Original Article

Risk Factors, Site and Outcome of Intracranial Hemorrhage in Young Adults

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ABSTRACT

OBJECTIVE: To determine risk factors and the site and outcome of intracranial Hemorrhage in young adults.

METHODOLOGY: This cross-sectional observational study was conducted in neuromedicine ward 28 at Jinnah Postgraduate Medical center, Karachi, from September 2020 to August 2023. All emergency patients with evidence of Neuroimaging and symptomatic intracranial Hemorrhage were included. Using the Glasgow outcome scale, we investigated the risk factors, cause, location and prognosis of intracranial hemorrhage. Traumatic hemorrhages, primary sub-arachnoid hemorrhage and brain tumors were excluded.

RESULTS: 72 patients aged 16 to 40 years were included. Forty were Male patients, 55%, and 32 were female patients, 45%. The risk factors for intracranial hemorrhages were hypertension 60/72 (83.33%), ArterioVenous malformation 7/ 72 (9.33%), Cryptogenic 2/72 (2.77%), drug-induced 1/72 (1.38%), hypocholesterolemia 1/72(1.38%) and tobacco and alcohol intake 1/72 (1.38%). In 36/72 (50%), the location was basal ganglia, 25/72(34.72%) was in lobar, 7/72 (9.72%) in Subarachnoid, and 4/72 (5.55%) in other locations. The outcome was favorable in 65/72 (90.27%) patients.

CONCLUSION: It has been found that hypertension, even in adults, is the leading risk factor for intracranial Hemorrhage below 40 years of age. Intracranial Hemorrhage is primarily present in the basal ganglia. AV malformation is the second most common risk factor in adults at our setup, and the outcome is good in adults. Drug, smoking, and hypocholesterolemia are less common causes of intracranial Hemorrhage in young adults.

KEYWORDS: Lobar, Arteriovenous malformation, hypertension, intracranial Hemorrhage

INTRODUCTION

Intracranial Hemorrhage is the type of stroke in which blood is present in the parenchyma of the brain without any trauma. It is 10% of all strokes and causes a high complication rate[1]. It is the leading cause of death[2]. In young patients, due to vascular malformation, 49% hypertension in 11% and unknown cause in 15%. Other causes are venous thrombosis 5% and drug-induced 4%. The location is primarily lobar in 55%, basal ganglia in 22% and Other Sites in 24% of patients[3]. Aspirin is a high-risk medicine for subdural or extradural Hemorrhage (relative risk 1.53) and then intra-cerebral hemorrhages, especially in low doses[4]. So, aspirin's role in preventing cardiovascular Disease is controversial[5]. Intracranial Hemorrhage causes high mortality[6]. Primary hemorrhages are 85% of all intracranial hemorrhages. Secondary hemorrhages due to bleeding disorders are less common than 60%; it is due to hypertension and is most commonly located in the basal ganglia, pons, piriform fossa and thalamus. Arteriovenous malformation, cavernous angioma, cerebral aneurysm, nicotine, alcohol and cocaine are also factors for intracranial hemorrhage[7].

The study's rationale is that studies on intracranial Hemorrhage were done previously in patients of older ages. In young patients less than 40 years old, it is less commonly investigated, so we conducted this study in young adults suffering from intracranial Hemorrhage. We also wanted to know the cause of intracranial Hemorrhage in young adults. This study will sensitize the physician to screen out hypertension in adults early, and diagnosis of hypertension along with its treatment will prevent intracranial Hemorrhage; this will lead to a reduction in mortality in adults due to intracranial Hemorrhage. Now, intracranial Hemorrhage is becoming common in young patients due to hypertension, so the exact frequency of Hemorrhage due to different causes is needed in a setup. Risk factor identification is required in tertiary care centres to prevent intracranial haemorrhage. It will disseminate the knowledge to our general physician, and risk factors like alcohol, smoking, and hypertension can be reduced to avoid intracranial Hemorrhage in young patients in our setup. The study aimed to determine the risk factors, site, and outcome of intracranial hemorrhage in young adults.

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METHODOLOGY

It was a cross-sectional observational study. Seventy-two patients of both genders, below 40, enlisted in the study. The study was conducted in neurology ward 28 JPMC from September 2020 to August 2023. Intracranial Hemorrhage diagnosed on neuroimaging included. The inclusion criteria were less than 40 years. Risk factors, clinical features, site of Hemorrhage, causes, and outcomes were recorded according to the Glasgow outcome scale as follows:

1. Death
2. Persistent vegetable state
3. Severe disability; depends on others for daily support
4. Moderate disability; independently works in a sheltered setting
5. Good recovery; resumption of everyday life despite minor deficits

Glasgow outcome scale 1 and 2 grades were defined as poor, and 3 to 5 work were good. CT scan and MRI findings were recorded. Risk factors are recorded and described as having a diastolic blood pressure of more than 90 and a systolic blood pressure of more than 160. More than two readings were labeled as hypertension or were already on anti-hypertensive drugs. Patients with hypercholesterolemia were included when cholesterol was more than 250 mg/dl at admission and hypocholesterolemia when fasting cholesterol was less than 160 mg/dl at admission. Smokers were included with daily use of 10 cigarettes for more than six months. Alcoholics were included when alcohol consumption was more than 200 ml/ day consumed by patients. Hematoma location parietal, occipital, temporal and frontal lobe labeled as lobar. Other locations were the basal ganglia, thalamus, internal capsule, cerebellum and brainstem. AV malformation confirmed by MRI or cerebral angiography. Cavernous angioma based on MRI criteria[8]. Drug intake, hemophilia, thrombocytopenia, Von Willebrand disease, brain tumor, eclampsia of pregnancy and trauma were excluded. Cryptogenic patients labeled in which no risk factors predisposing were considered. Patients were followed for three months. Traumatic and primary subarachnoid Hemorrhage were excluded. Results were analyzed by using SPSS version 26.

Sample size

A sample size of 72 achieves 80.000% power to detect a difference (P1-P0) of -0.0824 using a two-sided exact test with a significance level (alpha) of 0.050. These results assume that the population proportion under the null hypothesis (P0) is 0.1000.[2]

Reference: PASS 2020 Power Analysis and Sample Size Software (2020). NCSS, LLC. Kaysville, Utah, USA, ncss.com/software/pass.

RESULTS

Total 72 patients of age ranging from 16 to 40 years. 40(55%) were Male patients and 32(45%) were female patients. The risk factors for intracranial hemorrhages are shown in **Table I**. The leading risk factors were hypertension and AV malformation 67/72 (93.05%), while others were only 5/72 (6.95%). In 36/72 (50%), the location was basal ganglia, 25/72 (34.72%) was in lobar, 7/72 (9.72%) in subarachnoid, and 4/72 (5.55%) in other locations. The outcome was favorable in 65/72 (90.27%) patients.

Table I: Risk Factors of Intracranial Hemorrhage

Causes	No. of patients (Total=72)	Per-centage	95% Confidence Interval
Hypertension	60	83.33	73.39 - 90.64
AV malformation	7	9.72	4.35 - 18.28
Cryptogenic	2	2.78	0.47 - 8.87
Drug-Induced	1	1.39	0.07 - 6.65
Hypocholesterolemia	1	1.39	0.07 - 6.65
Smoking and Alcohol	1	1.39	0.07 - 6.65

DISCUSSION

Intracranial Hemorrhage is less common in young patients less than 40 years of age but recently has been increasing due to hypertension. The leading cause of intracranial Hemorrhage was hypertension in our study. About 50% of patients diagnosed with AV Malformation were below 40. This study found 7/72 (9.272%) patients with AV malformation. A study shows that 14.6% of intracranial Hemorrhage was due to AV malformation[9]. Minimally invasive surgery is advised to treat such AV malformation. The overall risk of AV Malformation in intracranial Hemorrhage is 2.4%[10].

Hypertensive intracranial hemorrhages are the most common, mainly affecting Basal ganglia[11]. Similar findings were found in this study. The leading risk factor of intracranial Hemorrhage was hypertension in young patients below 40 years of age, and the site of hypertension was basal ganglia. Hypertension is the cause of intracranial Hemorrhage in 80% of patient[12]. Hypertension causes microaneurysms of perforating arteries, which can rupture and cause atherosclerosis of vessels and hyaline atherosclerosis. In this study, 60/72 (83.33%) were due to hypertension, so hypertension is considered a leading risk factor in young patients and bleeding in the piriform fossa and extending into the ventricle lead to poor prognosis. Only treatment of hypertension can prevent intracranial Hemorrhage, so screening for hypertension in asymptomatic hypertensive adults is indicated to avoid intracranial Hemorrhage and decrease mortality by intracranial Hemorrhage. Hypertension usually occurs above 40 years of age.

Complications of hypertension are common in old age. Still, in modern life, due to stressful life, changes in dietary habits, and lack of exercise, hypertension has been noticed in adults younger than 40 years, so

intracranial Hemorrhage occurs due to lack of treatment for hypertension. Hypertension is usually asymptomatic and presents with severe complications like intracranial Hemorrhage, so only dietary modification, exercise and early treatment of hypertension can prevent intracranial hemorrhages, even in young adults. Blood Pressure should be checked to identify hypertensive patients because it is a leading risk factor for intracranial Hemorrhage in our setup. If, after a thorough investigation to determine the cause of intracranial Hemorrhage is not found, it is called cryptogenic intracranial Hemorrhage, and 4.1% of intracranial hemorrhages are cryptogenic. It is associated with hypervitaminosis E[13]. So, the clinician should check the vitamin E level, especially in cryptogenic intracranial hemorrhage. In this study, cryptogenic was 2/72 (2.77%), but Vitamin E was normal.

Antiplatelet' role as a causative agent for intracranial Hemorrhage is still controversial. In some studies, anti platelets were blamed, but in the USA, no association was found[14]. In this study, one patient took an anti-platelet (1.38%), possibly due to medicine or cryptogenicity.

Literature established that intracranial Hemorrhage is more common in cigarette smokers. The 2nd study showed that cigarette smokers had developed intracranial Hemorrhage, and the outcome of intracranial Hemorrhage in smokers was also worse in (3.17%) [15]. In this study, 1.32% were smokers.

In our study, the location is lobar 25/72(34.72%), basal ganglia 36/72 (50%), primarily hypertensive. In another study, 30% were found to be in Subarachnoid[16]. This study also found subarachnoid in AV malformation at 9.72%. 36.31% were intraventricular, 18.16% were parenchymal, and 4/72 (5.55%) in other locations. 38% had no neurological deficit, 37% were independent in their activity, 19% were moderately disabled, and 6% were severely disabled. Parenchymal hemorrhages were fatal.

The outcome in this study was good in 65/72 (90.27%) on follow-up.

The limitation of the study was that the sample size was small. If we do long-duration research, the frequency percentage may be affected. Some patients lost the follow-ups, so they were excluded from this study. If they had been included, then the mortality and prognosis of the study would have been affected.

CONCLUSION

It has been found that hypertension, even in adults, is the leading risk factor for intracranial Hemorrhage below 40 years of age. Intracranial Hemorrhage is mainly seen in the basal ganglia. AV malformation is the second most common risk factor noticed in adults in our setup, and the outcome is primarily good in adults. Drug, smoking and hypocholesterolemia are less common risk factors for intracranial Hemorrhage in adults. The outcomes of patients in this study were good in 90.27% on follow up as they either had severe to moderate disability or good recovery according to Glasgow Scale. Of the rest of the patients, 90.27% had poor outcomes, resulting in a persistent vegetative state or death.

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AUTHOR CONTRIBUTION

Haji S: Data collection, data analysis, manuscript writing and literature review

Afzal M: Data collection, manuscript writing and literature review

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