Physical Medicine and Rehabilitation - International

Open Access

Austin Publishing Group

Special Article - Neurologic Rehabilitation

Prevalence of Post-stroke Emotional Disorders in Saudi Arabia

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Received: January 23, 2015; **Accepted:** February 16, 2015; **Published:** February 18, 2015

Abstract

The occurrence of Post-Stroke Anxiety (PSA) and Post-Stroke Depression (PSD) has been linkedto cognitive impairment and reductions in functional recovery and social activity. This study examined the prevalence of post-stroke anxiety and post-stroke depression in one hundred (100) Saudi stroke patients (76 men, mean age 60.53 years) in the rehabilitation wards or outpatient clinics at three Saudi medical facilities: King Abdulaziz Medical City, Sultan Bin Abdulaziz Humanitarian City and King Fahad Medical City. An Arabic version of the Hospital Anxiety and Depression Scale was used to assess anxiety and depression. The Barthel Index was used to assess independence in personal day-to-day activities. The findings of subgroups confirmed the presence of PSA in 36% of participants (mean score 7.8 SD= 5.09). The prevalence of PSA was found to be significantly affectedby age (≤ 60 and ≥ 61 years), level of education (literate and illiterate) and the length of time elapsed since the stroke (≤ 6 and ≥ 7 months). Further, PSD was identified in 44% of participants (mean score 7.87 SD= 4.77). The results from the post-hoc analysis using the Mann-Whitney test for PSD indicated that differences in level of education and time since stroke between subgroups showed significant effects, whereas other characteristics (gender, treatment site, side of weakness) did not. There was a significantnegative correlation between scores on the Barthel Index and the prevalence of anxiety and depression. Seventy patients were reassessed after three months, of whom13 (18.6%) were found to suffer from emotional disorders. The results of the Mann-Whitney test showed significant differences in PSA and PSD prevalence between subgroups according to gender (male and female) and level of education (literate and illiterate).

Keywords: Post-Stroke Emotional Disorders; Post-Stroke Anxiety; Post-Stroke Depression; Hospital Anxiety and Depression Scale; The Barthel Index

Abbreviations

PSA: Post-Stroke Anxiety; PSD: Post-Stroke Depression; HADS: The Hospital Anxiety and Depression Scale; BI: The Barthel Index

Introduction

Stroke is a medical condition caused by the disruption of cerebral blood flow leading to chronic neurological impairments [1]. Clinical evidence confirms that stroke attributes are not only associated with physical disabilities of survivors but can also engender critical emotional and cognitive outcomes, which can range from low severity to unbearable conditions [2]. In this context, post-stroke emotional disorders have been identified as one of the biggest challenges to public health due to their potential for affecting the quality of lives of patients as well as those of their caregivers [3]. It has been observed that stroke patients often suffer from emotional disorders that can have adverse or aggravating effects on their post-stroke recovery [4]. These disorders increase mortality and disability rates, as well as lengthen the duration of patients' hospital stay [5]. It is also observed that the interactions among interlinked physical and psychological qualities of health and apparent Quality of Life (QoL) of individuals indicate that those patients often require a re-evaluation of their life in terms of individual goals, guidelines and directions, as well as review their social activities in order to take into account stroke-induced physical and cognitive insufficiencies [6, 7].

Post-stroke anxiety

The term 'anxiety disorder due to a general medical condition' is commonly used to describe symptoms of anxiety that are gauged to be a direct physiological consequence of a medical ailment, such as a stroke [8]. However, most studies usually use the term 'Post-Stroke Anxiety Disorder' (PSA) to describe a worried mood caused by a stroke [9, 10]. PSA is clinically characterised by symptoms such as restlessness, being easily fatigued, difficulty concentrating or frequently experiencing the mind going blank, irritability, muscle tension and sleep disturbance [8]. In addition, a range of other symptoms are also considered to indicate anxiety in stroke patients, such as a fear of falling, avoiding people in meetings, and experiencing memories and flashbacks of the stroke [11].

While PSA can occur at any period after the stroke in about 20 to 25% of [12] patients, the length of time elapsed since the stroke is a vital factor in the prevalence of PSA. Indeed, it has been found that anxiety seems to be associated with a greater impairment of physical and cognitive abilities during the acute phase of the post-stroke period. Barker-Collo, et al. [13] found a 21.1% prevalence of PSA, from moderate to severe anxiety, among patients three months

Citation: Al-Arjan Sami, Shirley T and Nadina L. Prevalence of Post-stroke Emotional Disorders in Saudi Arabia. Phys Med Rehabil Int. 2015;2(2): 1033.

after the stroke. Meanwhile, D'Aniello, et al. [14], who examined the prevalence of PSA based on the length of time elapsed since the stroke, found that PSA incidence rates increased most notably during the chronic stage of the stroke, with prevalence levels reaching 20%, 23% and 24% after one, five and six months after the stroke, respectively.

Moreover, the rate of prevalence for PSA varies depending on the assessments used. The prevalence of Anxiety disorders was found to be 18% when assessed by clinical interviews but increased to 25% when assessed using the rating scale [12]. It has also been observed that PSA occurs in females more than in male patients. For example, Burvill, et al. [15] found the prevalence to be 5% in men and 19% in women when measured separately.

Post-stroke depression

PSD is a term used to identify mood disturbances among patients diagnosed with cerebral or haemorrhagic stroke. Corresponding or comparable terms from previous studies include 'depressive mood', 'mood disorder', 'emotional disorder', and 'psychological distress.' Medically, the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the Classification of Mental & Behavioural Disorders (ICD-10) criteria are used to diagnose PSD, which is classified as a 'mood disorder due to a general medical condition'.

According to the literature, PSD is observed in approximately 29% to 52% of stroke patients [16]. However, inconsistencies in the findings across the range of existing studies may reflect differences in the samples and assessments used. Furthermore, a number of studies have examined various contributing factors that might influence the occurrence or prevalence of PSD. For instance, damage to specific brain sites has been investigated as one factor behind this disorder [17]. In particular, the left hemisphere is generally considered to be more significantly associated with the presence of PSD. However, systematic reviews [18, 19] found these findings to be inconclusive suggesting that both hemispheres could be linked to PSD. Another significant factor in this regard is the length of time elapsed since the stroke [20]. For instance, a systematic review by Hackett and Pickles [21] found that PSD was present in 28% of stroke patients within the first month of stroke, 36% after a 2-5 months period, 31% after 6-9 months, 33% after the first year, 25% after 2-4 years, 23% at 5 years, and 31% beyond 5 years after the stroke.

In addition to the stroke's lesion location and the duration of time since it took place, further demographic factors relating to aspects and elements of PSD have also been considered. Overall, depressive survivors tended to have lower education levels [22] and severe language problems [23], while female patients were significantly associated with depression [24, 25].

Post-Stroke emotional disorders in Saudi Arabia

While numerous studies have examined the prevalence of stroke in Saudi Arabia, relatively few of these have focused on investigating PSA or PSD. Indeed, only one study, conducted by Hamad et al. [26], has examined PSD in a Saudi sample, finding incidences of depression in 17% of stroke survivors during the first month after stroke. Similar studies undertaken in a western context cannot be generalised because of the significant cultural and demographic differences between the two different geographical contexts. As such, the study by Hamed et al. [26] is unique in being the only one to date that examined demographic factors such as age, gender, level of education, time since stroke, treatment setting (hospital or rehabilitation unit) and side of weakness (left or right) within the Saudi Arabian population in order to identify the frequency and severity of PSA and PSD among participants.

The limited scope and depth of existing research literature on Saudi Arabian healthcare highlights the need for an investigation into the prevalence of post-stroke anxiety and post-stroke depression in the country. This is because a country-specific version will help take into account the crucial cultural and social factors influencing PSD and PSA. By considering both post-stroke anxiety and post-stroke depression, the present study thus aims to provide a much-needed contribution to the current limited body of research on PSA and PSD disorders in Saudi Arabia.

Objectives

As mentioned above, the prevalence of post-stroke emotional disorders is higher for specific patient subgroups/characteristics, such as being older (> 60 years), female, having a lower educational level, having a left-sided site of injury and a shorter period time elapsed (≤ 6 months) since the stroke. Research literature on the prevalence of both PSA and PSD in Saudi Arabia remains very limited, notably in terms of patients' demographic characteristics. We hypothesised that the prevalence of emotional disorders is consistent with patterns observed in a Western context and, with that in mind, examined six demographic factors potentially contributing to this prevalence. In particular, this study aimed (1) to explore the prevalence of post-stroke anxiety disorder in Saudi Arabia, (2) to explore the prevalence of post-stroke depression disorder in Saudi Arabia, (3) to examine the relationships between post-stroke emotional disorders and dependency, (4) to identify the main factors affecting the prevalence of post-stroke emotional disorders and (5) to compare post-stroke emotional disorders at baseline and after a three months follow-up period.

Method

An observational study was undertaken to identify the prevalence of emotional disorders one month or more following an ischemic or haemorrhagic stroke. A follow-up assessment, after three months, was also carried out to explore any variations within the observed frequencies of PSA and PSD. Key sub-groups were identified based on six major variables, so as to collect the necessary information based on a pre-determined protocol.

- Age: The mean age of the Saudi population was used to divide study participants into two groups of patients: those aged 60 or under, and those over 61, respectively.

- Gender: Male and female.

- Level of education: It was considered necessary to divide the sample into 'literate' and 'illiterate'subgroups, since a significant segment (18% approximately) of the over-60 populationin Saudi Arabia is illiterate. In this study, the level of education of participants was assessed based on their ability to read and write. In this context, the term 'Illiterate'refers toa participant unable to read and/or write, while 'literate' indicates a participant who was able to read and write, or who had received a level of formal education.

• Time since stroke: The sample was divided into two subgroups, patients with 6 months or less since their stroke and those with 7 months or more. This study variable was designed based on evidence from past studies showing that the first 6 months after the stroke are highly crucial compared to the period after the 7-months mark [27].

• Side of weakness: Left and right.

• Treatment Setting: Hospital and rehabilitation unit.

Participants

The sample of participants included patients who had been diagnosed by neurologists with ischemic or haemorrhagic stroke according to either CT scans or MRI results, and who had been treated for at least one month following their first-ever stroke, either at out-patient clinics or in stroke units based at one of three medical centres in Riyadh, the capital city of Saudi Arabia. Approximately 300 stroke patients are annually admitted to the King Abdulaziz Medical City's National Guard stroke programme, of whom 85% present cases of ischemic stroke, while around 10-15% of all patients die within the acute phase of the stroke.

It has been observed that half of all stroke patients may be subsequently referred to the rehabilitation unit due to severe physical disabilities, and usually remain in hospital for six (6) weeks. A structured database for the acute stroke unit has been maintained at the King Fahad Medical City since 2005, where over 1600 patients are admitted and around 200 patients treated for stroke each year. For its part, the Prince Sultan Bin Abdulaziz Humanitarian City is a rehabilitation centre where more than 280 patients are admitted annually (70% male, 30% female) 90% of whom are ischemic stroke patients who are allowed to stay for up to 12 weeks.

Procedures

In order to recruit participants, clinical staff first determined whether the patients were suitable for taking part in accordance with the study criteria. The recruitment procedure was divided into outpatient and in-patient recruitment, respectively.

- Outpatient Recruitment

For those in an outpatient clinic, the consultant neurologist notified suitable patients and invited them to speak to the researcher. Those who agreed were referred to an investigation room.

-In-Patient Recruitment

Ward staff identified patients who had been already admitted into the rehabilitation centre and who might be eligible to participate in this study. With their permission the researchers would subsequently visit them in their hospital room to discuss their contribution.

Inclusion Criteria

Participants had received a definitive diagnosis of ischemic or haemorrhagic stroke; were at least one month post onset of stroke; and must have been assessed to be conscious, orientated, and able to sufficiently comprehend and communicate informed consent.

Exclusion Criteria

Patients were excluded if their case satisfied a number of conditions. These included the presence of severe dementia, a history of alcohol or drug abuse; and/or chronic psychiatric or other concurrent neurological disorders. Blind or deaf patients were also excluded to ensure the standardised administration of neuropsychological assessments. Finally, patients who were unable to speak or understand Arabic; were medically instable; or suffered from bilateral weakness, were all excluded.

Clinical assessment protocol

The researcher met with each participant, either in an examination room or their admission room (if still hospitalised), to provide them with information sheet as well as verbally brief them about the study. The researcher explained the aims and objectives of the study and addressed any questions the patients or their partners raised. Patients who agreed to take part were asked to sign a consent form. Participants were assessed using the Hospital Anxiety and Depression Scale (HADS) and the Berthel Index (BI). Demographic data was collected, both from patients during the assessment as well as from medical staff after wards.

With regards to patients who were either illiterate or suffered from reading difficulties, their legal representatives assisted them with reviewing the information sheet before signing the consent form on their behalf.

Measures

The hospital anxiety and depression scale (HADS)

The Hospital Anxiety and Depression Scale was devised for the purposes of a brief measurement of both anxiety and depression disorders, and comprises 14 items (seven assessing depression and seven assessing anxiety) [28]. In the present study, the Arabic version of the HADS [29] was used. El-Rufaie and Absood [29] found that this scale was reliable and showed significant levels of sensitivity and specificity. Similarly, Malasi, Mirza and EI-Islam [30]also concluded that the Arabic version of HADS enjoyed high sensitivity and specificity scores (79% and 87% respectively).

According to the literature, the recommended cut-off points for stroke patients varied between 4/5 and 5/6 for anxiety and from 4/5 to 7/8 for depression [2]. However, for researchers using the Arabic version of HADS, El-Rufaie and Absood [31] suggested cut-off points of 8/9 (sensitivity = 65.9% and specificity = 92.3%) for anxiety and of 5/6 (sensitivity = 69.8% and specificity = 93.3%) for depression, and these cut-off points were therefore adopted in this study.

The barthel index (BI)

The Barthel Index (BI) [32] was used to assess the level of dependence in personal day-to-day activities. Scale items used in the BI include mobility, bathing, walking, hygiene, feeding, toileting, personal grooming, negotiating stairs, bladder and bowel control.

Statistical analysis

All statistical analyses were performed using the SPSS (version 22) software. For the prevalence of PSD and PSD, percentages (%) were used once participants were classified into six subgroups based on their age, gender, level of education, time since stroke, side of weakness and treatment setting, with each group divided into two subgroups: age (≤ 60 and ≥ 61 years), gender (male and female), level of education (literate and illiterate), time since stoke (≤ 6 and ≥ 7 months), side of weakness (left and right), setting (hospital and rehabilitation).

Table 1: Characteristics of participants.

Characteristic	No of patients (100)
Age (years)	
Mean	60.53
Median (min to max)	60 (36 to 85)
SD.	11.26
Gender	
Male	76
Female	24
Literacy	
Literate	72
Illiterate	28
Time since stroke (months)	
Mean (SD.)	8.15 (10.49)
Median (min to max)	3.00 (1 to 48)
Centers (%)	
King Abdulaziz medical City	40
King Fahad Medical City	13
Sultan Bin Abdulaziz Humanitarian City	47
Side of weakness	
Right side	51
Left side	49
Settings	
Hospitals	41
Out-patients	13
In-patients	28
Rehabilitation	59

Table 2: Frequencies Post- Stroke Anxiety.

Factors	Subgroups	N	*Frequency (%)*
Age	≤ 60 years	53	16 (30.2 %)
	≥ 61 years	47	20 (42.6 %)
Gender	male	76	26 (34.2 %)
	female	24	10 (41.7 %)
Level of education	literate	72	21 (29.2 %)
	illiterate	28	15 (53.6 %)
Time since stroke	≤ 6 months	74	31 (41.9 %)
	≥ 7 months	26	5 (19.2 %)
Side of weakness	right	51	19 (37.3 %)
	left	49	17 (34.7 %)
Settings	hospital	41	14 (34.1 %)
	rehabilitation	59	22 (37.3 %)
All cases		**100**	**36 %**

The Mann-Whitney test was performed in order to compare differences in HADS scores between the subgroups. The means, SDs, percentiles are calculated for the HADS scores, and a Z-score was measured to confirm whether the observed value differed from the mean. X^2 was performed after re-grouping all participants into two subgroups, 'anxious' and 'non-anxious'. Six demographic characteristics were compared for these two groups. Moreover, this analysis was performed after participants were categorised into 'depressed' and 'non-depressed' groups. To evaluate whether emotional disorders correlate with dependency, Pearson's correlation analysis was performed between HADS and BI. A linear regression analysis was undertaken to examine whether demographic characteristics and dependency predicted the occurrence of emotional disorders, with PSA and PSD used as dependent variables, and age, gender, level of education, time since stroke, side of weakness, treatment setting and BI scores adopted as independent variables. A p-value of ≤ 0.05 was defined as statistically significant.

Ethical considerations

The study was approved by the Faculty of Medicine and Health Sciences (FHMS) Research Ethics Committee, University of Nottingham, UK.

Results

Results from baseline assessment

Characteristics of patients: In the period from 1-12-2013 to 31-3-2014, 263 patientswho had suffered ischemic or haemorrhagic strokeshad their medical charts examined. Of these, 144 (43.4%) patients had been hospitalised for an acute stroke at the rehabilitation ward or outpatient clinics at King Abdul-Aziz Medical City. Similarly, 48.28% were admitted to stroke units at the Sultan Bin Abdul-Aziz Humanitarian City, while 22 (8.36%) patients were admitted to the acute stoke unit, rehabilitation centre or neurology clinics at King Fahad Medical city. Based on the exclusion criteria, 181 participants were deemed eligible to participate, of whom 72 (39.77%) patients or their family representatives declined to take part. Meanwhile, 9 (4.97%) patients withdrew from the study during the psychological assessment. In total, one hundred (100) patients were accepted to take part in this study. The data collected on the patients' characteristics comprises demographic facts such as age, gender, level of education, side of weakness (left or right); treatment setting (hospital or rehabilitation unit) and the time elapsed since the stroke. Table 1 presents an overview of these characteristics.

Prevalence of post-stroke anxiety: The prevalence figures of PSA for various patient characteristics are presented in Table 2. These findings show that for the two age sub-groups, PSA was found in 16 (30.2%) out of 53 patients in the under-60 group and in 20 (42.6%) out of 47 patients in the 61-and-older group. In terms of gender, PSA was found in 26 (34.2%) out of a total of 76 male patients and in 10 (41.7%) out of a total of 24 female participants. In terms of literacy, the findings confirm that illiteracy has a considerable bearing on the likelihood of PSA in the patient. Indeed, PSA was found in 21 (29.2%) out of 72 literate members, while it affected 15 (53.6%) out of a total of 28 illiterate patients.

In terms of time elapsed since the stroke, PSA was found in 31 (41.9%) of the 74 patients in the 6 months or less sub-group while only 5 (19.2%) of the 26 patients in the 7 months-or-more subgroup were affected. Furthermore, PSA was found in 19 (37.3%) out of the 51 patients with a right-hand side weakness, and in 17 (34.7%) out of the 49 patients with a left-hand side weakness. Overall, based on the total sample of 100 patients taking part in the study, the prevalence of PSA was found to be 36%, with an average mean of 7.8.

Differences in PSA prevalence between subgroups: Mann-Whitney tests were conducted to compare anxiety scores between the subgroups. The incidence of PSA among selected participants was found to be significantly affected by differences in age, literacy and the time elapsed since stroke. For age sub-group *(z= -2.340; p= 0.019)*. For the literate sub-group *(z= -3.066; p= 0.002)* and for the time elapsed since stroke *(z= -4.024; p = 0.001)*. However there was no significant difference in anxiety scores for gender, side of weakness and time since stroke Table 3.

Table 3: Results from the post-hoc analysis using the Mann-Whitney test examining differences in PSA prevalence among subgroups.

	Subgroups	N	Mean (min to max)	SD.	Percentiles			Z	Sig.
					25th	50th (median)	75th		
Age	≤ 60 years	53	6.811 (0 to 20)	4.74	2	6	10	-2.340	.019*
	≥ 61 years	47	8. 957 (0 to 16)	4.60	5	8	14		
Gender	male	76	7.658 (0 to 20)	5.01	4	7	12	-1.047	.29
	female	24	8.333 (1 to 16)	3.67	5	7	12		
Level of education	literate	72	6.764 (0 to 20)	4.51	3.25	6	9.75	-3.066	.022*
	illiterate	28	10.536 (1 to 16)	4.43	6	12	14		
Time since stroke	≤ 6 months	74	8.905 (1 to 20)	4.80	5	8	14	-4.024	.001*
	≥ 7 months	26	4.731 (0 to 12)	3.08	2	5	5.25		
Side of weakness	right	51	8 (0 to 20)	4.33	5	7	12	-.632	.52
	left	49	7.632 (0 to 16)	4.76	4	7	12		
Settings	hospital	41	8.244 (1 to 20)	4.89	5	7	12	-.729	.46
	rehabilitation	59	7.525 (0 to 16)	4.71	4	7	12		

Table 4: Differences between anxious and non-anxious subgroups on the HADS (n = 100).

		PSA		X^2	Sig.
		Anxious (n= 36)	Non-anxious (n= 64)		
Age	≤ 60 years	15 (28.3 %)	38 (71.7%)	2.900	.089
	≥ 61 years	21 (44.7%)	26 (55.3%)		
Gender	male	26 (340.2%)	50 (65.8%)	.440	.057
	female	10 (41.7%)	14 (58.3%)		
Level of education	literate	19 (26.4%)	53 (73.6%)	10.310	.001
	illiterate	17 (60.7%)	11 (39.3%)		
Time since stroke	≤ 6 months	31 (41.9%)	43 (58.1%)	4.288	.038
	≥ 7 months	5 (19.2%)	21 (80.8%)		
Side of weakness	right	19 (37.3%)	32 (62.7%)	.071	.790
	left	17 (34.7%)	32 (65.3%)		
Settings	hospital	15 (36.6%)	26 (63.4%)	.010	.919
	rehabilitation	21 (35.6%)	38 (64.4%)		

Differences between anxious and non-anxious subgroups: Differences in the prevalence of anxiety symptoms between participants classified as 'anxious' and 'non-anxious', respectively, was significant in two subgroups: level of education *($X^2 = 10.310$, $p = .001$)* and time since stroke *($X^2 = 4.288$, $p = .038$)* Table 4.

Prevalence of post-stroke depression: Results examining the prevalence of Post-Stroke Depression (PSD) among study participants are presented in Table 5. These findings indicate that PSD was found among 21 (39.6%) out of 53 patients aged 60 or under, and in 23 (48.96%) out of the 46 patients aged 61 years and older. In terms of gender, PSD was found in 31 (40.8%) out of 76 male participants and in 13 (54.2%) of 24 female patients. Furthermore, PSD was found in 27 (37.5%) of the 72 literate participants, but in 17 (60.7%) of the 28 illiterate patients. In terms of time elapsed since the stroke, the results indicate that PSD was found in 39 (52.7%) of the 74 patients in the 6-months-or-less sub-group, where as it affected only 5 (19.2%) of

Table 5: Frequencies of Post-Stroke Depression.

Factors	Subgroups	N	Frequency (%)
Age	≤ 60 years	53	21 (39.6%)
	≥ 61 years	47	23 (48.9%)
Gender	male	76	31 (40.8%)
	female	24	13 (54.2%)
Level of education	literate	72	27 (37.5%)
	illiterate	28	17 (60.7%)
Time since stroke	≤ 6 months	74	39 (52.7%)
	≥ 7 months	26	5 (19.2%)
Side of weakness	right	51	24 (47.1%)
	left	49	20 (40.8%)
Settings	hospital	41	18 (43.9%)
	rehabilitation	59	26 (44.1%)
All cases		**100**	**44%**

Table 6: Results from the post-hoc analysis using the Mann-Whitney test examining differences in PSD prevalence among subgroups.

	Subgroups	N	Mean (min to max)	SD.	Percentiles			Z	Sig.
					25th	50th (median)	75th		
Age	≤ 60 years	53	6.981 (0 to 20)	5.04	2	7	12	-1.858	.063
	≥ 61 years	47	8. 723 (0 to 17)	5.09	5	8	14		
Gender	male	76	7.526 (0 to 20)	5.30	3	7	12	-.729	.46
	female	24	8.666 (1 to 17)	4.33	5	8.5	12		
Level of education	literate	72	6.861 (0 to 20)	4.89	3	7	11.75	-3.507	.001*
	illiterate	28	10.214 (1 to 17)	4.86	6.25	10	14		
Time since stroke	≤ 6 months	74	8.743 (0 to 20)	4.99	5	8	13	-3.162	.002*
	≥ 7 months	26	5.115 (0 to 16)	4.40	1.75	3.5	7		
Side of weakness	right	51	8.157 (0 to 20)	5.05	5	8	12	-.388	.69
	left	49	7.429 (0 to 17)	4.76	3	7	12		
Settings	hospital	41	8.366 (1 to 20)	5.41	3	8	13	-.704	.48
	rehabilitation	59	7.407 (0 to 16)	4.85	3	7	12		

Table 7: Differences between depressed and non-depressed subgroups on the HADS (n = 100).

		PSD		X^2	Sig.
		Depressed (n= 44)	Non-depressed (n= 56)		
Age	≤ 60 years	21 (39.6%)	32 (60.4%)	.877	.349
	≥ 61 years	23 (48.9%)	24 (51.1%)		
Gender	male	31 (40.8%)	45 (59.2%)	1.325	.250
	female	13 (54.2%)	11 (45.8%)		
Level of education	literate	27 (37.5%)	45 (62.5%)	4.409	.036
	illiterate	17 (60.7%)	11 (39.3%)		
Time since stroke	≤ 6 months	39 (52.7%)	35 (47.3%)	8.748	.003
	≥ 7 months	5 (19.2%)	21 (80.8%)		
Side of weakness	right	24 (47.1%)	27 (52.9%)	.395	.530
	left	20 (40.8%)	29 (59.2%)		
Settings	hospital	18 (43.9%)	23 (56.1%)	.000	.987
	rehabilitation	26 (44.1%)	38 (6434%)		

the 26 participants in the 7-months-or-longer sub-group. Moreover, PSD was found in 18 (43.9%) out of 41 patients with a right hand side weakness and in 26 (44.1%) out of 59 patients with a left hand side weakness. Overall, the prevalence of PSD among study participants was found to be 44%.

Differences in PSD prevalence among subgroups: A post-hoc analysis was conducted on the study findings using the Mann-Whitney test for PSD. The results (presented in Table 6) indicate significant results for the literate sub-group *(z= -3.507; p = 0.001)* and for the time since stroke (*z = -3.162; p = 0.002*). All other characteristics, however, presented results that were in significant in the context of PSD.

Differences between depressed and non-depressed subgroups: Differences in the prevalence of depression symptoms between participants classified as 'depressed' and 'non-depressed', respectively, was significant in two subgroups: level of education *(X^2 = 4.409, p = .036)* and time since stroke *(X^2 = 8.748, p = .003)* Table 7.

The relationship between post-stroke emotional disorders and dependence in personal day-to-day activities

Pearson's correlation analysis found significant negative correlations between Barthel Index scores and both anxiety scores (*r=-0.62, p <0.001*) and depression scores (*r = -0.63, p<0.001*).

Predictors of emotional disorders' severity at baseline assessment

Multiple linear regressions were used to measure the severity of anxiety and depression using the Arabic HADS. The following seven predictors were selected based on their significant effect on emotional disorders as established from the research literature: age, gender and level of education, time since stroke, side of weakness, treatment setting and BI.

The baseline assessment results show that BI is a significant

Table 8: Characteristics of participants.

Characteristic	No of patients (70)
Age (years)	
Mean	57.76
Median (min to max)	58 (36 to 79)
SD.	10.43
Gender	
Male	56 (80%)
Female	14 (20%)
Literacy	
Literate	55 (78.6%)
Illiterate	15 (21.4%)
Time since stroke (months)	
Mean (SD.)	9.8 (12.03)
(min to max)	(1 to 48)
Side of weakness	
Right side	36 (51.4%)
Left side	34 (48.6%)
Settings	
Hospitals	30 (42.9%)
Rehabilitation	40 (57.1%)

predictorof the severity of PSA (*B= -0.616; p <0.001*). Meanwhile, all other predictors were found to have an insignificant effect in predicting PSA, such as age (*p = 0.62)*, gender (*p = 0.61)*, level of education (*p = 0.18)*, time since stroke with (*p = 0.43)*, side of weaknesses (*p = .43)* and treatment setting (*p = .85)*. The overall significance values of the model were *(F = 59.971; p < 0.001 and R^2 = 0.38)*.

Furthermore, the Arabic HADS baseline assessment results for PSD illustrated similar results to those of the PSA predictors. Most notably, only dependency was found to be a significant predictor of the severity of PSD (B = - 0.637; *p <0.001*), whereas all other predictors proved insignificant, with age (*p = 0.61)*, gender (*p = 0.69)*, level of education (*p = 0.43)*, time since stroke (*p = 0.42)*, side of weaknesses (*p = 0.89)* and treatment setting (*p = 0.11)*.The overall significance values of the model were *(F = 66.851; p < 0.001 and R^2 = 0.406)*.

Results from the 3 months follow-up assessment

Characteristics of participants: At the end of a three month post-stroke follow-up period, the incidence frequencies for PSA and PSD were established and examined against the corresponding figures from the early evaluation. Follow-up participants had a mean age of 57.76 (SD=10.43)age, with 80% of participants being male. Out of 70 patients, 42.9% were in a hospital setting while 57.1% were in a rehabilitation setting. Furthermore, it was found that 78.6% of patients were literate while (21.4%) were not. 51.4% of patients exhibited right side weaknesses and 48.6% had left-sided weakness ones, Table 8.

Table 9: Results from the post-hoc analysis conducted using the Mann-Whitney test examining differences in PSA prevalence among subgroups for 70stroke patients at the 3-month follow-up assessment.

	N	Mean	SD.	Percentiles			*Z*	*Sig.*
				25th	50th (median)	75th		
Age								
≤ 60 years	38	5.053	3.77	2	4.5	8	-.119	.91
≥ 61 years	32	5.125	3.53	2.25	5	6.75		
Gender								
Male	56	4.554	3.65	2	3	6.75	-2.857	.004*
Female	14	7.214	2.75	4.75	7	9.25		
Level of education								
Literate	55	4.748	3.25	2	4	7	-2.562	.01*
Illiterate	15	7.467	4.07	4	7	12		
Time since stroke								
≤ 6 months	48	5.437	3.78	2	5	7	-1.221	.22
≥ 7 months	22	4.318	3.26	2	3	6.25		
Side of weakness								
Right	36	5.333	3.62	2	5	7	-.609	.54
Left	34	4.318	3.26	2	4	7.25		
Settings								
Hospital	30	5.167	4.07	2	4.5	7	-.107	.91
Rehabilitation	40	5.025	3.32	2	5	7		

Frequencies of PSA: Findings from the follow-up assessment indicated that PSA was foundin 38 (21.1%) participants in the 60-or-under age group, while 15.6% were in the 60-and-over subgroup. Among these patients, 56 were male with PSA (17.9%) according to follow-up results. Additionally, a significant change was found in the follow-up results relative to the earlier evaluation in terms of the time elapsing since stroke. In particular, of the 48 patients in the 6-months-or-under sub-group, 10 (20.8%) were found to suffer from PSA at the 3-month follow up assessment, while 3 (13.6%) patients from the 7-months-or-longer group were affected.

Differences in PSA prevalence among subgroups: A Mann-Whitney test was conducted on the findings of the follow-up assessment, the results of which are presented in Table 9. For gender, the table shows significant follow-up assessment results with *(z = -2.857; p = 0.004*). Likewise, the level of education showed significant results, with (*z = -2.562; p = 0.01*). All other characteristics, however, were insignificant in the context of PSA prevalence.

Frequencies of PSD: Overall, 18.6% of patients at the follow-up suffered from PSD, including 21.6% of patients aged 60 or under, and 21.6% of participants aged 61 or over. Meanwhile, 23.2% of male participants were affected, compared to 42.9% of female patients. Anotable change was noted in the 'time since stroke' factor, where PSD was found in 35.4% of patients in the 6-months-or-less sub-group whereas only 9.1% of those in the 7-months-or-longer were affected.

Differences in PSD prevalence among subgroups: A Mann-Whitney test was conducted on the findings of the follow-up assessment for PSD. The results, shown in Table 10, were insignificant for differences in age, time since stroke, side of weakness and treatment setting. However, the results for gender showed significant differences, with *(z = -2.160; p = 0.03)* at the follow-up assessment. In terms of level of education, the table shows significant follow-up assessment results of *(z = -1.947; p = 0.05)*.

Predictors of emotional disorder severity at follow-up assessment: In order to determine which variables were significant predictors of anxiety and depression severity at the 3-months follow-up, linear regression was performed using the Arabic version of HADS and taking into consideration seven factors: age, gender, level of education, time since stroke, side of weakness, treatment setting and dependency (as measured by BI). Only the level of education *(B = 0.233; p <0.05)* and the BI *(B = 0.431; p <0.001)* levels proved to be significant predictors of PSA severity, whereasall other predictors were less reliable. The findings yielded the following *p* values: age (*0.54)*, gender (*0.08)*, time since stroke (*0.713)*, side of weakness (*0.72)* and treatment setting (*0.62)*. From these results, the overall significance values of the model of the Arabic HADS-Anxiety subscale was very important with *(F = 15.53; p <.001 and R^2 = .186)*.

Meanwhile, the 3-months follow-up assessment results showed

Table 10: Results from the post-hoc analysis conducted using the Mann-Whitney test examining differences in PSD prevalence among subgroups for 70 stroke patients at the follow-up assessment.

	N	Mean	SD.	Percentiles			*Z*	*Sig.*
				25th	50th (median)	75th		
Age								
≤ 60 years	38	5.921	5.21	2	4.5	10.5	-.509	.61
≥ 61 years	32	6.156	4.59	2	6	7		
Gender								
Male	56	5.464	4.51	1	4.5	7	-2.160	.03*
Female	14	8.286	4.08	4.75	9	12		
Level of education								
Literate	55	5.436	4.68	2	5	7	-1.947	.05*
Illiterate	15	8.2	5.21	3	8	12		
Time since stroke								
≤ 6 months	48	6.604	5.03	2	5	7	-1.327	.18
≥ 7 months	22	4.773	4.44	1.75	3	7		
Side of weakness								
Right	36	5.806	4.84	1.25	5	9.5	-.372	.71
Left	34	6.265	5.02	2	6	10.5		
Settings								
Hospital	30	6.5	5.64	2	4	12.5	-.316	.75
Rehabilitation	40	5.675	4.29	2	6	8.75		

that only BI was a significant predictor of PSD severity *(B = -0.424; p <0.001)*, while all other predictors proved insignificant: age *(p = 0.64)*, gender *(p = 0.27)*, level of education *(p = 0.33)*, time since stroke *(p = 0.50)*, side of weaknesses *(p = 0.48)* and treatment setting *(p = 0.28)*. The overall significance values of the model are *(F = 14.91; p < 0.001 and R2 =0 .180)*.

Discussion

At the initial assessment, out of the total sample of 100 patients who took part in the study, PSA and PSD was identified in 36% and 44% of participants, respectively. PSA prevalence levels established in the course of the present study are moderately superior to those found in a number of Western-set studies [12]. Meanwhile, PSD prevalence levels identified in the present study echoed results from recent Western-set literature [16]. Although participants ranged in age from 36 to 85 years-old, PSA/PSD prevalence amongthoseaged 61 or older was found to be disproportionately high. This can be attributed to the fact older people tend to suffer from greater levels of depression due to a greater likelihood of losing their physical and social capacities and support. Distance from family, lack of understanding of procedures, and deteriorating mental capacities with the passage of time all contribute to an increase in emotional disorders within this age group [33]. In light of the literature review findings, patients aged 60 and above can be said to be more susceptible to strokes and, in consequence,to a greater likelihood of suffering from post-stroke emotional disorders [34]. While the age frequency findings presented in this study differ from those reported by Al Rajeh, et al. (1993), this can be attributed to differences in the sample sizeand evaluation methods [35]. Moreover, the sample in the present study was hospital-based and participants were, as such, recruited from only stroke units or rehabilitation centres. However, most stroke survivors are more likely to be living in the community.

Further, the literature review drew attention to the significance of the level of education as a principal risk factor in the occurrence of emotional disorders [36, 37], a finding confirmed by the results of the present study. In particular, it can be seen from the Mann-Whitney test for PSD and PSA that the level of education is one of the most crucial contributors towards either increasing or reducing the likelihood of post-stroke emotional disorders. This study's findings highlight the role of illiteracy in the prevalence of such disorders. Similarly, baseline outcomes and follow-up results for PSA, as well as those for PSD confirm that the patient's level of education plays a much more significant role during the follow-up period (relative to the initial baseline) in predicting the likelihood of emotional disorders [37].

Similarly, the length of time elapsed since the stroke was acknowledged as a strong predictor of both PSD and PSA. This is arguably due to the fact the more time has elapsed since the stroke, the lesser and more attenuated its effects will be on the patient's physical and mental condition and, as such, the severity of post-stroke emotional disorders will be lessened [38].

While the research literature seems to suggest that loss of control and the inability to perform daily functions carries a greater impact on the incidence of post-stroke emotional disorders [39], no evidence has been found in the present study to confirm the effect of the patient's treatment setting on the prevalence of emotional disorders in the selected three hospital settings in Saudi Arabia [14, 26, 40].

Methodological limitations of our study should be acknowledged. Most notably, a number of further important demographic factors, such as the site of the stroke, the extent of cognitive dysfunctions, the degree of social support, the type/nature of psychiatric treatment, as well as the presence of physical and psychiatric diseases, were not considered. Nevertheless, such characteristics can have an impact on the prevalence of PSA and PSD among stroke patients. Furthermore, for aphasic patients, or those suffering from severe cognitive impairments, appropriate psychological scales should be used instead of the HADS. Finally, the PSA and PSD prevalence levels observed in this study may have been unduly biased by the adopted exclusion criteria.

Acknowledgments

We wish to thank the study sponsors, The King Abdulaziz Medical City – The Ministry of National Guard and The Saudi Cultural Bureau in London for their funding. We also thank TheKing Abdullah international medical research centre, The Institutional Review Board atKing Fahad Medical City, and The Research Ethics Committee at the Sultan bin Abdulaziz Humanitarian City, for providing the necessary authorisation of the study. We would like to express our gratitude towards themedical staff for their help throughout the data collection process in Saudi Arabia. In particular, Dr Fahmi Al-Senani, Dr Ali Al-Khathami, Dr Omar Al-Modyafer, Dr Saeed Wahass, Dr Eman Smail, Mr. Abdulaziz Bin Khenain, Ms. Noor Alkhodair and Ms Maha Al-Dodari.

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Phys Med Rehabil Int - Volume 2 Issue 2 - 2015
ISSN : 2471-0377 | www.austinpublishinggroup.com

Citation: Al-Arjan Sami, Shirley T and Nadina L. Prevalence of Post-stroke Emotional Disorders in Saudi Arabia. Phys Med Rehabil Int. 2015;2(2): 1033.