Received: 6 May 2022 | Revised: 6 September 2022 | Accepted: 2 October 2022

DOI: 10.1002/nop2.1417

EMPIRICAL RESEARCH QUANTITATIVE

NursingOpen Open Access WILEY

Prevalence of depression and its associated factors among stroke survivors in Saudi Arabia

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Abstract

Aim: The purpose of this study was to investigate the prevalence of poststroke depression (PSD) in Saudi Arabia and its association with socio-demographic and clinical factors.

Design: A predictive correlational cross-sectional study.

Methods: The study adopted a non-probability convenience sampling method to recruit 211 stroke survivors between April and October 2021 from the neurology outpatient departments of two main governmental hospitals in Saudi Arabia. PSD was measured using a self-assessment reliable and valid scale (The Hospital Anxiety and Depression Scale [HADS]).

Results: More than two-thirds (70.6%) of the study sample (Mean age = 53 years, SD = 8.5, 51.2% were males) experienced some degree of depression (Score ≥8); of these, approximately half (48.8%) were in severe depression. The final prediction model was statistically significant (χ_2 [15] = 31.39, p < .01). PSD is a statistically significant health issue and requires immediate attention by healthcare providers to improve the health outcomes of stroke survivors.

KEYWORDS
poststroke depression, predictors, prevalence, Saudi Arabia, stroke survivors

1 | INTRODUCTION

A stroke is defined as a sudden loss of brain function caused by a disruption in blood supply to the brain due to ischemia (lack of blood flow), obstruction (thrombosis, arterial embolism), or bleeding, resulting in statistically significant mortality and long-term disability in adults worldwide (Asirvatham & Marwan, 2014; Robinson & Jorge, 2016; Towfighi et al., 2017). Stroke is the world's second-biggest cause of mortality after ischemic heart disease and the leading cause of severe physical impairment. (Liu et al., 2020; Mendis et al., 2015; Mirzaei et al., 2012). There is ample evidence that most patients are experiencing depression poststroke (Ayasrah et al., 2018; Bartoli et al., 2018; Brainin et al., 2011; Limampai et al., 2017; Liu et al., 2020). Furthermore, considerable evidence suggests that depression is statistically significantly more prevalent in people with stroke than in general (De Ryck et al., 2014; Liu et al., 2020; Towfighi et al., 2017). In addition to depression, a stroke can also result in tension, anxiety, and unhappiness. Furthermore, it has the potential to influence how individuals think and feel (Kamel et al., 2012; Towfighi et al., 2017).

Stroke is one of the fastest-growing cerebrovascular disorders in Saudi Arabia (SA), leading to amplified morbidity and mortality,

thereby increasing the social and economic burden in SA (Asirvatham & Marwan, 2014; Memon et al., 2019). Despite a dearth of statistics on the prevalence of stroke in SA, recent research undertaken by the Ministry of Health (MOH) indicated a prevalence of 29/100,000 persons every year (Memon et al., 2019). The prevalence and incidence of stroke in the Middle East have augmented dramatically in the latest decade, surpassing the developed countries. In a literature review conducted by Asirvatham and Marwan (2014), the incidence rate of stroke in Middle East countries (22.7–250/100,000 population per year from 2000–to 2014) has even exceeded the rates in developed countries (crude stroke incidence rates of 112–223 per 100,000 population per year in 2000–2008) (Asirvatham & Marwan, 2014; Basheti et al., 2019).

Stroke survivors are often left with severe mental and physical disabilities, posing a tremendous social and economic burden (Asirvatham & Marwan, 2014; Basheti et al., 2019; Towfighi et al., 2017). Many people suffer from depression without being identified or treated. Depression is continuing to be the single leading cause of disability (Ayasrah et al., 2018; Ayerbe et al., 2013; Mendis et al., 2015). Depression and stroke are inextricably linked (Cameron et al., 2016; De Ryck et al., 2014; Towfighi et al., 2017). Up to two-thirds of people who have a stroke have depression at some point later; depression is more prevalent in the first year following a stroke (Cameron et al., 2016; Towfighi et al., 2017; Yildirim & Ones, 2019). Stroke is becoming a fast-growing concern in SA and a statistically significant cause of sickness and death (Asirvatham & Marwan, 2014; Memon et al., 2019). However, compared to industrialized nations, research on stroke incidence, prevalence, and socio-demographic features remains insufficient due to the lack of appropriate studies conducted in these areas (Asirvatham & Marwan, 2014; Ayasrah et al., 2018; Towfighi et al., 2017).

Poststroke depression (PSD) is linked with an increased disability and cognitive impairment (Robinson & Jorge, 2016; Towfighi et al., 2017), greater mortality (Bartoli et al., 2018; Towfighi et al., 2017), increased risk of falls, and finally, worse rehabilitation and clinical outcome (Gillen, 2014; Towfighi et al., 2017). Despite a shortage of statistics on the prevalence of PSD in SA, recent research undertaken by Ahmed et al. (2020) indicated a 36% prevalence of PSD in a sample of 50 participants in two Saudi tertiary stroke centres during the COVID-19 epidemic. In particular, depression is considered the strongest predictor of quality of life in stroke survivors and has been associated with a statistically significant increase in total healthcare expenditure (Guajardo et al., 2015; Pan et al., 2008). Depression is documented as a statistically significant public health problem in developing countries (Ayasrah et al., 2018; Kamel et al., 2012; Liu et al., 2020; Towfighi et al., 2017; Yildirim & Ones, 2019). Therefore, depression has lately received increasing attention (Al-Azzam et al., 2013; Liu et al., 2020). Although substantial progress in public awareness of depression and its profound effects has occurred during the past decade, research on PSD and its factors is still scarce. According to Broomfield et al. (2014), in spite of their prevalence, poststroke mood disorders are relatively under-researched compared to stroke-related physical disabilities (Broomfield et al., 2014).

A greater understanding of the risk factors of depression following stroke could help inform research and target interventions (Broomfield et al., 2014; Towfighi et al., 2017; Yildirim & Ones, 2019). Therefore, this study aimed to investigate the prevalence of PSD in SA and its association with socio-demographic and clinical factors.

1.1 | Research questions

1. What is the prevalence of PSD among Saudi stroke survivors?
2. What factors are associated with PSD among Saudi stroke survivors?
3. What are the predictors of PSD among Saudi stroke survivors?

2 | MATERIALS AND METHODS

2.1 | Design and participants

A predictive correlational cross-sectional study was conducted between April and October 2021. The study adopted a non-probability convenience sampling method to recruit stroke survivors who met the study's inclusion criteria. Inclusion criteria included patients diagnosed with stroke aged 18 years or older who agreed to participate with a consent form. The exclusion criteria were as follows: stroke survivors with a history of recurrent stroke or dementia diagnosed before the stroke, those with surgically treatable lesions on CT-scan (e.g. brain tumours), other central nervous systems (CNS) conditions that can cause depression (e.g. Parkinson's disease), severe comorbidity (e.g. long-term kidney disease), and previous history of psychiatric disturbances. Survivors who could not comprehend and communicate verbally (because of aphasia) were also excluded from the study.

The calculation using G*Power 3.1.9.2 software (Faul et al., 2014) indicated that for multiple linear regression analysis, assuming a significance level (α) of .05 (two-tailed), effect size (ES = .15), and a power of .80 would require a minimum sample size of 135 participants (Kadam & Bhalerao, 2010). Because of the expected attrition rate, additional participants were recruited. Therefore, a larger sample (211 participants) was recruited for the current study. The study was conducted among 211 participants attending the neurology outpatient department (OPDs) of two main governmental hospitals in SA.

2.2 | Study instrument

The researchers used a self-administered questionnaire to collect data. The first section of the questionnaire consists of 21 questions about participants' socio-demographic data, personal, medical, and surgical history. The second section of the questionnaire assesses

depression using the depression subscale of the Hospital Anxiety and Depression scale (HADS). This questionnaire is a self-assessment scale designed and proven reliable for diagnosing depression in a hospital medical outpatient clinic context (Zigmond & Snaith, 1983). The scale demonstrated excellent internal reliability (Cronbach's α values = .82) for the depression subscale (Bjelland et al., 2002). The HADS comprises anxiety subscale (7 items assessed on a 4-point Likert scale) and depression subscale (7 items assessed on a 4-point Likert scale). Each subscale's potential scores were calculated by adding the relevant items, with a maximum score of 21 for each subscale. On any subscale, a score of 0–7 is categorized as a normal case, 8–10 is classified as a doubtful case, and 11–21 is deemed a definite case of depression (Zigmond & Snaith, 1983). The Arabic-translated form of the HADS has been used in this study since it has been validated in a variety of medical settings (Al Aseri et al., 2015; Terkawi et al., 2017). The Arabic version has an internal consistency that ranges from (Cronbach's α) value of .70 to .83 (Terkawi et al., 2017). In addition, the construct and concurrent validity were tested to reveal adequate validity when compared with the Arabic version of the major depressive inventory scale (Al Aseri et al., 2015; Terkawi et al., 2017).

2.3 | Data collection

Following the Research Ethics Committee approval obtained from the Local Committee of Bioethics (LCBE) committee at Jouf University, permission from the selected hospital was obtained. Initially, the researchers posted a notice on the public board of neurology OPDs at hospitals to encourage participation, including detailed information about the study and a few copies of the printed survey. Afterward, the researchers started identifying eligible participants at the OPDs according to the described eligibility criteria; the researchers explained the study's aim, risks, and outcomes to eligible participants. After signing informed consent, the researcher sent an online survey as a weblink to participants via E-Mail and social media (WhatsApp, Messenger, and Instagram). Participants who were unable to complete the online survey were given the option of completing a paper survey. During the data collection phase, the researchers were present to answer any questions. The data collection process was conducted after finishing the appointments in the neurology OPDs to ensure that participants would not miss their appointments or concentration. A special well-lit room with comfortable chairs in the neurology OPDs has been used during data collection after arrangement with the department supervisor.

2.4 | Data analysis

Descriptive statistics were computed using SPSS Statistics version 25 (IBMCorp Ibm, 2017) for the sample socio-demographics. Categorical variables (gender, marital status, income, educational level, work

TABLE 1 Social and clinical characteristics of study participants ($N = 211$)

Variables	N	(%)
Age **Mean (SD)** 53 (8.5)		
Gender		
Male	108	51.2
Female	103	48.8
Marital status		
Single	22	10.4
Married	152	72.0
Widowed	19	9.0
Divorced	18	8.5
Living with		
my family	186	88.2
my husband's family	16	7.6
Alone	9	4.3
Place of residency		
City	184	87.2
Village	27	12.8
Educational level		
Secondary	78	37.0
Diploma	74	35.0
Bachelor's degree or higher	59	28.0
Currently work		
Yes	116	55.0
No	95	45.0
Income per month in Saudi Riyal		
Low (<5,000)	10	5.0
Intermediate (5000–10,000)	167	79.0
High (>10,000)	34	16.0
Previous surgery		
Yes	48	22.7
No	163	77.3
Smoking history		
Yes	48	22.7
No	163	77.3
HTN history		
Yes	180	85.3
No	31	14.7
DM history		
Yes	46	21.8
No	165	78.2
Levels of depression		
Normal cases (non-depression cases)	62	29.4
Borderline abnormal cases (Doubtful cases)	46	21.8
Definite cases (Depression cases)	103	48.8

Abbreviations: DM, diabetes mellitus; HTN, hypertension; SD, Standard Deviation.

status, residence, presence of long-term diseases, and smoking history) were shown as percentages and frequencies. In addition, the age variable was said by central tendency measures (mean and standard deviation). However, the total score of depression was said by median and interquartile range. Moreover, Spearman's rho and rank biserial correlations were used to investigate the relationship between stroke patients' depression categories and their characteristics. Ordinal logistic regression was also used to predict PSD among Saudi stroke survivors. Statistical comparisons of participants' characteristics among depression categories were carried out using ANOVA and chi-square tests. Independent samples Kruskal-Wallis post hoc test was used to examine the differences between levels of depression by different educational levels and different income levels.

2.5 | Ethical consideration

The institutional review board examined and approved this study (IRB approval no. 23–06-42, Date: April 5, 2021). Several techniques were employed to ensure the anonymity and confidentiality of the participants. Based on the Declaration of Helsinki (Association, 2001), All participants were assigned a code number, and all submitted data was handled electronically by the researcher through a password-protected account. In addition, Study data were reported in an aggregate form, and no name identification appeared in the study results. Furthermore, an informed consent form was attached to both the online and printed surveys.

3 | RESULTS

3.1 | Socio-demographic characteristics

The mean age of study participants was 53 years (SD = 8.5), and most of them (72%) were married. Males made up about 51.2% of the patients. The majority (88.2%) lived with their families, resided in cities (87.2%), and three-quarters of participants (79.1%) reported a monthly household income between 5,000–10,000 Saudi Riyal (1 USD equal to 3.75 SAR). Almost one-third of the study sample (37.0%) had secondary education, and more than half of them had a job. The study participants had additional comorbid conditions such as hypertension (85.3%) and Diabetes mellitus (21.8%), and 22.7% of them were smokers (Table 1).

3.2 | Prevalence of depression among poststroke Saudi survivors

The median (25th, 75th percentiles) of the total depression item (ranging from 0–21) was 10 (7, 14). Figure 1 shows the participants' depression scores for the current study. Overall, 70.6% of the study sample had some degree of depression (Score ≥8); of these, 48.8% were categorized as depression cases (Score 11–21), and 21.8% were categorized as borderline cases (Score 8–10). (Table 1).

3.3 | Factors associated with poststroke depression among Saudi stroke survivors

The results (F = 2.36, *DF* = 2 *p* = .09) showed non-significant differences in mean age of non-depressive cases (M = 51.3, SD = 8.5), doubtful cases (M = 52.6, SD = 7.7), and depression cases (M = 54.2, SD = 8.8). Similarly, no statistically significant differences were found among depression categories based on gender, marital status, residency status, and income. However, there were statistically significant differences based on the educational level (x^2 = 13.9, p < .01), in which a higher proportion of depression cases were found in patient with lower educational levels (58.1% in Diploma and 50% in Secondary education or less). Furthermore, there were statistically significant differences among depression categories based on the presence of hypertension comorbidity (x^2 = 8.67, p < .05). Participants who had a history of hypertension had a higher

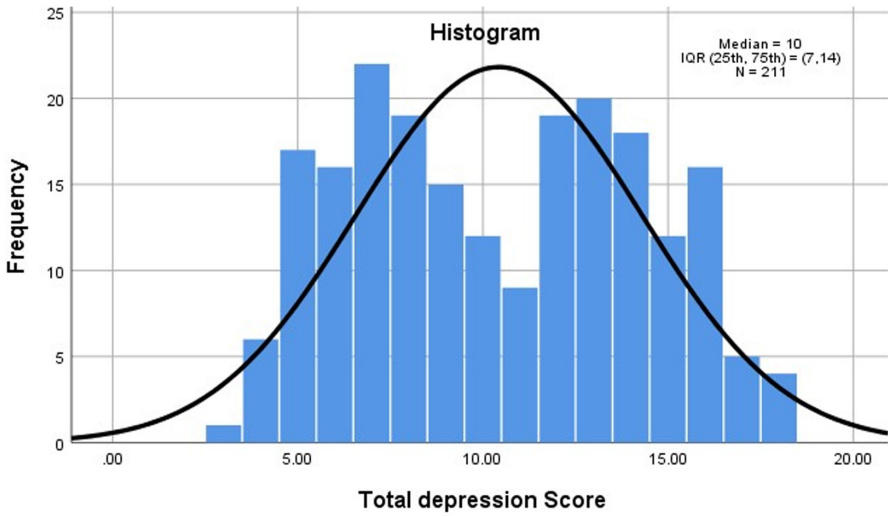

FIGURE 1 Depression score among participants

TABLE 2 Comparisons of participants' characteristics among depression categories ($N = 211$)

Variables	Non-depression cases ($N = 62$) median (IQR)	Doubtful cases ($N = 46$) median (IQR)	Depression cases ($N = 103$) Median (IQR)	
	6 (5,7)	9 (8, 10)	14 (12, 15)	
Total depression score	Non-depression cases ($N = 62$) M (SD)	Doubtful cases ($N = 46$) M (SD)	Depression cases ($N = 103$) M (SD)	Statistic test
Age	51.3 (8.5)	52.6 (7.7)	54.2 (8.8)	F (2) = 2.36 $p = .09$
	Non-depression cases *N* (%)	Doubtful cases *N* (%)	Depression cases *N* (%)	
Gender				
Male	32 (29.6)	28 (25.9)	48 (44.4)	$x^2 = 2.60$ $p = .27$
Female	30 (29.1)	18 (17.5)	55 (53.4)	
Marital status				
Single	9 (40.9)	7 (31.8)	6 (27.3)	$x^2 = 10.66$ $p = .1$
Married	41(27.0)	27 (17.8)	84 (55.3)	
Widowed	7 (36.8)	6 (31.6)	6 (31.6)	
Divorced	5 (27.8)	6 (33.3)	7 (38.9)	
Living with				
With my family	56 (30.1)	40 (21.5)	90 (48.4)	$x^2 = 6.07$ $p = .2$
With my husband family	3 (18.8)	2 (12.5)	11 (68.8)	
Alone	3 (33.3)	4 (44.4)	2 (22.2)	
Place of residency				
City	53 (28.8)	38 (20.7)	93 (50.5)	$x^2 = 1.91$ $p = .38$
Village	9 (33.3)	8 (29.6)	10 (37.0)	
Educational level				
Secondary or less	19 (24.4)	20 (25.6)	39 (50.0)	$x^2 = 13.9$ $p < .01$
Diploma	15 (20.3)	16 (21.6)	43 (58.1)	
Bachelor's degree or higher	28 (47.5)	10 (16.9)	21 (35.6)	
Currently work				
Yes	37 (31.9)	30 (25.9)	49 (42.2)	$x^2 = 4.78$ $p = .09$
No	25 (26.3)	16 (16.8)	54 (56.8)	
Income per month in Saudi Riyal				
Low (<5,000)	2 (20.0)	1 (10.0)	7 (70.0)	$x^2 = 3.24$ $p = .52$
Intermediate (5000–10,000)	50 (29.9)	35 (21.0)	82 (49.1)	
High (>10,000)	10 (29.4)	10 (29.4)	14 (41.2)	
Previous surgery				
Yes	14 (29.2)	6 (12.5)	28 (58.3)	$x^2 = 3.62$ $p = .16$
No	48 (29.4)	40 (24.5)	75 (46.0)	
Smoking history				
Yes	13 (27.1)	12 (25.0)	23 (47.9)	$x^2 = .41$ $p = .81$
No	49 (30.1)	34 (20.9)	80 (49.1)	
HTN history				
Yes	47 (26.1)	38 (21.1)	95 (52.8)	$x^2 = 8.67$ $p = .01$
No	15 (48.4)	8 (25.8)	8 (25.8)	
DM history				
Yes	10 (21.7)	9 (19.6)	27 (58.7)	$x^2 = 2.48$ $p = .29$
No	52 (31.5)	37 (22.4)	76 (46.1)	

Abbreviations: DM, diabetes mellitus; HTN, hypertension; IQR, interquartile range (25th, 75th percentiles); P, statistical significance level among depression groups (two-tailed); x^2, chi-square test.

proportion (52.8%) of depression cases. Moreover, a greater proportion (56.8%) of those who did not work (had no job) were categorized as depression cases. (Table 2).

3.4 | Correlation between participants' socio-demographic characteristics and levels of depression

Spearman's rank correlation coefficient test revealed a statistically significant correlation ($r_{=}$ .14, $p < .05$) between the depression categories and age variable score. Participants, who were advanced in age, were more likely to be categorized as a depression case or borderline case. Furthermore, participants were more likely to be considered depressive if they were not married ($r_{=}$ .18, $p < .05$) and had comorbid hypertension disease ($r_{=}$ .20, $p < .01$). Moreover, participants with lower educational status were more likely ($r_{=}$ .18, $p < .05$) to be in the depression category. No statistically significant correlations were found between the rest of the participants' characteristics and depression categories. (Table 3).

3.5 | Predictors of depression among Saudi poststroke survivors

Logistic regression (Ordinal) has been used to explore predictors of depression among Saudi stroke patients. The full model test (containing the complete set of predictors) was statistically significant (χ^2 [15] = 31.39, $p < .01$). The model had a good fit indicated by non-significant results of both the Pearson chi-square test (χ^2 [303] = 401.1, $p = .25$) and the deviance test (χ^2 [383] = 390.7, $p = .38$). The final prediction model accounted for a proportion of variance as represented by the value of Nagelkerke's R^2 (.16) and Cox and Snell's R^2 (.14). The assumption of proportional odds was met as the tests of a parallel line (χ^2 [15] = 20.4, $p = .16$) was non-significant. Participants who were not married, had lower educational levels (secondary or less), and had a medical history of hypertension had statistically significantly higher levels of depression. Among those who were not married (single, widowed, or divorced), the odds of having a higher depression level was 1.94 times (Wald $\chi^2 = 4.3$, $p < .05$) than those who were married. In addition, among those with a lower educational level (Diploma), the odds of being categorized in a higher depression status were 2.89 times (Wald $\chi^2 = 8.4$, $p < .01$) than those with a bachelor's degree or higher. Moreover, the odds of being categorized in a higher depression status among participants with hypertension history was 2.6 higher (Wald $\chi^2 = 4.7$, $p < .05$) than those with no comorbid conditions. (Table 4).

Independent samples Kruskal-Wallis test was conducted to examine the differences between levels of depression by different educational levels. There was a statistically significant difference (H [2] = 10.78, $p = .005$), with a mean rank of (109.6) for secondary or less educational level, (117.8) for diploma educational level, and (86.4) for Bachelor or more educational level. Pairwise comparisons using Kruskal-Wallis post hoc test indicated that group (Bachelor or more) scores were observed to be statistically significantly different from those of group (Diploma, $p = .004$) and group (Secondary or less, $p = .04$). No other differences were statistically significant. In contrast, independent samples Kruskal-Wallis test revealed no statistically significant differences (H [2] = 1.73, $p = .42$) between levels of depression and income categories (low, intermediate, and high). (Table 5).

TABLE 3 Correlation between stroke patients' depression categories and their characteristics ($N = 211$)

	Level of depression	
Socio-demographics characteristics	***r***	***p***
Spearman's rho correlations		
Age	.14	.04
Level of education (Secondary = 1/ Diploma = 2/Bachelor =3)	−.15	.04
Income	−.07	.28
Rank biserial correlation r_{rb}		
Gender (Male = 1/Female = 0)	.06	.37
Marital Status (Married =2/Single, widowed, divorced = 1)	.16	<.01
Residency	−.06	.27
With whom Living	.11	.05
Currently work (No = 0/Yes = 1)	−.12	.07
Previous surgery (No = 0/Yes = 1)	.06	.32
Smoking history (No = 0/Yes = 1)	.006	.94
HTN history (No = 0/Yes = 1)	.17	<.01
DM history (No = 0/Yes = 1)	.10	.11

Abbreviations: DM, diabetes mellitus; HTN, hypertension; P, statistically significant level.

4 | DISCUSSION

Depression is frequent in stroke survivors, affecting up to one-third of them at any given moment (Knapp et al., 2020; Towfighi et al., 2017). The natural history of PSD is complex, although symptoms usually appear during the first year (Towfighi et al., 2017). Even though PSD is common, there is still confusion about predisposing risk factors and the best preventative and treatment measures (Knapp et al., 2020; Kutlubaev & Hackett, 2014). According to the available data, this is the first study in SA investigating the prevalence of PSD and its association with socio-demographic and clinical factors.

The current study revealed that more than two-thirds (70.6%) of the study sample had some degree of depression (Score ≥8); of these, approximately half (48.8%) were in severe depression. Compared to studies conducted in developed countries (Ayerbe et al., 2013; Hasin et al., 2005; Kessler et al., 2005; Knapp et al., 2020; Kutlubaev & Hackett, 2014; Towfighi et al., 2017),

TABLE 4 Predictors of poststroke depression survivors ($N = 211$)

Variables	B	Wald	Odds ratio	Confidence interval	*p* value
Age	−.001	.004	1.0	(.96–1.05)	.95
Gender					
Male	.21	.23	1.2	(.52–2.98)	.64
Female		Ref			
Marital status					
Single/Widowed/ Divorced	.66	4.3	1.9	(1.04–3.62)	.04
Married		Ref			
Living with					
Alone	−.66	.53	.52	(.09–3.08)	.47
With my family	−.27	.19	.76	(.23–2.56)	.66
With my husband family		Ref			
Place of residency					
City	−.48	1.46	.62	(.29–1.35)	.23
Village		Ref			
Educational level					
Secondary	.74	4.2	2.1	(1.03–4.2)	.04
Diploma	.98	8.4	2.8	(1.41–5.91)	< .01
Bachelor's degree or higher		Ref			
Currently work					
Yes	−.21	.2	.8	(.32–2.1)	.66
No		Ref			
Income per month in SR*					
Low (<5,000)	.63	.6	1.9	(.38–9.38)	.44
Intermediate (5000–10,000)	−.23	.33	.8	(.37–1.71)	.56
High (>10,000)		Ref			
Previous surgery					
Yes	.29	.63	1.3	(.66–2.69)	.43
No		Ref			
Smoking history					
Yes	.24	.46	.8	(.39–1.58)	.50
No		Ref			
HTN history					
Yes	.94	4.70	2.6	(.17–.91)	.03
No		Ref			
DM history					
Yes	.24	.39	.8	(.37–1.68)	.53
No		Ref			

Abbreviations: B, beta coefficient; DM, diabetes mellitus; HTN, hypertension; P, statistically significant level; Ref, reference group.

this study revealed a higher prevalence of PSD. However, similar results about PSD prevalence were noticed in studies conducted in developing countries (Ayasrah et al., 2018; Ayerbe et al., 2013; Islam et al., 2016; Sarfo et al., 2017). This disparity might be due to a lack of contemporary therapeutic and rehabilitative services in these countries (Ayasrah et al., 2018; Basheti et al., 2019). The second reason could be the late detection and diagnosis of PSD (Garin et al., 2014; Kutlubaev & Hackett, 2014; Limampai et al., 2017). The high proportion of PSD cases in the current study highlights the significance of early identification and treatment. It is recommended

TABLE 5 Pairwise comparisons of levels of depression by different educational levels using Kruskal-Wallis post hoc test ($N = 211$)

Pairwise comparison	Test statistics	Standard error	*p* value
(Bachelor or more) group—(Secondary or less) group	23.20	9.7	.04
(Bachelor or more) group—(Diploma) group	31.46	9.8	.004
(Secondary or less) group—(Diploma) group	−8.25	9.1	1

Abbreviation: P, statistically significant level.

to start the pharmacologic, non-pharmacologic, and rehabilitation intervention as early as possible to decrease the burden of depression that could interfere with daily life activities (Fang et al., 2017; Robinson et al., 2008). Thus, Community-based initiatives that involve regular follow-ups and reintegration of patients into social and working life are highly needed in SA.

In this study, advanced-age participants were more likely to be categorized as depression or borderline cases. However, the age variable was not a statistically significant predictor of PSD. These results were in line with numerous previous studies (Ayasrah et al., 2018; Huang et al., 2014; Islam et al., 2016; Ojagbemi, 2013), which failed to detect statistically significant age-group differences. The Barker-Collo (2007) study reported contrary results in which younger stroke survivors were statistically significantly more likely to have depression after 3 months of stroke. Gender and marital status of the participants had no statistically significant correlations with depression categories, which was consistent with numerous studies (Ayerbe et al., 2013; De Ryck et al., 2014; Kutlubaev & Hackett, 2014).

About the level of education, almost one-third of the participants had a secondary level of education or less, and there was a negative correlation between the level of education and depression level. These results were consistent with the literature (Ayasrah et al., 2018; Islam et al., 2016; Kutlubaev & Hackett, 2014; Paul et al., 2013), in which a higher proportion of depression cases were found in a patient with lower educational levels. The post hoc test results emphasized the protective role of education in which a statistically significantly higher proportion of non-depression cases were found in the (bachelor's degree or higher) category. In contrast, a previous study by Jiang et al. (2014) found no association between educational status and depression.

Among those who were not married (single, widowed, or divorced), the odds of having a higher depression level was 1.94 times (Wald $\chi^2 = 4.3$, $p < .05$) than those who were married. These findings confirmed previous research (Ayasrah et al., 2018; Ayerbe et al., 2013; De Ryck et al., 2014; Islam et al., 2016; Sarfo et al., 2017), indicating that family and social support have a protective effect against PSD. In other words, a lack of social support during the rehabilitation phase could statistically significantly contribute to severe episodes of depression among the stroke population (Taylor-Piliae et al., 2013; Yildirim & Ones, 2019). According to the stress process model (Pearlin et al., 1990), the consequences of any stressful events in human life are heavily dependent on the available coping support network. In this case, social support may be one of stroke survivors' most effective coping mechanisms. This may have an impact on their mental health. This clarifies why stroke patients who had a strong social support system reported reduced depression. According to the literature (Ayasrah et al., 2018; Ayerbe et al., 2013; Garin et al., 2014; Karatepe et al., 2007; Kutlubaev & Hackett, 2014), hypertension is ranked as the first and major risk factor for the incidence of stroke and could statistically significantly increase the prevalence of PSD. Our study findings suggest similarly that having a history of comorbid hypertension could predict PSD, highlighting the significance of regular monitoring by the primary healthcare providers.

The exclusion of participants who were unable to communicate verbally (because of aphasia) is considered one of this study's main limitations. In addition, the study was conducted in OPDs of two governmental hospitals, which could affect the representativeness of the Saudi stroke community. Furthermore, the study's cross-sectional nature limits the assessment of depression at one point rather than considering the time dynamic effect. Therefore, there is a need for further cohort studies. In addition, experimental studies are highly needed to increase our understanding of PSD preventive measures. Given these limitations, the study results highlighted the high incidence of PSD among Saudi stroke survivors and revealed some of its related factors and predictors. In addition, this is one of the few studies from Saudi Arabia highlighting the importance of early detection and treatment of PSD. Moreover, it gives more in-depth information about the main factors that could exaggerate the level of depression among Saudi stroke survivors.

5 | CONCLUSION

In Saudi Arabia, the body of knowledge about PSD and its associated factors, which is the essence of stroke survivors' physical and psychological wellness, is limited and under investigation. Based on our study findings, the high prevalence of PSD among Saudi stroke survivors is alarming (70.6% of the participant had some degree of depression). Therefore, it is essential for healthcare providers to receive appropriate training and develop early preventive and treatment measures to improve stroke survivors' outcomes. Furthermore, special attention should be given to stroke survivors with a low education level, poor social support, and comorbid conditions.

6 | RELEVANCE TO CLINICAL PRACTICE

The current study findings suggest the importance of early detection of PSD and emphasize regular monitoring by healthcare providers. It

also highlights the high-risk groups of stroke survivors who should have special attention by identifying statistically significant predictors of PSD (socio-demographic and clinical characteristics). A greater understanding of these risk factors (predictors) could help develop early preventive and treatment interventions to improve stroke survivors' outcomes.

ACKNOWLEDGEMENT

We acknowledge all participants who participated in this study for their time, and for their willingness to participate in the study.

CONFLICT OF INTEREST

The authors have no funding or conflicts of interest to disclose.

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How to cite this article: Abuadas, F. H., Ayasrah, S. M., Ahmad, M. M., Abu-Snieneh, H. M., Obiedallah, H. F., & Basheti, I. A. (2023). Prevalence of depression and its associated factors among stroke survivors in Saudi Arabia. *Nursing Open*, *10*, 1629–1638. https://doi.org/10.1002/nop2.1417