Orginal Article

Spectrum of Intracerebral Hemorrhage in a Tertiary Hospital

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Abstract

Introduction: intracerebral hemorrhage is a devastating type of stroke that leads to profound morbidity and carries high mortality. Survivors of hemorrhagic stroke suffer not only from physical and social decline but also results in loss of productivity and financial burden.

Causes of hemorrhagic stroke are hypertension, coagulopathic condition, diabetes mellitus and cardiovascular diseases. lesional hemorrhagic stroke can be due to subarachnoid hemorrhage from intracranial aneurysm, arteriovenous malformation, dural arteriovenous fistula etc.

Methods: A retrospective cross sectional study carried out at KISTMCTH. Data from six years duration was analysed from hospital records, outpatient department records. Patients that presented with intracranial hemorrhage were included. Post operative patients and traumatic intracerebral hemorrhage cases were not included.

Results: Total of 112 patients was included in the study. 73 (65.1%) of them were male and 39 (34.8%) were female. putamen and caudate region were most common 47 (41.9%) followed by subarachnoid region 27 (24.1%), thalamus 19 (16.9%), cerebellum 9 (8.04%), lobar region 8 (7.1%) and brainstem 2 (1.7%). Intracranial hemorrhage was more common in age group of 41-60 years 59 (52.6%) followed by age group 61- 100 years 42 (37.5%). 14 (51.8%) female had subarachnoid hemorrage in comparision to 13 male (48.1%). Anterior communicating artery aneurysm had highest occurrence 10 (37%) followed by middle cerebral artery aneurysm 6 (22.2%), paraclinnoidal/anterior choroidal/posterior communicating artery aneurysm 5 (18.5%), vertebral artery aneurysm 3 (11.1%), distal anterior cerebral artery aneurysm 1 (3.7%).

Intracranial hemorrhage had highest occurrence on the month of January (15%) and lowest on the month of November (3.57%). 29 (25.8%) of total intracranial hemorrhage patient had intraventricular extension of hemorrhage. Intraventricular extension was more common in thalamic hematoma 15 (13.39%) followed by caudate/putaminal hematoma 10 (8.9%), cerebellum 3 (2.6%). Modified Rankin Scale (MRS) outcome score was found to be highest as MRS 6 for 34 (30.6%) patients. while good outcome in terms of MRS 1, MRS 2 and MRS 3 were observed for 7 (6.2%), 26 (23.2%), 25 (22.3%) patients respectively.

Conclusion: Hypertension remains one of the major risk factor that results in various location specific hemorrhage and it shows specific peak seasonal variation. Proper blood pressure control is recommended for prevention of intracranial hemorrhages.

Keywords: *Intracerebral hemorrhage, subarachnoid hemorrhage, modified rankin scale (MRS) outcome*

Introduction

Intracerebral hemorrhage (ICH) is a devastating form of stroke. stroke is second most common cause of death world wide in age group more than 60 years.[1] It is leading cause of functional morbidity. it carries significant economic burden with loss of productivity. 6.2 million people succumb to death annually due to stroke.[1] Most of these occur in middle and low income group.[2] Causes of stroke are hypertension, diabetes mellitus, cigarette smoking and cardiovascular diseases.[3] 3% of survivors of stroke live with disability.[4] 45% of stroke victim return to home and 55% need long term rehabilitation.[5]

Spontaneous intracerebral hemorrhage (SICH) accounts for 10% of stroke while lesional SAH accounts for 3% of all stroke.[3] Causes of hemorrhagic stroke are hypertension, use of anticoagulant, bleeding from brain tumor and cerebral amyloid angiopathy.[6]

Spontaneous intracerebral hemorrhagic stroke is classified according to location of bleeding into brain. Outcome can be variable depending upon these sites and underlying comorbities. After traumatic brain injury, SICH are the second most common neurosurgical disease that present to kist medical college teaching hospital. This study presents different types of SICH that presented in this hospital

Methods

This study was done in neurosurgery unit of surgery department of KIST medical college teaching hospital from January 2017 to September 2023. The study was carried out as per ethical guidelines of 1975 Declaration of Helsinki and was approved by Institutional Review Board of KISTMCTH. All patient who presented to emergency department and diagnosed with intracerebral hemorrhage were included in the study. Post operative hemorrhage, traumatic hemorrhage, were excluded from the study.

Data collected from patient's records were analysed using statistical package for social sciences (SPSS) for window version 16.

Results

Total of 112 patients data was collected from hospital records and out patient department charts. 73 (65.1%) of them were male and 39 (34.8%) were female (table :1). Location wise distribution showed putamen and caudate region were most common 47 (41.9%) followed by subarachnoid region 27 (24.1%), thalamus 19 (16.9%), cerebellum 9 (8.04%), lobar region 8 (7.1%) and brainstem 2 (1.7%) (Table: 1). Except for subarachnoid hemorrhage all regions of hemorrhage showed more number of males suffered from intracranial hemorrhage in comparison to female. Age wise distribution showed that intracranial hemorrhage was more common in age group of 41-60 years 59 (52.6%) followed by age group 61- 100 years 42 (37.5%) (Table.2).

When data were analyzed for sexwise distribution of subarachnoid hemorrhage (27), 14 (51.8%) female had subarachnoid hemorrage in comparision to 13 male (48.1%). Causes of subarchnoid hemorrhage included rupture of aneurysm 25 (92.5%), perimesencephalic hemorrhage 1 (3.7%) and rupture of arteriovenous malformation 1 (3.7%). Among aneurysm types anterior communicating artery aneurysm had highest occurrence 10 (37%) followed by middle cerebral artery aneurysm 6 (22.2%), paraclinnoidal / anterior choroidal/posterior communicating artery aneurysm 5 (18.5%), vertebral artery aneurysm 3 (11.1%), distal anterior cerebral artery aneurysm 1 (3.7%) (Table. 3).

Monthwise variation analysis showed that intracranial hemorrhage had highest occurrence on the month of January (15%) and lowest on the month of November (3.57%). 29 (25.8%) of total intracranial hemorrhage patient had intraventricular extension of hemorrhage. intraventricular extension was more common in thalamic hematoma 15 (13.39%) followed by caudate/putaminal hematoma 10 (8.9%), cerebellum 3 (2.6%) (Table.4)

Modified Rankin Scale (MRS) outcome score was found to be highest as MRS 6 for 34 (30.6%) patients. while good outcome in terms of MRS 1 , MRS 2 and MRS 3 were observed for 7 (6.2%), 26 (23.2%), 25 (22.3%) patients respectively (Table.5)

Table 1. Location of intracranial hemorrhage in male and female.

Location	Brainstem	Thalamic Hematoma	Lobar Hematoma	Cerebellar Hematoma	Putamen/Caudate	Sah
Male	2	11	5	8	34	13
Female	0	8	3	1	13	14
Total	2	19	8	9	47	27
Percentage	1.79%	16.96%	7.14%	8.04%	41.96%	24.11%

Table 2: Age wise occurrence of intracranial hemorrhage in different location.

Age Group	Brainstem	Thalamus	Lobar	Cerebellar	Putamen/Caudate	Sah	Total	Percentage
1-18 YEARS	0	0	0	2	0	0	2	1.79%
19-40 YEARS	0	1	0	1	5	2	9	8.04%
41-60 YEARS	2	7	6	3	25	16	59	52.68%
61-100 YEARS	0	11	2	3	17	9	42	37.50%
TOTAL	2	19	8	9	47	27	112	

Table 3: Causes of subarachnoid hemorrhage in male and female.

Sah Cause	Male	Female	Total	Percentage
Middle Cerebral Artery Aneurysm	2	4	6	22.22%
Anterior Communicating Artery Aneurysm	5	5	10	37.04%
Internal Carotid Artery Aneurysm	1	4	5	18.52%
Vertebral Artery Aneurysm	2	1	3	11.11%
Perimesencephalic Sah	1	0	1	3.70%
Distal ACA	1	0	1	3.70%
Arteriovenous Malformation	1	0	1	3.70%

Table 4. Occurrence of intracerebral hemorrhage in different months

Months	Number	Percentage
January	17	15.18%
February	10	8.93%
March	8	7.14%
April	6	5.36%
May	9	8.04%
June	9	8.04%
July	15	13.39%
August	12	10.71%
September	5	4.46%
October	5	4.46%
November	4	3.57%
December	12	10.71%

Table 5: Occurrence of intraventricular hemorrhage in different location specific intracranial hemorrhage

Ich Location	Number	Intraventricular Hemorrhage	Percentage
Caudate/Putamen	47	10	8.93%
Thalamus	19	15	13.39%
Lobar	8	0	0.00%
Cerebellum	9	3	2.68%
Subarachnoid Hemorrhage	27	1	0.89%
Brainstem	2	0	0.00%
Total	112	29	25.89%

Table 6: Modified Rankin Scale (MRS) outcome in different location specific intracranial hemorrhage

Ich Location	MRS 1	MRS 2	MRS 3	MRS 4	MRS 5	MRS 6	Unspecified
Caudate/Putamen	2	10	18	5	0	12	0
Thalamus	0	2	5	3	0	7	2
Lobar	1	5	1	0	0	1	0
Cerebellum	2	2	0	0	0	4	1
Subarachnoid Hemorrhage	2	7	1	0	0	9	8
Brainstem	0	0	0	1	0	1	0
Tototal	7	26	25	9	0	34	11
Percentage	6.25%	23.21%	22.32%	8.04%	0.00%	30.36%	9.82%

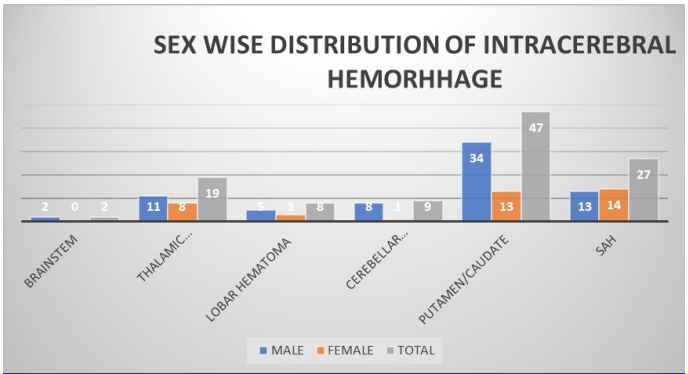

Fig 1: Sex wise distribution of intracerebral hemorrhage.

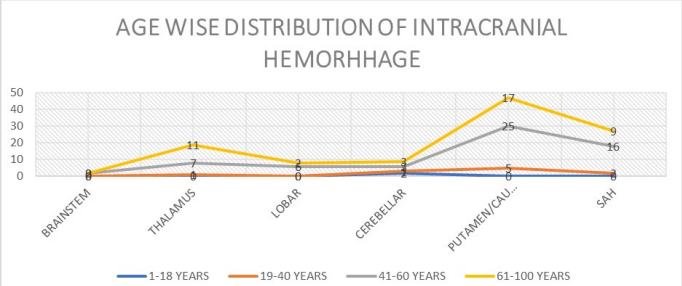

Fig 2: Age wise distribution of intracranial hemorrhage

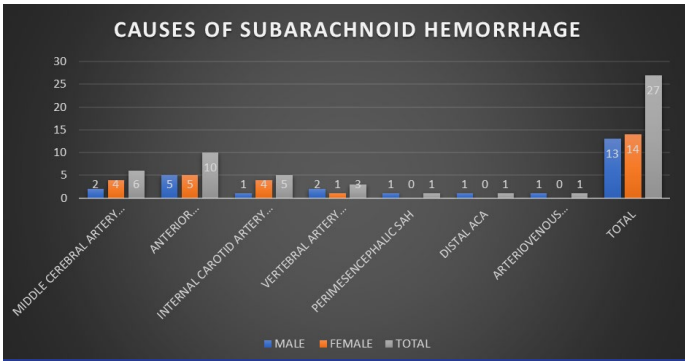

Fig 3: Causes of subarachnoid hemorrhage

Fig 4: Seasonal variation in intracranial hemorrhage

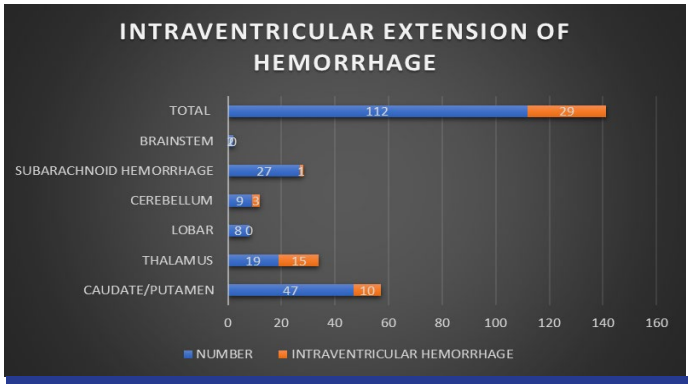

Fig 5: Intraventricular extension of Intracranial hemorhhage

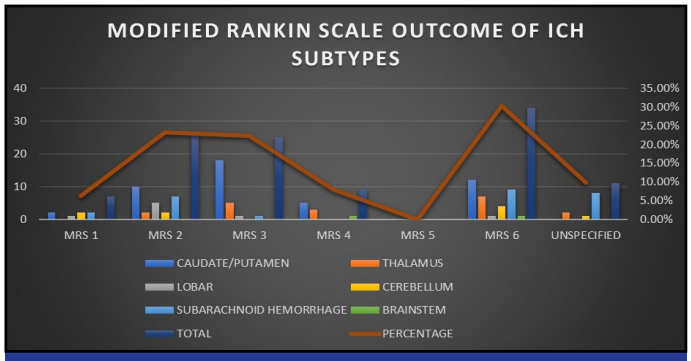

Fig 6: Modified Rankin Scale (MRS) outcome intranial hemorrhage subtypes.

Discussion

Intracranial hemorrhage (ICH) can be either traumatic or non traumatic in origin. Causes of non traumatic ICH can be lesion related or non lesional. Common causes of vascular lesion causing ICH are namely intracranial aneurysm, arteriovenous malformation, dural arteriovenous fistula. hypertension remains most common cause of spontaneous non lesional ICH. Other causes of ICH can be anticoagulant therapy, tumor bleed, coagulopathy, moya moya disease, cerebral amyloid angiopathy.

In this study male patients tend to have more ICH than female. this was seen in non lesional spontaneous ICH. It did not hold true in case of subarachnoid hemorrhage. Female sex tend to have more SAH than male. Seshadri et. al have reported that life time risk of stroke was 1 in 5 for women and 1 in 6 for men.[7,8] Our finding of male preponderance of non lesional spontaneous ICH stands in stark contrast with their findings. They contributed their finding to longer life expectancy of women. Sabrina et. al attribute high risk of stroke in women to early menopause and early decline in estradiol having adverse effect on blood vessels.[9]

Putamen/caudate region was most common site of non lesional ICH, this was followed by thalamus, cerebellum

and lobar regions including frontal, parietal and parietooccipital region in descending order. Edgie et. al, have stated in their study that basal ganglia region was most common site of ICH followed by patietal lobe, frontal lobe, temporal lobe and cerebellum in descending order.[10] Basal ganglia region that includes putamen, caudate and thalamus were the most common site of bleeding in our study as well. Study on prevalence of thalamic hematoma have reported ranging from 6% in series of Juvela et al.[11] to 15.7% in series of tatu et al.[12]

Kumral et al. have reported prevalence of thalamic hematoma as 25.6%.[13] Subarachnoid hemorrhage (SAH) seconded basal ganglia region hematoma in frequency in this study. Out of these locations intraventricular extension was found to be more common with thalamic hematoma followed by caudate/putamen regions and cerebellar hematomas. Their proximity to ventricles would be cause for increased intraventricular extension. Arboix et al. also reports 42.6% of intraventricular hemorrhage in case of thalamic hematoma.[14]

SAH data from this study showed that aneurysmal rupture was most common cause of non traumatic subarachnoid hemorrhage. Frequency wise, anterior communicating artery aneurysm (ACOM) was most common site in our study followed by middle cerebral artery (MCA) aneurysm , Internal carotid artery aneurysm (ICA) groups namely paraclinoidal aneurysm, anterior choroidal artery aneurysm, posterior communicating artery (PCOM) aneurysm in descending order. Our findings are similar to location wise occurrence of different intracranial aneurysms in findings of Gawlitza et al.[15] There were one case each of distal anterior cerebral artery (DACA) aneurysm and arteriovenous malformation (AVM).

Monthwise analysis of the data in our study showed that there were two peaks of occurrence of ICH in this hospital . January and July were the peak month of those seasons of increased occurrence of ICH. One of the strongest risk factor for stroke is blood pressure which may be increased by increased salt intake, less physical activity during cold season.[16,17,18] Cold season in Nepal during January may be the reason for observed increased intracranial hemorrhage in this study. July tends to be prime month for major agriculatural activity in Nepal. blood pressure fluctuation during these stressful season might be reason for peak of intracranial hemorrhage seen on July.

Outcome analysis of various subtypes of ICH as per modified rankin scale (MRS) outcome score showed mortality was observed for 34 (30.3%) patients while good outcome of MRS 1, MRS 2, MRS 3 was observed for 7 (6.2%), 26 (23.2%), 25(22.3%) patients respectively. 9% of patients who refused treatment at our center were categorized as unspecified outcome category.

Conclusion

Intracranial hemorrhage is one of the most devastating condition of brain that results in high mortality and morbidity. Hypertension remains one of the major risk factor that results in various location specific hemorrhage and it shows specific peak seasonal variation. Proper blood pressure control is recommended for prevention of intracranial hemorrhages.

References

1. Mendis S, Puska P, Norrving B, World Health Organization, World Heart Federation, World Stroke Organization. Global Atlas on Cardiovascular Disease Prevention and Control. World Health Organization in collaboration with the World Heart Federation and the World Stroke Organization; 2011.

2. Truelsen T, Heuschmann PU, Bonita R, et al. Standard method for developing stroke registers in low-income and middle-income countries: experiences from a feasibility study of a stepwise approach to stroke surveillance (STEPS Stroke). Lancet Neurol. 2007;6(2):134-139. DOI: 10.1016/S1474-4422(06)70686-X PMID: 17239800

3. Benjamin EJ, Blaha MJ, Chiuve SE, et al. Heart disease and stroke statistics-2017 update: a report from the American heart association. Circulation. 2017;135(10):e146-e603. DOI:10.1161/CIR.0000000000000485 PMCID: PMC5408160

4. Centers for Disease Control and Prevention (CDC). Prevalence and most common causes of disability among adults--United States, 2005. MMWR Morb Mortal Wkly Rep. 2009;58(16):421-426. http://www.ncbi.nlm.nih.gov/pubmed/19407734.

5. Buntin MB, Colla CH, Deb P, Sood N, Escarce JJ. Medicare spending and outcomes after postacute care for stroke and hip fracture. Med Care. 2010;48(9):776-784. DOI:10.1097/MLR.0b013e3181e359df PMID: 20706167 PMCID: PMC3627731

6. Grysiewicz RA, Thomas K, Pandey DK. Epidemiology of ischemic and hemorrhagic stroke: incidence, prevalence, mortality, and risk factors. Neurol Clin. 2008;26(4):871-895. DOI: 10.1016/j.ncl.2008.07.003 PMID: 19026895

7. Seshadri S, Wolf PA. Lifetime risk of stroke and dementia: current concepts, and estimates from the Framingham Study. Lancet Neurol. 2007;6:1106- 1114. DOI: 10.1016/S1474-4422(07)70291-0 PMID:18031707

8. Bushnell CD. Stroke in women: risk and prevention throughout the lifespan. Neurol Clin. 2008;26:1161-76, xi.
DOI: 10.1016/j.ncl.2008.05.009
PMID: 19026906 PMCID: PMC2634299

9. Welten S, Moret C, Boer J, Verschuren M, Schouw Y.Age at Menopause and risk of Ischemic and Hemorrhagic Stroke. Stroke. 2021;52:2583-2591.
DOI: 10.1161/STROKEAHA.120.030558
PMID: 34078111 PMCID: PMC8312566

10. Edzie E K, Dzefi-Tettey K, Gorleku P, et al. (March 25, 2021) Evaluation of the Anatomical Locations of Stroke Events From Computed Tomography Scan Examinations in a Tertiary Facility in Ghana. Cureus 13(3): e14097.
DOI: 10.7759/cureus.14097

11. Juvela S: Risk factors for impaired outcome after spontaneous intracerebral hemorrhage. Arch Neurol 1995, 52:1193-1200
DOI: 10.1001/archneur.1995.00540360071018
PMID: 7492294

12. Tatu L, Moulin Th, Mohamad RE, Vuillier F, Rumbach L, Czorny A Primary intracerebral hemorrhages in the Besançon Stroke Registry. Initial clinical and CT findings, early course and 30-day outcome in 350 patients. Eur Neurol 2000, 43:209-214.
DOI: 10.1159/000008177
PMID: 10828650

13. Kumral E, Kocaer T, Ertubey NO, Kumral K: Thalamic hemorrhage.A prospective study of 100 patients. Stroke 1995, 26:964-970
DOI: 10.1161/01.STR.26.6.964
PMID: 7762047

14. Arboix A, Aguilar R, et al. : Thalamic haemorrhage vs internal capsule - basal ganglia haemorrhage: clinical profile and predictors of in - hospital moartality. BMC Neurology 2007, 7:32
DOI: 10.1186/1471-2377-7-32
PMID: 17919332 PMCID: PMC2169250

15. Gawlitza M. , Soize S., Barbe C,Clainche A, White P, Spelle L, Pierot L: Aneurysm Characteristics, Study Population, and Endovascular Techniques for the Treatment of Intracranial Aneurysms in a Large, Prospective, Multicenter Cohort: Results of the Analysis of Recanalization after Endovascular Treatment of Intracranial Aneurysm Study. AJNR Am J Neuroradiol 40:517-23 Mar 2019 www.ajnr.org.
DOI: 10.3174/ajnr.A5991
PMID: 30819769 PMCID: PMC7028648

16. Salam A, Kamran S, Bibi R, et al. Meteorological factors and seasonal stroke rates: a four-year comprehensive study. J Stroke Cerebrovasc Dis 28: 2324-2331, 2019.
DOI: 10.1016/j.jstrokecerebrovasdis.2019.05.032
PMID: 31227318

17. Primatesta P, Poulter NR. Hypertension management and control among English adults aged 65 years and older in 2000 and 2001. J Hypertens 6: 1093-1098, 2004
DOI: 10.1097/00004872-200406000-00008
PMID: 15167442

18. Smith WC, Lee AJ, Crombie IK, et al. Control of blood pressure in Scotland: the rule of halves. BMJ 300: 981-983, 1990.
DOI: 10.1136/bmj.300.6730.981
PMID: 2344507 PMCID: PMC1662684