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Functional Stroke Mimics: Incidence and Characteristics at a Primary Stroke Center in the Middle East

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ABSTRACT

Objective: Approximately 30% of individuals who initially present with stroke are found to be stroke mimics (SM), with functional/psychological SM (FSM) accounting for up to 6.4% of all stroke presentations. Middle Eastern countries may have higher rates of somatization of emotional distress. The aim of this study was to evaluate the incidence and characteristics of FSM at a large general hospital in the Middle East.

Methods: All patients presenting with an initial diagnosis of stroke from June 2015 to September 2016 were eligible for this study. Clinical and sociodemographic data were obtained from the hospital's stroke database. All SM and strokes were diagnosed by Joint Commission International–certified stroke program neurologists. SM was defined as any discharge diagnosis (other than acute stroke) for symptoms that prompted initial admission for suspected stroke. FSM were compared with medical stroke mimics (MSM) and strokes (ischemic, hemorrhagic, and transient ischemic attacks).

Results: A total of 1961 patients were identified; 161 FSM (8.2%), 390 MSM (19.9%), and 1410 strokes (71.9%) (985 ischemic strokes, 196 transient ischemic attacks, 229 intracerebral hemorrhages). Admission with FSM was related to patients' nationality, with the highest frequency in Arabic (15.6%) and African (16.8%) patients. FSM patients were younger, more often female, and had fewer cardiovascular risk factors except for smoking compared with the strokes. FSM patients presented with more left-sided weakness and had more magnetic resonance imagings than the stroke and MSM groups. A total of 9.9% of FSM patients received thrombolysis versus only 0.5% of the MSM and 16.4% of ischemic strokes.

Conclusions: FSM frequencies varied by nationality, with Arab and African nationals being twice as prevalent. Stress, vulnerable status as expats, sociopolitical instability, and exposure to trauma are proposed as potential factors contributing to FSM.

Key words: African, Arabic, functional stroke mimic, Middle East, stroke, stroke mimic.

INTRODUCTION

Acute stroke management requires rapid patient assessment for administration of thrombolysis (tpa) and other interventions within a very brief time window. Stroke mimics (SM) initially present as a stroke but are later determined to be either functional/psychological (functional SM [FSM]) or due to another medical condition (medical SM [MSM]) (1–5). SM are quite common. A recent meta-analysis of 8839 patients presenting as strokes found that 17% to 34% were mimics (6). It is critical to understand SM to prevent unnecessary treatment, associated risks, and expense and provide optimal patient care.

FSM have been identified in up to 6.4% of all acute stroke presentations (7–9). They present with neurological patterns that are not suggestive of any particular neurological disorder; imaging (computerized tomography [CT] and/or magnetic resonance imaging [MRI]) does not demonstrate changes and laboratory values are all normal. FSM have been found to be younger, are more likely to be female, smoke more, have fewer cardiovascular risks, present with weakness, slurred speech and a trend toward a left-sided lateralization, and are more likely to have MRI (10). FSM are more likely to have headache at presentation, and one or more medically unexplained symptoms and are less likely to present with vertebrobasilar dysfunction (11). In a recent UK study,

➢ Related editorial on pages 412–415

CT = computerized tomography scan, **FSM** = functional stroke mimics, **HGH** = Hamad General Hospital, **MENA** = Middle East and North Africa, **MRI** = magnetic resonance imaging, **mRS** = modified Rankin Scale, **MSM** = medical stroke mimics, **SM** = stroke mimics, **tpa** = thrombolysis, **TIA** = transient ischemic attack

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47% of FSM were found to have been referred for psychological treatment at 1 year, with depression- and stress-related conditions being the most common diagnoses (10).

Somatization is the presentation to medical care of physical symptoms for which no organic explanation can be found, as a manifestation of psychological distress (12). Culture may play a role in somatization, and some studies have suggested that Middle Eastern countries have higher rates of somatization than Western countries (13–15). In Arabic countries, the physical expression of emotional stress has been reported to be more common and acceptable. In addition, higher levels of stigma around mental illness may be linked with increased somatization of psychological concerns into physical symptoms (13,14,16,17).

This study was undertaken to determine the incidence and characteristics of FSM and MSM identified in the Middle Eastern country of Qatar.

METHODS

Patients presenting to Hamad General Hospital (HGH) with an initial diagnosis of stroke were included in a stroke database. HGH is a Joint Commission International–accredited 600-bed hospital and serves as the teaching hospital for Weill Cornell Medical College in Qatar. It is the only tertiary care medical service in Qatar, and 95% of all strokes requiring admission to hospital are admitted to HGH. HGH has a Joint Commission International–certified stroke program and is equipped with all necessary laboratory, neuroradiological and neurosurgical facilities, and infrastructure required to manage acute stroke patients including a 24-hour tpa and endovascular service (18).

All patients presenting to HGH Emergency Department with an acute onset of a focal neurological deficit were medically assessed for potential stroke. Assessment of patients included a neurological examination, neuroimaging, and routine laboratory assessments to assess for any systemic problems. The diagnosis of FSM was made based on historical and clinical features in keeping with a FSM. Diagnostic features were assessed clinically, and all FSM met DSM-5 (19) criteria for functional neurological disorders. (A) The patient has one or more symptoms of altered voluntary motor or sensory function. (B) Clinical findings provide evidence of incompatibility between the symptom and recognized neurological or medical conditions. (C) The symptom or deficit is not better explained by another medical or mental disorder. (D) The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation. Cases were not diagnosed based on normal imaging. The diagnosis was confirmed by the admitting neurologist and the study co-investigator.

All patients seen from June 2015 to September 2016 were included in the study. Based on discharge diagnosis, FSM, MSM, and strokes (ischemic, hemorrhagic, and transient ischemic attacks [TIAs]) were compared with determine prevalence frequency. In addition, the relationship between demographics (including nationality), stroke risk factors and stroke symptom, and discharge location were analyzed between the three groups. The following data were collected: demographics including age, sex and ethnicity, blood pressure, initial diagnosis, history, and current cardiovascular risk factors including diabetes, hypertension, dyslipidemia, history of prior stroke, cardiac disease, and current smoking. Potential signs of stroke included weakness (with location), speech deficit, posterior symptoms (dizziness, vomiting, and reduced loss of consciousness), headache, seizure, visual concerns, and abnormal behavior. Imaging including CT brain, CT angiogram, CT perfusion, MRI brain, MRAngiogram, and tpa. Other variables included mode of arrival (ambulance versus private vehicle), National Institutes of Health Stroke Scale, modified Rankin Scale (mRS), and discharge location.

The Qatari group was analyzed separately from the Arab population because of key differences in demographics. Qataris are the only nonexpats. They have families in the country, receive special financial benefits from the government, and do not have to leave the country when they retire. Patients from Qatar typically comprise the highest socioeconomic level in the patients served by the HGH. Africans were from Sudan, Kenya, Nigeria, Morocco, Tunisia, Ethiopia, Algeria, Ghana, Somalia, and Uganda. Arabs were from Egypt, Saudi Arabia, Jordan, Iran, Iraq, Palestine, Yemen, and Syria. Southeast Asians were from India, Bangladesh, Nepal, Pakistan, and Sri Lanka, and Far Eastern patients were from the Philippines, Indonesia, and Thailand.

This was a retrospective study, and patients did not sign consent forms. The study was reviewed and approved by the Hamad Medical Corporation Research Internal Review Board (Study Protocol #16424/16).

Statistical Analysis

Continuous data were expressed by the “”mean ± standard deviation and categorical data as frequency (percent). Continuous variables were compared with analysis of variance or with the Kruskal Wallis test depending on whether the distribution was Gaussian or not. Categorical data were compared with a Pearson χ^2 test or with a Fisher exact test whenever appropriate. Statistical analyses were performed using SPSS Version 22. A p value of less than.05 was considered significant.

RESULTS

In this 16-month period, 1961 patients were identified, including 161 FSM (8.2% FSM), 390 MSM (19.9% MSM), and 1410 strokes (71.9%). The strokes were composed of 985 ischemic (50%), 196 TIA (10%), and 229 intracerebral hemorrhages (12%) (Table 1).

Functional SM

The frequency of FSM varied by nationality with the Arab and African groups having twice the rate of other nationalities (15.6 and 16.8% of all stroke presentations, respectively), whereas the Southeast Asian, Far Eastern, Western, and Qatari groups ranged from 5.2% to 7.9%. FSM were approximately 10 years younger ($p < .001$). Males were more prevalent because of the greater number of expat laborers in Qatar (72% of Qatari population is male per United Nations), but females were twice as common in the FSM group (14.4% of females were FSM versus 6.5% of males) ($p < .001$).

Patients with a FSM admission were less likely to arrive by ambulance compared with admissions for stroke (57.1% versus 66.6%). Their cerebrovascular risk factors, including hypertension, diabetes, and dyslipidemia (but not smoking) were significantly lower than MSM and strokes ($p < .001$). Body mass was slightly higher in the FSM (28.75 ± 6.00) than in strokes (27.55 ± 4.99, $p < .001$). Smoking was greatest in the FSM group at 26.1% ($p < .001$).

Thirty two of 161 FSM had a history of old stroke, and this group had a higher medical burden. They were older (mean age of 49 versus 43 years = .007), more likely to be diabetic (62.5% versus 25.6%, $p < .001$), more likely to be hypertensive (68.8% versus 35.7%, $p < .001$), had more cardiac disease (25% versus 6%, $p = .004$), and had greater frequencies of disability before their current event (28.1% had mRS ≥1 versus 4.7% of FSM with no history of old stroke, $p < .001$).

FSM were most likely to have left-sided weakness (50.9%, right-sided weakness was 32.3% and none was 13%) and were the most likely group to have an MRI ($p < .001$) or MRA ($p = .003$). They had fewer speech deficits than true strokes (19.3 versus 39.1, $p < .001$). A total of 9.9% of FSM received tpa versus only 0.5% of the MSM ($p < .001$). mRS disability scores were lowest in the FSM group at both admission and discharge ($p < .001$),

TABLE 1. Characteristics of FSM, MSM, and Strokes

	FSM (161)	MSM (390)	Stroke (1410)	*p*
Age, M (SD)[abc]	44.42 (12.77)	55.76 (16.51)	53.41 (12.80)	<.001*
Sex, % by dx group[bc]				<.001
Female	62 (14.4)	135 (31.3)	234 (54.3)	
Male	99 (6.5)	255 (16.7)	1176 (76.9)	
Nationality[abc]				<.001
Qatar	30 (7.9)	120 (31.6)	230 (60.5)	
Arab	53 (15.6)	86 (25.4)	200 (59.0)	
Southeast Asian	47 (5.2)	130 (14.4)	728 (80.4)	
Far Eastern	12 (6.3)	19 (9.9)[d]	161 (83.9)	
African	16 (16.8)	20 (21.1)	59 (62.1)	
Western	3 (6.0)	15 (30.0)	32 (64.0)	
Mode of arrival[b]				
Emergency	92 (57.1)	246 (63.1)	939 (66.6)	.037
Hypertension[ab]	68 (42.2)	255 (65.4)	994 (70.5)	<.001
Body mass index, M (SD)[bc]	28.75 (6.00)	28.88(6.48)	27.55(4.99)	<.001*
Diabetic[abc]	53 (33.0)	206 (52.8)	719 (51.0)	<.001
Prediabetic (HgA1c 5.7–6.4)	21 (13.0)	35 (9.0)	204 (14.5)	
Dyslipidemia[ab]	48 (29.8)	160 (41.0)	666 (47.2)	<.001
Previous stroke[bc]	32 (19.9)	106 (27.2)	146 (10.4)	<.001
Smoking[ab]	42 (26.1)	55 (14.1)	215 (15.2)	.001

FSM = functional stroke mimics; MSM = medical stroke mimics; dx = diagnostic; HgA1c = hemoglobin A1C.

Results are expressed as *n* (%), unless otherwise indicated.

Multiple comparison analysis was done using Bonferroni method.

p value has been calculated using Pearson χ^2 test or Fisher exact test whenever appropriate, unless otherwise indicated.

**p* value has been calculated using analysis of variance.

[a] FSM versus MSM.

[b] FSM versus stroke.

[c] MSM versus stroke.

[d] Mean only 40 y.

and 100% of FSM were discharged home. Mean length of stay (LOS) was shortest for the FSM group at 2.4 days (Table 2).

Medical SM

The frequency of MSM was significantly lower in Far Eastern and Southeast Asian patients (9.9%–14.4% versus 21.1%–31.6%, $p < .001$). However, the Far Eastern Medical Mimic group was significantly younger (mean age of 40 versus 50–62 for the other groups), and this likely accounts for the lower number of MSM in this group. The most common MSM were the following: infection/inflammatory (79), structural (76), peripheral vertigo (62), dementia/old stroke(s) (57), seizures (31), cardiovascular (31), metabolic (27), and headache (26).

MSM were the oldest group (mean ± SD age = 55.76 ± 16.51 years). Women were more likely than men to be MSM (31.3% versus 16.7%, $p < .001$). MSM arrived by ambulance at similar frequencies as strokes (63.1%). Cerebrovascular risk factors were either similar to strokes (hypertension) or greater than the stroke group (diabetes, dyslipidemia), and MSM had a greater number of previous strokes reported than the stroke group (27.4 versus 10.4%, $p < .001$).

MSM were least likely to present with weakness and had fewer speech deficits than the strokes ($p < .001$). Only 0.5% had tpa. Their mRS disability ranking was higher than the FSM or stroke group pre-event (26.7% had a mRS score of 1 or more at baseline versus 9.3 and 9.4 for the functional and stroke groups, $p < .001$). Mean LOS for MSM was 4.8 days, with 91.8% discharged home.

Strokes

Confirmed stroke individuals were more likely to arrive by ambulance (66.6%) versus FSM cases (57.1%) ($p = .036$). Cardiovascular risk factors were significantly greater ($p < .001$) in the stroke group than in the FSM including blood pressure, diabetes mellitus, hypertension, and dyslipidemia. Body mass index was slightly lower than both mimic groups ($p < .001$).

Stroke patients experienced significantly ($p < .001$) more one-sided weakness than the MSM (77.6% versus 44.6%, $p < .001$). Speech deficits were significantly greater ($p < .001$) in stroke (38.1 versus 19.3% and 19.5%).

Interventions were more common in the stroke group. Interventions seem lower in the total stroke group because it includes ischemic, TIA, and intracerebral hemorrhage patients. A total of 14.5% of ischemic stroke patients received tpa only, an additional 1.9% received tpa plus thrombectomy, and .2% received thrombectomy alone.

National Institutes of Health Stroke Scale scores overall are consistent with the lower severity of strokes in Qatar. The stroke group was more impaired than both mimic groups at admission

TABLE 2. Presenting Symptoms and Interventions

Factors	FSM	MSM	Stroke	*p*
Weakness[ac]				
None	21 (13.0)	185 (47.4)	282 (20.0)	< .001
Right	52 (32.3)	84 (21.5)	514 (36.5)	
Left	82 (50.9)	90 (23.1)	579 (41.1)	
Face	2 (1.2)	11 (2.8)	7 (0.5)	
General	4 (2.5)	20 (5.1)	28 (2.0)	
Speech deficit[bc]	31 (19.3)	76 (19.5)	537 (38.1)	< .001
Posterior sxs[abc]				
None	127 (78.9)	215 (55.1)	1022 (72.5)	< .001
Dizzy	28 (17.4)	105 (26.9)	212 (15.0)	
Dizzy + vomiting	3 (1.9)	48 (12.3)	93 (6.6)	
Reduced LOC	3 (1.9)	22 (5.6)	83 (5.9)	
CT brain[bc]				
(CT not done on cases that went directly to MRI)	155 (96.3)	384 (98.5)	1409 (99.9)	< .001
CTA/CTP[ac]	63 (39.1)	76 (19.5)	456 (32.3)	< .001
MRI[ab]	126 (78.3)	256 (65.6)	870 (61.7)	< .001
MRA[b]	114 (70.8)	235 (60.3)	804 (57.0)	.003
Interventions[ac]				
(tpa[d] and/or thrombectomy)	16 (9.9)[d]	2 (0.5)[d]	164 (11.6)[d]	< .001
NIHSS mean at admission[bc]				
Mild (0–5)	138 (85.7)	345 (88.5)	921 (65.3)	< .001
Moderate (6–11)	18 (11.2)	25 (6.4)	238 (16.9)	
Mod/severe and severe (12–19+)	5 (3.1)	20 (5.1)	276 (14.1)	
mRS score = 0 pre-event[ac]	146 (90.7)	286 (73.3)	1275 (90.4)	< .001
mRS score = 0 discharge[abc]	141 (87.6)	207 (53.1)	386 (27.4)	< .001
Discharge location[abc]				
Home	161 (100)	358 (91.8)	1001 (71.0)	< .001
Rehabilitation	0 (0)	9 (2.3)	269 (19.1)	
Other hospital	0 (0)	6 (1.5)	26 (1.8)	
LTC	0 (0)	9 (2.3)	59 (4.2)	
Death	0 (0)	8 (2.1)	55 (3.9)	
Length of stay, M (SD), d[abc]	2.4 (1.6)	4.8 (6.3)	5.9 (6.4)	< .001[e]

FSM = functional stroke mimics; MSM = medical stroke mimics; sxs = symptoms; LOC = loss of consciousness; CT = computed tomography; CTA/CTP = computed tomography angiography/computed tomography perfusion; MRI = magnetic resonance imaging; MRA = magnetic resonance angiography; NIHSS = National Institutes of Health Stroke Scale; mRS = modified Rankin Scale; LTC = long term care.

Results are expressed as *n* (%), unless otherwise indicated.

Multiple comparison analysis was done using Bonferroni's method.

p value has been calculated using Pearson χ^2 test or Fisher exact test whenever appropriate.

[a] FSM versus MSM.

[b] FSM versus stroke.

[c] MSM versus stroke.

[d] 16.4% of ischemic strokes received tpa.

[e] *p* value has been calculated using analysis of variance or Kruskal Wallis test as appropriate.

(28.4% had at least moderate impairment versus 14.3% percent of FSM and 11.5% of MSM). At discharge, 71% of the stroke group went home and 19.1% went to rehabilitation.

DISCUSSION

This is the first study to assess SM in the Middle East and North Africa region (MENA). A total of 1961 patients presented as acute strokes to HGH over a 16-month period; final diagnoses were 161 FSM (8.2% FSM), 390 MSM (19.9% MSM), and 1410 strokes (71.9%).

FSM frequencies varied by nationality with Arab and African groups having twice the rate of other nationalities (15.6 and 16.8% versus 5.2%–7.9%) and more than twice the highest previously reported FSM rate of 6.4% (8).

The general characteristics of FSM were similar to what has been found in previous studies. They were approximately 10 years

younger, females were twice as common, and they were less likely to arrive by ambulance. Cerebrovascular risk factors (with the exception of smoking) were significantly lower in the FSM than the MSM and stroke groups. FSM smoking rate was 26.1%, higher than MSM and stroke. FSM had fewer speech deficits than strokes and were most likely to have left-sided weakness on examination. FSM were most likely to receive an MRI, and 100% were discharged home. A total of 9.9% of FSM received tpa versus only 0.5% of the MSM and 16.4% of the ischemic strokes.

What could explain the high frequency of FSM in the Arab and African groups? Somatization of psychological problems is common and may be more acceptable in the MENA region (13–15). Alsaleem and Ghazwani (15) found a 60.8% prevalence of somatoform disorders in primary care patients in Egypt. However, high rates of somatization are also found in Western cultures, with 30% to 50% of outpatient visits in primary and secondary care found to be nonorganic (16). There is a growing body of evidence that somatization is a universal phenomenon. However, the presentation, attributions, and illness behavior might differ across cultures because of culture-specific characteristics (13). For example, in Arabic cultures, stigma is viewed as affecting not only the individual but also the whole extended family. Further epidemiological study is needed regarding somatization rates in the MENA region.

In a similar vein, high rates of stigma have been found to surround mental illness and the expression of psychiatric concerns in Arabic and African cultures (17). An example of this is a finding in the United Arab Emirates that only 38% of parents would seek help from a mental health specialist for their child or family member in the event of psychiatric problems (20). Globally, more than 70% of people with mental illness receive no treatment, and evidence suggests that factors increasing the likelihood of psychiatric treatment avoidance or delay before presenting for care include (1) lack of knowledge to identify features of mental illnesses, (2) ignorance about how to access treatment, (3) prejudice against people who have mental illness, and (4) expectation of discrimination against people diagnosed with mental illness (21).

Although attribution and illness behavior may vary by country, high somatization rates and stigma are prevalent worldwide. Frequencies of FSM were not higher for Qataris, suggesting that they are similar to a Western/European group. The question of why the Arab and African groups had double the FSM frequencies still remains. Further study is needed, but potential causative factors that may be important are stress from lack of stability, income vulnerability, and exposure to trauma. For example, the Arab/African group in Qatar is composed of expatriates without permanent residency. They are vulnerable to potentially losing their jobs at any time. In addition, many have experienced trauma due to political instability in the Middle East, and trauma history is a known risk for somatization (22).

There were significantly fewer MSM in the Southeast Asian population (14.4 versus 21.1%–31.6%). While all residents of Qatar have access to low cost health care, expatriates from Southeast Asian countries tend to be in the lowest paying jobs, and sponsors may not provide for low-income expats adequately. A 2013 study found that 56% lacked the government-mandated health card (23). Thus, they may be less likely to seek medical attention because of lack of financial resources and insurance, and only the most severe cases (which may more likely be strokes) may be brought in to emergency service. Socioeconomic background and continued preferences for traditional over modern therapies may limit the number of MSM among the lowest income expatriates. Most expatriates from Southeast Asia have a rural background (66%–82% of the total population) with poor literacy rates (24). The environment influences concepts of illness, and use of traditional therapies generally declines with income and education (25).

Unlike other studies, body mass index was found to be slightly higher in the functional and MSM than in strokes; all three groups fell in the overweight range (26). This is consistent with the fact that two-thirds to three-quarters of Qatari adults are overweight or obese, with higher obesity frequencies seen in Qatari women (27). It will be important to further study and address issues of obesity and psychiatric comorbidity in SM in Qatar.

Women were also more likely than men to be MSM. MSM arrived by ambulance at similar frequencies as strokes (63.1%). Cerebrovascular risk factors were either similar to strokes (hypertension) or greater than the stroke group (diabetes, dyslipidemia), and MSM had a greater number of previous strokes reported than strokes. MSM were least likely to present with weakness and had fewer speech deficits than strokes. Their mRS disability ranking was higher than the FSM or stroke group pre-event. Mean LOS was 4.8 days, with 91.8% discharged home.

FSM represent a group with primary psychiatric care needs. Anxiety and depressive disorders commonly occur with conversion disorders (16). A recent study from the United Kingdom (10) found that 47% of FSM were diagnosed with a mental health condition within a year, with depression, "stress-related," and anxiety diagnoses the most common. It will be useful to formally assess mood and other psychiatric concerns when a functional stroke mimic is identified, as many FSM may benefit from referral to mental health services.

Treatment of FSM patients should optimally include an initial psychiatric assessment. Promising treatments for FSM populations currently include cognitive behavioral therapy (CBT) and physiotherapy (28–30). Guided self-help CBT (4 half-hour sessions and a manual) in functional neurological patients increased self-rated health (28). CBT has also demonstrated promising results in functional/psychogenic seizure cases (29), reducing episodes by 51% as well as significantly improving depression, anxiety, quality of life, and global functioning. An additional interesting approach for motor-based functional symptoms is physiotherapy. A small trial by Nielsen et al. (30) found that 72% of the intervention group demonstrated symptom improvement versus 18% of controls.

We recommend that future studies of FSM patients look at culture, stress and social/living situation, history of trauma, and psychiatric and psychosocial variables. Increased public education about mental health issues is recommended along with increased access to culturally sensitive psychiatric assessment and care in the MENA region.

Limitations

Limitations to this study include the fact that it was retrospective, and thus, information on psychiatric symptoms and history, educational and cultural background, psychosocial stressors, and trauma history were not available. Patients who presented to the emergency

department with acute focal neurologic symptoms of sudden onset were first evaluated by the stroke team to provide timely treatment. This may have increased the total number of mimics but should not have affected the difference by nationality. Finally, given that Qataris are the local population with the highest social status, there may have been physician diagnostic ascertainment bias, leading to underdiagnosing a functional disorder in Qatari patients; further study is needed.

CONCLUSIONS

FSM were twice as common in Arabic and African nationals in the Middle Eastern country of Qatar, occurring in up to 16.8% of stroke presentations. Further research is needed to better understand the factors underlying this difference. Potential etiologies are stress due to lack of stability, income vulnerability, and trauma history. Cultural factors may play a role in presentation, but somatization has been found at high levels worldwide, and thus, nationality alone is not likely the etiology of differences in frequency of FSM. MSM were less common in those from Southeast Asian countries, potentially because of health access issues, lower education levels, and cultural encouragement of more nontraditional medicine. Increased education of neurology, medical, and psychiatric team staff in culturally sensitive mental health assessment, referral, and treatment will likely be beneficial. It is recommended that further studies of FSM be conducted in the MENA region and in areas with significant numbers of refugees from Arab and African countries.

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