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Original Research

Descriptive Characteristics of Subarachnoid Hemorrhage in a Lebanese Sample

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ABSTRACT

Introduction: Subarachnoid hemorrhage (SAH) is a life-threatening condition characterized by bleeding into the subarachnoid space. Most data regarding non-traumatic SAH is from the U.S. and Europe with a paucity of studies from the Middle East. Therefore, this study aims at assessing the characteristics of SAH patients and describing associated factors and outcomes in a sample of SAH patients presenting to an emergency department in a regional tertiary-care medical center in Lebanon.

Method: A retrospective medical chart review was conducted on all patients presenting to the emergency department with non-traumatic SAH from September 2009 to September 2016 using hospital discharge diagnosis (ICD-9 code 430); descriptive analyses were carried out to map patients' characteristics, clinical presentation and potential factors.

Results: Within the span of seven years, 94 patients presented with non-traumatic SAH with a mean age of 55 years and a predominance of female gender (62.8%). Most patients presented with headache (79.8%). Almost all patients underwent non-contrast computed tomography scan of the brain in the emergency department (95.7%), 95.6% of which had a positive finding. Etiology of SAH was mostly due to an aneurysm (66.0%), 75.8% of which were in the anterior cerebral circulation, followed by unknown causes (28.7%). In-hospital complications were found in 21.3% of patients and in-hospital mortality was 6.4%.

Conclusion: Subarachnoid hemorrhage is a debilitating medical condition which has not previously been described in the Lebanese population. Incidence and outcomes of SAH in this study are comparable to other regions including Europe and the United States.

Keywords: aneurysm, bleeding, cerebrovascular disorders, emergency, hemorrhage

INTRODUCTION

Subarachnoid hemorrhage (SAH) is a devastating disease with a global health burden. Estimated incidence rate is around 6.1 per 100,000 people annually, which varies according to age, gender, and region.[1,2] SAH carries disease-specific burdens targeting mainly patients younger than 55 years, leading to permanent disabilities or cognitive impairments, with one-third of SAH patients dying within the first days to weeks post-hemorrhage.[3] This is also reflected on a community level where SAH leads to significant loss of productive life-years.[1]

The major risk factors for SAH include hypertension, smoking, and heavy alcohol consumption.[4–9] If awake, nearly all patients with SAH report severe headache, typically describing it as the "worst headache in their life".[10] Other patients present with decreased level of consciousness,

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altered mental status, seizures, coma, and sometimes death.[11,12] Often, SAH is fatal with mortality rates reaching up to 50 percent even with early medical intervention, and up to 15 percent of deaths occur before reaching the hospital.[13,14] The survivors often have residual symptoms, neurocognitive deficiencies, and lifestyle restrictions.[15]

It is estimated that 5 percent of the population have cerebral aneurysms as revealed in studies on post-mortem autopsy. SAH is often the result of rupture of these aneurysms with increased age.[1,16] SAH still presents a challenge to neurologists, neurosurgeons and emergency physicians, but survival rates are gradually improving. Most data regarding non-traumatic SAH are from the U.S. and Europe, and there is a paucity of studies looking at populations in the Middle East and in particular Lebanon. Therefore, this study aims to describe the presentations of SAH diagnosed in the emergency room between 2009 and 2016 at a regional tertiary care medical center, and inspect patients' characteristics, risk factors and clinical outcomes for SAH.

MATERIALS & METHODS

Study Design and Setting

This was a retrospective chart review study conducted by reviewing medical charts of patients who presented with SAH to the Emergency Department (ED) of a regional tertiary care center in Lebanon. This study was approved by the institutional review board of the American University of Beirut.

Inclusion/Exclusion Criteria

This study included all patients presenting to the ED with SAH as a primary discharge diagnosis from the 1st of September 2009 till the 1st of September 2016. Patients were identified using the ICD-9 code (430) as a discharge diagnosis. Those who developed iatrogenic SAH due to surgery or medical intervention during the same period were excluded from the study.

Data Analysis

Descriptive analyses were carried out for the study sample. Results were described as number and percent for categorical variables, while the mean ± standard deviation (±SD) and median with the interquartile ranges (IQR) were calculated for continuous ones. IBM SPSS Statistics for Windows version 22 (Armonk, NY: IBM Corp) was used for data analysis.

Results

A sample of 113 patients was identified, 94 of whom had confirmed spontaneous subarachnoid hemorrhage. Others were either pediatric patients or had a traumatic etiology of their SAH. Only 9 patients were lost to active follow-up after their discharge from the hospital. Included patients represented 0.0236% of all patients presenting to the ED between September 2009 and September 2016.Out of the 399,103 patients screened; 94 cases were diagnosed with SAH over the 7 years span of the study.

Patient and Clinical Characteristics

Table 1 lists the characteristics of patients enrolled in the study. The mean age of patients was 55.3 ± 16.9 years, with female patients more than males (62.8% versus 37.2%, respectively). 1.1% of patients consumed alcohol and 33.4% were smokers. The majority of patients enrolled had a medical comorbidity such as hypertension (48.9%), dyslipidemia (15.0%), diabetes mellitus (15.0%), or coronary artery disease (7.0%). Previous SAH and previous brain surgery were only identified in 2.0% of patients.

Upon their presentation to the ED, most enrolled patients had an Emergency Severity Index (ESI) score of 2 and 3 (57.4% and 33.0%, respectively). Of the included patients, 79.8% presented to the ED with a chief complaint of headache (79.8%) (table 2), 77.3% of these patients described their headache as severe on a 10-point pain scale (score of 7-10), however only 14.7% labeled it as their worst headache ever. None of the patients had described the headache as mild (score ≤ 3).

Only 40.0% of patients were alert, active and oriented, and about 40.0% of patients reported nausea and/or vomiting. On exam, 25.5% of the cases were found to have a new neurological deficit. Meningismus, defined in our study as the presence of photophobia, phonophobia and/or nuchal rigidity, was identified in a 23.4% of patients and seizures

Table 1 Characteristics and demographics of patients with SAH

	Total	Mean ± SD	Median (IQR)
Age	94	55.33 ± 16.87	55 (67.00 – 47.75)
		n	%
Gender			
Female		59	62.8%
Male		35	37.2%
Smoking status			
Non-smoker		69	73.4%
Smoker		25	26.6%
ESI			
1		7	7.4%
2		54	57.4%
3		31	33.0%
4		1	1.1%
Unknown		1	1.1%
Chronic Diseases			
Hypertension		46	48.9%
Dyslipidemia		14	14.9%
Diabetes		14	14.9%
Coronary artery disease		7	7.4%
Previous subarachnoid hemorrhage		2	2.1%
Peripheral vascular disease		2	2.1%
Previous brain surgery		2	2.1%
Intracranial aneurysm		1	1.1%
Chronic kidney disease		1	1.1%
Drugs at home (Yes)			
Antihypertensive		29	63.1%
Aspirin		19	20.2%
Other antiplatelets		2	2.1%
Anticoagulants		1	1.1%
Transfer from another hospital		43	45.7%

were only identified in 5.3% of cases. Of enrolled patients, 63.5% had a Glasgow Coma Scale (GCS) score of 13-15, 25.4% of patients were comatose upon presentation to the ED (GCS score ≤ 8) and the rest (11.1%) had a GCS score between 9 and 12. As for the Hunt-Hess and World Federation of Neurosurgical Societies Scale (WFNS), 18.4% and 20.0%of the patients scored grade 5 in both scales respectively.

Management

Half of SAH patients received analgesic medications in the ED with opioids administered to 25.5% of patients (table 3). Antihypertensive medications were given in the ED to 45.0% of patients diagnosed with spontaneous SAH. Nimodipine, a dihydropyridine calcium channel blocker, was initiated within 96 hours of ED presentation in 53.0% of cases.

Most patients (96.0%) were initially investigated with a computed tomography (CT) of the head. The latter showed positive CT findings in 96% of cases. Hydrocephalus was identified in 38.0% of initial CT scans, increased intracranial pressure (ICP) findings were present in 24.0%, and concomitant findings suggestive of stroke were found in 10% of those CT scans. 13.0% of the brain CT imaging showed other findings including a concomitant intraparenchymal, intraventricular or a subdural

Table 2 ED presentation of patients with SAH

Signs and Status	n	%
Headache	75	79.8%
Mild (0-3)	0	0.0%
Moderate (4-6)	3	4.0%
Severe (7- 10)	58	77.3%
Unknown	14	18.6%
Worst headache ever (Yes)	11	14.7%
Level of consciousness		
AAO	38	40.4%
Confused	18	19.1%
Obtunded	23	24.5%
Comatose	15	16.0%
Nausea	40	42.6%
Vomiting	41	43.6%
Seizure	5	5.3%
Meningismus*	22	23.4%
New neurological deficits	24	25.5%
Presence of trigger**	5	5.3%
Glasgow Coma Scale		
13- 15	40	63.5%
9- 12	7	11.1%
≤8	16	25.4%
Hunt-Hess scale		
Grade 1	23	46.9%
Grade 2	4	8.2%
Grade 3	6	12.2%
Grade 4	7	14.3%
Grade 5	9	18.4%
World Federation of Neurosurgical Societies scale		
Grade 1	25	50.0%
Grade 2	4	8.0%
Grade 3	2	4.0%
Grade 4	9	18.0%
Grade 5	10	20.0%

AAO: Awake Alert Oriented
**Meningismus was defined by presence of photophobia/ phonophobia or nuchal rigidity*
***Triggers include bending, sneezing forcefully, and standing up*

Table 3 Evaluations and interventions of patients with SAH

	n	%
Lumbar puncture	7	7.5%
Antihypertensive in ED	42	44.7%
Nimodipine*	50	53.2%
Pain medication	43	45.7%
Non-opiates	33	35.1%
Opiates	24	25.5%
CT brain	90	95.7%
Positive finding	86	95.6%
CT angiography of brain	60	63.8%
Positive finding	56	93.3%
MRI brain	5	5.4%
Positive finding	4	80%
Surgical intervention	66	70.2%
Endovascular coiling	43	45.7%
Surgical clipping	11	11.7%
Craniotomy	8	8.5%
Ventriculostomy	17	18.1%
Other**	5	5.3%
Etiology		
Aneurysm	62	66.0%
Anterior cerebral circulation	47	75.8%
Posterior cerebral circulation	8	12.9%
Posterior communicating arteries	7	11.3%
Unknown	27	28.7%
AV malformation	3	3.2%
Old subarachnoid re-bleed	1	1.1%

**Nimodipine administration within 96 hours of presentation*
***Other surgical procedures include: craniectomy, embolization, ventriculo-peritoneal shunt, tracheostomy*

bleed.

A lumbar puncture was performed for 7 cases; the obtained cerebrospinal fluid (CSF) was xanthochromic in 5 cases, while 1 case had a bloody tap and another case had a clear, colorless CSF result.

Etiology, mortality and morbidity rates

In-hospital mortality was equal to 6.0% with a 72-hour mortality of 4.0% and a 28-day mortality of 6.0%. Etiology of SAH was identified in 70.0% of cases: 66.0% of patients diagnosed with a spontaneous SAH were found to have a cerebral vascular aneurysm. 3 patients (3.0%) were found to have an arterio-venous malformation (AVM) considered as the etiology of their SAH and only 1 patient was found to have an old subarachnoid hemorrhage re-bleed.

Furthermore, 70.0% of patients diagnosed with a spontaneous SAH underwent a surgical intervention: 46.0% endovascular coiling, 12.0% surgical clipping, 8.0% craniotomy, 18.0% ventriculostomy, and 5% of cases underwent other surgical procedures including craniotomy, embolization, ventriculo-peritoneal (VP) shunt, and tracheostomy.

As for the outcomes, 28.0% had complications distributed as the following: re-bleeding (6.4%), vasospasm (5.3%), stroke (5.3%) and seizure (5.3%); a total of 5 patients (5.3%) had one of the more rare complications including herniation, increased ICP, and pneumonia (table 4).

Table 4 Complications and outcomes of patients with SAH

	n	%
Complications*	22	19.5%
Re-bleed	6	6.4%
Vasospasm	5	5.3%
Stroke	5	5.3%
Seizure	5	5.3%
Other**	5	5.3%
Mortality	16	17.1%
In-hospital	6	6.4%
72-hour mortality	4	4.3%
28-day mortality	6	6.4%

**Some patients had more than one complication*

DISCUSSION

The present study assessed the characteristics of subarachnoid hemorrhage in a Lebanese sample.

The incidence rate of SAH varies by geographic region. In 2010, in Asia the incidence rate was around 7.7 per 100,000 and in Europe 6.6 per 100,000;[2] current literature suggests that modifiable (high blood pressure and smoking) and non-modifiable (gender) risk factors are associated with SAH.[2,17,18] Results related to non-modifiable risk factors (gender) in our study was found to be similar to other studies in the literature, where women were more prone to be diagnosed with SAH.[19,20] As for the modifiable factors, hypertension is considered as a major risk factor associated with SAH; results of this current study conform with previous studies, where almost 50.0% of enrolled patients had a history of hypertension.[17] As for smoking, Etminan et al (2019) indicated that it is strongly associated with SAH, in fact each percentage decrease in smoking prevalence decreased the incidence of SAH by 2.4%.[2] However, in this study only 26.6 %

of patients had a history of smoking.

In the body of literature, the most documented presentation for SAH is headache (97.0%), which patients tend to describe as abrupt and as the worst headache in their life. Other symptoms include meningismus, loss of consciousness, and seizures.[18] Symptoms described in this study match previous studies. In fact, most patients described their headache as severe; furthermore 59.6% were not fully conscious or alert and 23% of them had positive meningismus signs. Brain CT was the mostly used diagnostic tool in our study and previous research for the diagnosis of SAH.[11,17,18]

The major etiology of SAH documented in the literature is ruptured cerebral aneurysm [21], which is also the main cause in our study affecting 66.0% of all the cases. It is well known that this disease is considered as an enormous health burden leading to high fatality as well as morbidity rates.[14] In fact, around 10-25% of patients with acute SAH (10-25%) die, with most death occurring in the period short after the bleed occurs, sometimes even before reaching the hospital.[19,22] In addition, almost one third of the patients remain permanently in nursing care centers, and only a third can live independently.[22] Similarly, the results in this study agree with previous studies in regards to mortality (16% within the first 28-days post-bleed) as well as morbidity (21.3%) rates.

Based on observational data, the results of our study should be interpreted in the light of potential limitations. Given that the medical center in our study is a regional hospital with considerable referrals, this favors selection bias in our sample. In addition, patients who died before reaching hospital were not included, thus true number of cases is potentially more varied. Further wide epidemiological studies in Lebanon are needed to identify the incidence of SAH in the general population and associate with our discussed factors.

CONCLUSION

Subarachnoid hemorrhage is an often fatal condition with high morbidity requiring resource-intensive medical care which is not yet well described in the Lebanese population. This study suggests that the factors and outcomes of SAH are comparable to other studies in regions including the Middle East and North Africa region, Europe, and the United States.Conflicts of Interest: The author declare no conflicts of interest or sources of funding.

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