, survivors of stroke.

Introduction

Stroke is a devastating disease that results in permanent disability. The psychosocial health of survivors of stroke is as important as their physical health and cognitive function. Globally, the approximately 15 million people every year who experience a stroke are at risk of developing depression (Hackett & Pickles, 2014). Depression after stroke is a dynamic phenomenon that regularly affects up to one third of stroke survivors, with depressive symptoms frequently occurring within the first year (Virani et al., 2020). The recent meta-analysis reported that 33% of stroke survivors experience an episode of depression within the first year of experiencing a stroke and that 25% and 23% experience an episode of depression 1–5 years after stroke, respectively (Towfighi et al., 2017). Depression is a common phenomenon among survivors of stroke in Saudi Arabia (Alarjan et al., 2015), with a prevalence ranging from 17% to 63.3% (Abdul-sattar & Godab, 2013; Al-Busaidi & Alamri, 2016; Hamad et al., 2011). However, the dearth of updated epidemiological studies in the Saudi population may underestimate its prevalence and incidence (Memon et al., 2019).

Survivors of stroke experience negative physical and emotional outcomes. Poststroke depressive symptoms (PSDSs) affect patients’ rehabilitation and delay recovery if these symptoms are not discovered and treated early (Almhawaii...
et al., 2021; Robinson & Jorge, 2016). Most survivors of stroke who develop PSDSs experience decreased activities of daily living (Stein et al., 2018), poor cognitive recovery, delayed return to social activities, reduced quality of life (Khedr et al., 2020), and increased mortality (Bartoli et al., 2018). The risk factors associated with depression after stroke have been studied and reported extensively in the literature. The most consistently reported risk factors include previous history of depression, stroke severity, functional dependence, and cognitive impairment (Ayerbe et al., 2013; Babkair, 2017).

Furthermore, stroke is a stressful life event that requires effective coping strategies, and social and family support are protective factors against negative stroke outcomes, including PSDSs. Survivors of stroke frequently experience declines in social support and their social networks (Saadi et al., 2018). Strokes disrupt family relationships when survivors are unable to continue in their prestroke roles or communicate effectively (Northcott et al., 2016). Studies have reported that lack of social and family support is associated with an increased risk of PSDSs in patients with stroke, whereas adequate social support improves quality of life and increases functional dependence (Khedr et al., 2020). Northcott et al. found that survivors of stroke with less social support reported higher rates and longer periods of PSDSs than their peers who received adequate support. Moreover, survivors of stroke with PSDSs have reported inadequate perceived social support, poor social participation, low quality of life, and physical disability, although sufficient social support and self-efficacy are protective elements for PSDSs as well as predictors of PSDS resolution (Lewin et al., 2013).

Healthcare professionals, especially nurses, provide direct support to survivors of stroke on a daily basis, and social support helps patients cope effectively with the stress associated with stroke outcomes. Social support enhances health and improves recovery. Therefore, nurses should be aware of the influence of social support on patient health outcomes and work to facilitate this support. A clear understanding of the phenomena of PSDSs and social support provides insights and assists healthcare providers to identify those patients at a high risk who will most likely benefit from support-based interventions. This, in turn, may result in improved quality of life, shorter hospital stays, reduced healthcare costs, and decreased mortality. The purpose of this study was to examine the influence of perceived social support (emotional and informational, tangible, affectionate, and positive social interaction), stress level, and functional independence on depressive symptoms in stroke survivors.

**Methods**

**Participants**

A cross-sectional study was conducted to collect information about PSDSs, social support, stress level, and functional independence in Saudi survivors of stroke. The participants were selected using a convenience sampling procedure from among survivors of stroke in outpatient settings and inpatient rehabilitation facilities in King Abdulaziz University Hospital, Sultan Bin Abdulaziz Humanitarian City, and Ministry of Health Hospitals in Saudi Arabia. Eligibility criteria included being a stroke survivor who was ≥18 years old and able to sufficiently comprehend and communicate in Arabic. Otherwise-qualified individuals with conditions such as cognitive impairment, dementia, aphasia, and chronic psychiatric diagnoses (except preexisting depression) that would limit their ability to complete a survey were excluded.

The neurologist and nursing staff introduced the research study to qualified individuals during clinical follow-up at outpatient clinics and rehabilitation sessions. Those who agreed to participate met with the researcher and completed psychometrically valid instruments, which assessed the presence of depressive symptoms, availability of social support, level of stress, and degree of functional independence. Data were collected from October 24, 2017, through January 31, 2018.

All of the participants volunteered to take part in this research and provided signed informed consent. The institutional review board at New York University approved this study (No. IRB-FY2017-909).

**Instruments**

**Demographic variables**

The demographic variables considered in this study were selected based on their potential influence on the study variables. The sociodemographic form collected data on participant age, gender, nationality, marital status, living status, literacy level, employment status, and income.

**History of depression**

History of depression was conceptualized in this study as any self-reported, prestroke history of depression. Data were collected using three questionnaire items that asked whether the participant had ever (a) been told by a healthcare professional that he or she had depression, (b) taken medication for depression, or (c) received counseling for depression.

**Chronic diseases**

The Charlson Comorbidity Index (CCI) was completed by the researcher for each participant. The CCI contains 19 classifications of comorbidity and is widely used to predict the 10-year mortality risk in patients who may have a range of comorbid conditions. Each condition is allotted a score of 1, 2, 3, or 6 depending on the risk of dying associated with this condition (Charlson et al., 1987).

**Poststroke depressive symptoms**

This study used the Patient Health Questionnaire-9 (PHQ-9) to measure the degree of depressive symptoms. The PHQ-9 Arabic version is a reliable and valid instrument for measuring PSDSs, with an internal consistency reliability coefficient...
of Cronbach’s alpha of .857 (AlHadi et al., 2017). Furthermore, Sawaya et al. (2016) provided psychometric properties for the PHQ-9 in 186 Lebanese subjects. The PHQ-9 is a brief, nine-item, self-administered tool on which participants note how often they were disturbed by nine distinct problems during the previous 2-week period. For this study, PSDSs were measured as a continuous variable using the total PHQ-9 score, and the presence or absence of PSDSs was treated as binary data with a cutoff point of ≥ 10.

**Social support**
Social support was assessed in this study using the Medical Outcomes Study Social Support Survey (MOS-SSS). Social support was hypothesized as the self-assessment by a participant regarding how often she or he can count on people for support in different situations (Sherbourne & Stewart, 1991). The 19-item MOS-SSS is brief, multidimensional, and self-administered. This survey was developed to measure perceived support, with one item included as a measure of structural support. The MOS-SSS is composed of four functional support subscales: (a) emotional/informational, (b) tangible, (c) affectionate, and (d) positive social interaction. Dafaalla et al. (2016) found that the Arabic version of the MOS-SSS had satisfactory validity. All of the items correlated highly with their hypothesized scales at ≥ .788. The MOS-SSS has high internal consistency, earning a Cronbach’s alpha of .97 for the overall scale and .95–.97 for the four subscales. In this study, the participants were asked to indicate how frequently they received different types of support. Survey scoring was based on Sherbourne and Stewart (1991), with higher subscale and overall support index scores indicating greater social support.

**Perceived stress**
Self-perceived level of stress was measured using the Perceived Stress Scale-10 (PSS-10). This scale is a 10-item self-report questionnaire used to measure the degree to which situations in an individual’s life are appraised as stressful, that is, unpredictable, uncontrollable, and/or overloaded (Cohen & Williamson, 1988). The PSS-10 has been used in survivors of stroke to explore the association between perceived stress and PSDSs (Laures-Gore & Defife, 2013). Furthermore, the PSS-10 has been used to measure perceived stress in survivors of stroke and their caregivers (Godwin et al., 2013). The reliability and validity of the PSS-10 are well documented (Chaaya et al., 2010). The Arabic PSS-10 has shown significant positive correlations with both the General Health Questionnaire-12 and the Edinburgh Postpartum Depression Scale (.59 and .49, respectively; Chaaya et al., 2010). The PSS-10 has internal consistency reliability coefficients of .74. Total scores range from 0 to 40, with higher scores indicating higher degrees of stress.

**Functional independence**
Functional independence was measured using the Functional Independence Measure (FIM). This scale was designed to measure degree of disability and assess how much help is required for the individual to do activities of daily living. The FIM consists of 18 items assessing six areas of function (self-care, sphincter control, mobility, locomotion, communication, and social cognition), which are classified into the two domains of motor (13 items) and cognitive (five items). The FIM has shown good internal consistency, with a Cronbach’s alpha of .88 at admission and an alpha of .91 at discharge. The intraclass correlation coefficient was shown to be .55 at admission and .86 at discharge. Moreover, an excellent correlation between the FIM motor subscale and the 10-item version of the Barthel Index (r = .92 at admission, r = -.94 at discharge) has been reported (Hsueh et al., 2002). In this study, the researcher completed the FIM for each participant. The total potential score range is 18–126, with 18 indicating complete functional dependence and 126 indicating complete independence.

**Data Analysis**
IBM SPSS Statistics 24.0 software (IBM Inc., Armonk, NY, USA) was used to analyze the data. Descriptive statistics were used to explain the sample and the instruments used in this study. Means and standard deviations were used to analyze the demographic variables of age and time since stroke. Frequencies were used to analyze the demographic variables of gender, nationality, level of literacy, employment status, income, history of depression, and PSDSs ≥ 10. Means, standard deviations, medians, and ranges were used for PHQ-9, MOS-SSS, stress level, and functional independence.

Analyses of PHQ-9, MOS-SSS, PSS-10, and FIM scores were undertaken to examine the effect of perceived social support and subscales, stress level, and functional independence on PSDSs. Bivariate comparisons using t tests or chi-square analyses were conducted on participants with and without depressive symptoms. Pearson correlations were used to test bivariate associations between PHQ scores and social support. Multivariate linear regression was conducted to identify the relationship between perceived social support and PSDSs after controlling for relevant risk factors. Variables identified in the bivariate analysis with p < .10 were included in the model. The presence of mediators including social support and stress level was tested.

**Results**

**Sample Characteristics**
Data on demographic characteristics, chronic diseases, and information on PSDSs are shown in Table 1. The average age of the participants was 57.84 years (SD = 12.32), with ages ranging from 24 to 87 years (median = 58 years). Most were male (68.1%), and 60% had experienced a stroke less than 6 months before the survey. Over half (59%) were recruited from outpatient clinics, whereas 27.4% and 14% were recruited from inpatient rehabilitation and outpatient rehabilitation, respectively. Most had multiple comorbid
conditions, and the CCI for the entire sample was either medium (24.4%) or high (72.6%). The most common comorbid conditions were hypertension (80%), diabetes (68%), and hyperlipidemia (68%). Most had experienced ischemic stroke (85%).

Most of the sample had a mild (26%) or moderate (29%) severity of depressive symptoms, with only 20% having a low severity level (score: 0–4). Half of the sample (54%) had a PHQ-9 score > 10 points, indicating the presence of depressive symptoms.

The average scores for the PHQ-9, perceived social support, perceived stress, and Functional Independence Measures are presented in Table 2. The average score on the PHQ-9 was 10.02 (SD = 5.56), indicating the presence of depressive symptoms. The average score of perceived social support was 77.53 (SD = 21.44), revealing fair perceived support. The average score of perceived stress level was 19.56 (SD = 8.77), indicating moderate stress. The average score of the FIM was 100.68 (SD = 21.56). Most of the sample had mild motor disability (68.72, SD = 20.38) without cognitive impairment (32.04, SD = 3.31). The FIM score varied significantly by recruitment site (F(2, 132) = 6.53, p = .002). The FIM for the participants from Sultan Bin Abdulaziz Humanitarian City (M = 92.50, SD = 23.71) was significantly lower than for those from King Abdulaziz University Hospital (M = 107.38, SD = 19.94) and Ministry of Health hospitals (M = 98.91, SD = 17.84).

A bivariate comparison of PSDSs and the social support score and its subcategories is presented in Table 3. There was a negative association between depressive symptoms and social support total score (r = -.65, p < .001). All social support subcategories were negatively associated with PSDSs. Moreover, there was a negative association between depressive symptoms and the FIM (r = -.45, p < .001), and PSDS score was positively associated with perceived stress score (r = .71, p < .001).

A marginally significant association between depressive symptoms and age was found (r = .15, p = .08). The PHQ-9 score for men (M = 9.03, SD = 5.39) was significantly lower than that for women (M = 12.14, SD = 5.39; t (133) = 2.89, p = .002). Furthermore, the mean PHQ-9 score for participants who were married (M = 9.27, SD = 5.39) was significantly lower than for those who were widowed (M = 14.06, SD = 5.73). Moreover, participants whose Arabic literacy included writing proficiency (M = 9.00, SD = 5.13)
had significantly lower PHQ-9 scores than those who were not writing proficient (M = 14.31, SD = 5.31; t(133) = 4.71, p < .001). Other factors were not found to be significantly associated with PHQ-9 score.

Multiple linear regression was conducted to examine the association between depressive symptoms (PHQ-9) and perceived social support, perceived stress level, and functional independence during the first poststroke year, after controlling for demographic factors (age, gender, marital status, literacy level, employment status, and income). A two-stage hierarchical multiple regression was conducted with depressive symptoms (PHQ-9) as the dependent variable. In the first model of hierarchical multiple regression, several demographic factors (gender, marital status, literacy, employment status, and monthly income) were entered, as shown in Table 4. This model was statistically significant (F(5, 129) = 5.29, p < .001), explaining 17% of the variance in depressive symptoms. After the entry of other predictors (Model 2), the total variance explained by the model as a whole was 63% (F(8, 126) = 26.44, p < .001). In the final adjusted model (2), three of eight predictor variables were statistically significant, with perceived stress having the highest beta value (β = .45, p < .001), followed by perceived social support (β = -.31, p < .001) and literacy level (β = .16, p = .01). The model showed that, for each unit increase in the stress level, depressive symptoms increased by .28 and that, for each unit increase in the social support, depressive symptoms decreased by .08. The FIM was insignificant in the final regression model (β = -.11, p = .07). However, two mediators were observed (social support and stress level) when the hierarchical multiple regression was conducted. The presence of social support weakened the relationship between FIM and PSDSs (β = -.258, p < .001) compared with the unmediated model (β = -.446, p < .001). Thus, the presence of this mediator (social support) diminished but did not eliminate the direct predictive power of the FIM, as shown in Figure 1. The results of the Sobel test (z = -3.708, p < .001) and the Aroian test (z = -3.687, p < .001) show that

Table 2
Scores on the PHQ-9, MOS Social Support Survey, Perceived Stress Scale, and Functional Independence Measure (FIM)

| Item                        | Mean | SD   | Median | Minimum | Maximum |
|-----------------------------|------|------|--------|---------|---------|
| PHQ-9                       | 10.02| 5.56 | 10.00  | 0.00    | 23.00   |
| MOS Social Support Survey   |      |      |        |         |         |
| Emotional and informational | 74.70| 25.92| 81.25  | 0.00    | 100.00  |
| Tangible support            | 89.03| 16.77| 100.00 | 31.25   | 100.00  |
| Affectionate support        | 73.94| 30.47| 83.33  | 0.00    | 100.00  |
| Positive social interaction | 72.84| 32.67| 83.33  | 0.00    | 100.00  |
| Perceived social support    | 77.53| 21.44| 83.33  | 15.63   | 100.00  |
| Perceived stress level      | 19.56| 8.77 | 18.00  | 2.00    | 38.00   |
| Functional Independence Measure |       |      |        |         |         |
| Motor subtotal-13           | 68.72| 20.38| 75.00  | 13.00   | 91.00   |
| Cognitive subtotal-5        | 32.04| 3.31 | 33.00  | 17.00   | 35.00   |
| Total FIM rating            | 100.68| 21.56| 106.00 | 41.00   | 126.00  |

Note. PHQ-9 = Patient Health Questionnaire-9; MOS = Medical Outcomes Study.

Table 3
Pearson Correlation Among PSDSs and Social Support

| Variable                          | 1     | 2     | 3     | 4     | 5     | 6     |
|-----------------------------------|-------|-------|-------|-------|-------|-------|
| 1. PHQ total score                | –     | –     | –     | –     | –     | –     |
| 2. Emotional and informational support | -.481**| -.415**| -.581**| -.574**| -.649**| –     |
| 3. Tangible support               | -.564**| -.690**| -.318**| -.731**| –     | –     |
| 4. Affection support              | -.602**| -.850**| -.492**| -.902**| -.861**| –     |
| 5. Positive social interaction    |       |       |       |       |       |       |
| 6. Social support total score     |       |       |       |       |       |       |

Note. PSDSs = poststroke depressive symptoms; PHQ = Patient Health Questionnaire.
* Correlation is significant at the .05 level (one-tailed). ** Correlation is significant at the .01 level (one-tailed).
the indirect effect was statistically significant in the mediated model. Approximately 42.60% of the effect of FIM on PSDSs was mediated through social support.

The presence of stress also weakened the relationship between FIM and PSDSs ($\beta = -0.185, p = .005$) compared with the unmediated model ($\beta = -0.446, p < .001$). Thus, the presence of the mediator (stress level) diminished but did not eliminate the direct predictive power of the FIM, as shown in Figure 1. The Sobel test ($z = -4.593, p < .0001$) and the Aroian test ($z = -4.574, p < .0001$) indicated the indirect effect was statistically significant in the mediated model. About 58% of the effect of FIM on PSDSs was mediated through stress level.

**Discussion**

The PSDS prevalence of 45% found in this study was higher than the 29% prevalence found in a meta-analysis by Ayerbe et al. (2013; 95% CI [25, 32]). Virani et al. (2020) reported a high frequency of PSDSs in the first year after stroke in nearly one in three survivors of stroke and a decline thereafter. However, the prevalence rate found in this study was within the range identified in previous studies conducted in Saudi Arabia. This discrepancy in the prevalence rate depends on several factors. One is that this study included subjects from rehabilitation centers and outpatient clinics. In this study, the participants from outpatient clinics had a significantly lower rate of psychological counseling than their rehabilitation center counterparts. Furthermore, the participants in this study experienced their stroke during the immediately preceding 6-month period, which is a period of relatively high PSDS prevalence (Ayerbe et al., 2013).

In this study, PSDSs were negatively associated with the social support total score. These findings are consistent with White et al. (2014), who found PSDSs to be associated with a lack of perceived social support ($p = .0161$) and lack of community participation ($p < .0001$). Teoh et al. (2009) reported a significant difference in perceived social support across depressed individuals ($M = 58.23, SD = 29.35$) and nondepressed individuals ($M = 81.41, SD = 20.42; p < .001$). Furthermore, Volz et al. (2016) found that lack of perceived social support predicted later PSDSs ($\beta = .95, p < .03$). PSDSs are common among Saudi survivors of stroke. During a period of critical illness, healthcare providers focus on the clinical management of stroke patients and pay little attention to their psychosocial status. Most survivors of stroke in Saudi Arabia are discharged from hospitals without receiving PSDS screening, which may be expected to increase the risk of developing PSDSs during the rehabilitation period. Survivors of stroke became fully aware of their physical disability, which typically increases perceived stress levels. With physical disability and functional dependence, stroke survivors require adequate social support from family members, friends, and healthcare providers. In the Saudi culture, individuals have strong relations and roles within the family structure. Individuals perceive social support as being highly available, because it is very common for family members to be present most of the time. However, the emotional status of survivors of stroke declines when they realize that their primary role within the family has changed from independent to dependent status. Survivors of stroke require more emotional and
tangible support from family and friends during their recovery period. The risk of PSDSs increases when stroke survivors experience lack of social support (White et al., 2014). In this study, the perceived stress score was shown to be positively associated with PSDSs. Laures-Gore and Defife (2013) reported a positive association between stress level and PSDS score \(r = .62, p < .001\). Stroke is a stressful life event for both the patient and the family. During crises, Saudi family members typically provide support to the affected member. However, survivors of stroke experience higher levels of stress when they are unable to restore their normal functions. Gender roles in Saudi culture are well defined. Saudi women who experience stroke experience higher levels of stress when they find themselves unable to care for their family. Saudi men who experience stroke experience heightened stress after stroke when they find themselves unable to return to work or practice regular activities of daily living. These feeling of weakness and functional limitations increase the stress level and risk of PSDSs.

In this study, those participants who developed PSDSs earned a significantly lower functional independence than their nondepressed peers. Furthermore, the effect of FIM on PSDSs was significantly mediated by social support and stress level. This finding is supported by Huang et al. (2010), who reported that social support mediated PSDSs through functional ability. Stein et al. (2018) reported a lower level of functional independence among depressed survivors of stroke (54% vs. 95%, \(p < .001\)) than their nondepressed peers. PSDSs have been shown to affect functional outcomes negatively, whereas physical disability has been consistently associated with PSDSs (Babkair, 2017). The discrepancy in the association between PSDSs and FIM may be explained by the inclusion in this study of participants from rehabilitation centers. Although stroke acute care and

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**Figure 1**

Social Support and Stress Level Mediations of the Relationship Between Functional Independence Measure Poststroke Depressive Symptom

![Diagram](image)

**Note.** FIM = functional independence measure; PSDS = post-stroke depressive symptoms; IV = independent variable; DV = dependent variable.
awareness are improving across Saudi Arabia, there is an urgent need for rehabilitation services. Most of the survivors of stroke who are discharged from hospitals in this country continue following up with healthcare providers in outpatient clinics. Regular clinical visits focus on patient compliance with medication, and little attention is directed toward rehabilitation needs. Therefore, survivors of stroke experience delayed recovery and prolonged physical disability.

**Limitations**

This study is affected by several limitations that warrant discussion. The finding related to the association between PSDSs and functional independence should be interpreted with caution because of the mediation effect. In addition, the findings of this study should be explored using a larger sample of stroke patients with an appropriately larger representation of subjects from rehabilitation facilities. Furthermore, the participants were recruited from large institutions in urban regions in Saudi Arabia, which may not represent individuals from suburban and rural regions with more-limited medical resources. The risk of selection bias exists in this study because of the use of convenience sampling. In addition, this study focused on survivors of stroke who had experienced their stroke within the previous year and excluded subjects in the acute stage, who also may develop PSDSs. There are additional limitations related to the data collection methods used. Depression history data were collected via participant self-reporting to questions related to prior depression diagnosis, antidepressant use, and depression counseling. Cultural beliefs must be considered when subjects are asked about depression, as stigma-related concerns may lead respondents to deny or avoid sharing information about depression and antidepressant medications. Therefore, culturally sensitive data may best be collected with permission from patient medical records.

**Implications for Future Research**

The nature of PSDSs in this population requires a great deal of attention from healthcare providers. All institutions offering services for survivors of stroke should be aware of the psychological consequences that may follow a stroke. Survivors and caregivers should be educated about the potential stroke-related negative emotional outcomes and PSDSs. Caregivers play an important role in the recovery journey of stroke survivors. Therefore, caregivers should be taught about possible negative outcomes and be encouraged to observe survivors of stroke for the development of PSDSs. Furthermore, in this study, the participants were found to be at risk of losing contact with friends and social activities after a stroke, suggesting that interventions designed to enhance social participation may be of value.

Research is needed to investigate the screening of survivors of stroke for PSDSs in the Saudi population. There is a pressing need to design a protocol for screening individuals for PSDSs and to use appropriate screening tools in this population. Furthermore, a longitudinal study should be considered for future research. Functional independence should be measured at different points (e.g., at admission and discharge) to gain a clear picture of an individual’s functional progress and allow for follow-up assessments to better elucidate the association between different variables and PSDSs. In future research, clinical trials with applied interventions should be designed to address continuing access to rehabilitation with the goal of supporting independence, decreasing disability, and enhancing social support and participation in meaningful ways. Finally, the findings of this study suggest the importance of including caregivers in studies that investigate social support in survivors of stroke. Importantly, caregivers are also at risk of developing depressive symptoms because of the stressful life situations that a family member is experiencing.

**Conclusions**

Stroke is a devastating disease that results in permanent disability and affects the psychosocial health of survivors of stroke, which is as important as their physical health and cognitive functions. The findings of this study support that several factors, including lack of social support, high stress level, and low functional independence, are associated with PSDSs in the Saudi population. Future research is required to develop and assess interventions to improve social support among caregivers and reduce PSDSs.

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**Author Contributions**

Study conception and design: All authors
Data collection: LAB, MAA
Data analysis and interpretation: LAB, DC, VVD
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**References**

Abdul-sattar, A. B., & Godab, T. (2013). Predictors of functional outcome in Saudi Arabian patients with stroke after inpatient rehabilitation. NeuroRehabilitation, 33(2), 209–216. https://doi.org/10.3233/NRE-130947
Alarjan, S., Thomas, S., & Lincoln, N. (2015). Prevalence of poststroke emotional disorders in Saudi Arabia. Physical Medicine and Rehabilitation International, 2(2), 1–9.

Al-Busaidi, I. S., & Alamri, Y. (2016). Poststroke anxiety and depression: Findings from Saudi Arabia. Journal of Stroke & Cerebrovascular Diseases, 25(7), 1653–1654. https://doi.org/10.1016/j.jstrokecerebrovasdis.2016.03.003

AlHadi, A. N., AlAtteef, D. A., Al-Sharif, E., Bawazeer, H. M., Alnani, H., AlShomrani, A. T., Shuqdar, R. M., & AlOwaybil, R. (2017). An arabic translation, reliability, and validation of Patient Health Questionnaire in a Saudi sample. Annals of General Psychiatry, 16, Article No. 32. https://doi.org/10.1186/s12991-017-0155-1

Almhdaawi, K. A., Alalrazi, A., Kanaan, S., Shyyab, A. A., Oteir, A. O., Mansour, Z. M., & Jaber, H. (2021). Post-stroke depression, anxiety, and stress symptoms and their associated factors: A cross-sectional study. Neuropsychological Rehabilitation, 31(7), 1091–1104. https://doi.org/10.1080/09602011.2020.1760893

Ayerbe, L., Aysis, S., Wolfe, C. D. A., & Rudd, A. G. (2013). Natural history, predictors and outcomes of depression after stroke: Systematic review and meta-analysis. The British Journal of Psychiatry: The Journal of Mental Science, 202(1), 14–21. https://doi.org/10.1192/bjp.bp.111.107664

Babkair, L. A. (2017). Risk factors for poststroke depression: An integrative review. Journal of Neuroscience Nursing, 49(2), 73–84. https://doi.org/10.1097/JNN.0000000000000271

Bartoli, F., Di Britta, C., Crocato, C., Clerici, M., & Carrà, G. (2018). Early post-stroke depression and mortality: Meta-analysis and meta-regression. Frontiers in Psychiatry, 9, Article 530. https://doi.org/10.3389/fpsyg.2018.00530

Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. (1987). A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. Journal of Chronic Diseases, 40(5), 373–383. https://doi.org/10.1016/0021-9681(87)90171-8.

Cohen, S., & Williamson, G. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), The social psychology of health (pp. 31–67). Sage Publications.

Dafaalla, M., Farah, A., Bashir, S., Khalil, A., Abdelhamid, R., Mokhtar, M., Mahadi, M., Omer, Z., Suliman, A., Elkhalfia, M., Abdelgadir, H., Kheir, A. E. M., & Abdalrahman, I. (2016). Validity and reliability of Arabic MOS social support survey. SpringerPlus, 5(1), Article No. 1306. https://doi.org/10.1186/s40064-016-2960-4

Godwin, K. M., Swank, P. R., Vaeth, P., & Ostwald, S. K. (2013). The longitudinal and dyadic effects of mutual efficacy on perceived stress for stroke survivors and their spousal caregivers. Aging & Mental Health, 17(4), 423–431. https://doi.org/10.1080/13607863.2012.756457

Hackett, M. L., & Pickles, K. (2014). Part I: Frequency of depression after stroke: An updated systematic review and meta-analysis of observational studies. International Journal of Stroke, 9(8), 1017–1025. https://doi.org/10.1111/ijs.12357

Hamad, A. M., Siddiqui, K. A., Al-Mansoor, N. M., Al-Senani, F. M., & Sinha, S. (2011). Post stroke depression in acute stroke: Correlating with site and stroke severity. Neurosciences (Riyadh, Saudi Arabia), 16(4), 382–383.

Huang, C.-Y., Hsu, M.-C., Hsu, S.-P., Cheng, P.-C., Lin, S.-F., & Chuang, C.-H. (2010). Mediating roles of social support on poststroke depression and quality of life in patients with ischemic stroke. Journal of Clinical Nursing, 19(19–20), 2752–2762. https://doi.org/10.1111/j.1365-2702.2010.03327.x

Khedr, E. M., Abdelrahman, A. A., Desoky, T., Zaki, A. F., & Gamea, A. (2020). Post-stroke depression: Frequency, risk factors, and impact on quality of life among 103 stroke patients—Hospital-based study. The Egyptian Journal of Neurology, Psychiatry and Neurosurgery, 56(1), Article No. 66. https://doi.org/10.1186/s41983-020-00199-8

Laures-Gore, J. S., & Defffe, L. C. (2013). Perceived stress and depression in left and right hemisphere post-stroke patients. Neuropsychological Rehabilitation, 23(6), 783–797. https://doi.org/10.1080/09602011.2013.811087

Lewin, A., Jöbges, M., & Werheid, K. (2013). The influence of self-efficacy, pre-stroke depression and perceived social support on self-reported depressive symptoms during stroke rehabilitation. Neuropsychological Rehabilitation, 23(4), 546–562. https://doi.org/10.1080/09602011.2013.794742

Memon, I., Abu-Shaheen, A., Heena, H., & Al-Tannir, M. (2019). Point prevalence study for stroke in Saudi Arabia: A cross-sectional survey. (82), 93–97. https://doi.org/10.4103/sjhs.sjhs_142_18

Northcott, S., Moss, B., Harrison, K., & Hilari, K. (2016). A systematic review of the impact of stroke on social support and social networks: Associated factors and patterns of change. Clinical Rehabilitation, 30(8), 811–831. https://doi.org/10.1177/0269215515602136

Robinson, R. G., & Jorge, R. E. (2016). Post-stroke depression: A review. The American Journal of Psychiatry, 173(3), 221–231. https://doi.org/10.1176/appi.ajp.2015.15030363

Saadi, A., Okeng’o, K., Biseko, M. R., Shayo, A. F., Mmbando, T. N., Grundy, S. J., Xu, A., Parker, R. A., Wibecan, L., Iyer, G., Onesmo, P. M., Kapina, B. N., Regenhardt, R. W., & Mateen, F. J. (2018). Post-stroke social networks, depressive symptoms, and disability in Tanzania: A prospective study. International Journal of Stroke, 13(8), 840–848. https://doi.org/10.1177/1747493018772788

Sawaya, H., Atoui, M., Hamadeh, A. Zeinoun, P., & Nahas, Z. (2016). Adaptation and initial validation of the Patient Health Questionnaire-9 (PHQ-9) and the Generalized Anxiety Disorder-7 questionnaire (GAD-7) in an Arabic speaking Lebanese psychiatric outpatient sample. Psychiatry Research, 239, 245–252. https://doi.org/10.1016/j.psychres.2016.03.030

Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. Social Science & Medicine (1982), 32(6), 705–714. https://doi.org/10.1016/0277-9536(91)90150-b

Stein, L. A., Goldmann, E., Zamzam, A., Luciano, J. M., Messé, S. R., Cucchiara, B. L., Kasner, S. E., & Mullen, M. T. (2018). Association between anxiety, depression, and post-traumatic stress disorder and outcomes after ischemic stroke. Frontiers in Neurology, 9, Article 890. https://doi.org/10.3389/fneur.2018.00890

Teoh, V., Sims, J., & Milgrom, J. (2009). Psychosocial predictors of quality of life in a sample of community-dwelling stroke survivors: A longitudinal study. Topics in Stroke Rehabilitation, 16(2), 157–166. https://doi.org/10.1310/tsr1602-157
Towfighi, A., Ovbiagele, B., El Husseini, N., Hackett, M. L., Jorge, R. E., Kissela, B. M., Mitchell, P. H., Skolarus, L. E., Whooley, M. A., Williams, L. S., & American Heart Association Stroke Council; Council on Cardiovascular and Stroke Nursing; and Council on Quality of Care and Outcomes Research. (2017). Poststroke depression: A scientific statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke, 48*(2), e30–e43. https://doi.org/10.1161/STR.0000000000000113

Virani, S. S., Alonso, A., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., Chamberlain, A. M., Chang, A. R., Cheng, S., Delling, F. N., Djousse, L., Elkind, M. S. V., Ferguson, J. F., Fornage, M., Khan, S. S., Kissela, B. M., Knutson, K. L., Kwan, T. W., Lackland, D. T., & American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. (2020). Heart disease and stroke statistics—2020 update: A report from the American Heart Association. *Circulation, 141*(9), e139–e596. https://doi.org/10.1161/CIR.000000000000757

Volz, M., Möbus, J., Letsch, C., & Werheid, K. (2016). The influence of early depressive symptoms, social support and decreasing self-efficacy on depression 6 months post-stroke. *Journal of Affective Disorders, 206*, 252–255. https://doi.org/10.1016/j.jad.2016.07.041

White, H. J., Attia, J., Sturm, J., Carter, G., & Magin, P. (2014). Predictors of depression and anxiety in community dwelling stroke survivors: A cohort study. *Disability & Rehabilitation, 36*(23), 1975–1982. https://doi.org/10.3109/09638288.2014.884172