



## SPECTRUM OF LESIONS IN BRAIN AND ITS CLINICOPATHOLOGICAL CORRELATION : A TWO YEAR PROSPECTIVE AUTOPSY STUDY

### Pathology

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### ABSTRACT

**Background:** The term “autopsy” derives from the Greek word “autopsia” meaning “to see for oneself” i.e. making a personal inspection. Non-traumatic (natural) brain lesions could be due to increased intracranial pressure, cerebrovascular diseases, metabolic disorders, tumors of the central nervous system (CNS), neurodegenerative diseases, infections of the CNS and myelin diseases.<sup>(1)</sup> This study was carried out to see the spectrum of brain lesions.

**Methods:** This was a prospective study done in a tertiary care teaching hospital for a period of 2 years. Total of 235 patients were included in the study. Histopathological examination of the specimen was done and the various histopathological patterns identified and classified.

**Results:** The age of patients ranged from 11-80 years. 24.25 % were in the age group 21-30 years . The most frequent mode of death was traumatic affecting 71.06 % of patients. Intracranial SOLs were most commonly noted in age group 41-50 years in 4 cases (33.3%) and Anaplastic astrocytoma was the most common intracranial lesion.

**Conclusions:** In India, postmortem examination is being done to confirm the clinical diagnosis and provide cause of death in most of the cases.

### KEYWORDS

Autopsy, Neurodegenerative disease, Anaplastic astrocytoma

### INTRODUCTION

The term “autopsy” derives from the Greek word “autopsia” meaning “to see for oneself” i.e. making a personal inspection. It is composed of two words, autos, meaning “self” and opis - “eye”. Usage of this word is however, restricted to the pathological sense i.e. the dissection of the dead body to determine, through observation, the cause of death or the nature of the disease. Brain lesions could be caused by either traumatic or non-traumatic incidents. Traumatic brain injuries (TBI) are caused by two mechanisms: either by impact and/or movement of the brain inside the skull. India has the rather unenviable distinction of having the highest rate of head injury in the world. In India, more than 100,000 lives are lost every year with over 1 million suffering from serious head injuries. 1 out of 6 trauma victims die, while in the United States this figure is 1 out of 200. TBI is a significant public health problem worldwide and is predicted to surpass many diseases as a major cause of death and disability by the year 2020. Non-traumatic (natural) brain lesions could be due to increased intracranial pressure, cerebrovascular diseases, metabolic disorders, tumors of the central nervous system (CNS), neurodegenerative diseases, infections of the CNS and myelin diseases.<sup>(1)</sup> This study will be carried out in a tertiary healthcare centre where autopsies (forensic and clinical) are conducted and to see the spectrum of brain lesions.

### AIMS AND OBJECTIVE

- To study the spectrum of intracranial lesions.
- To study the postmortem findings in brain and its clinicopathological correlation.

### METHOD AND METHADODOLOGY

This study is a Cross-sectional carried out from July 2015 to July 2017 at Autopsy and Neuropathology section of the tertiary health care centre. Total samples of 235 will be included under following criteria's.

#### a) Inclusion criteria :

- Bits of brain and whole brain received in Neuropathology section.
- Bits of brain and whole brain received in Autopsy section wherein an intracranial cause of death was suspected at autopsy.
- Age group : 11-80 years

#### b) Exclusion criteria :

- Decomposed bodies

**Ethical approval:** Necessary ethical approval from the Ethics committee of our institute was obtained.

All relevant information about each victim was gained from police reports and medical reports for those who were admitted to hospital prior to death. The information gathered included age, sex, clinical

history, mode of death, external and in-situ examination findings and probable cause of death as suggested by autopsy.

Bits of brain and whole brain received in 10% formalin were processed. Routine Hematoxylin and Eosin staining and special stains i.e. Ziehl-Neelson stain, Periodic acid-Schiff (PAS) and Grocott's methanamine silver (GMS) were done (whenever indicated).

### OBSERVATIONS AND RESULTS

The present study was carried out from July 2015 to July 2017 in our institute and during the period of 2 years, we received 2,117 viscera altogether in the Autopsy and Neuropathology sections. Out of the total 2,117 cases received, an intracranial cause of death was suspected at autopsy for 235 cases, accounting for 11.1 %, ranging in age from 11 – 80 years.



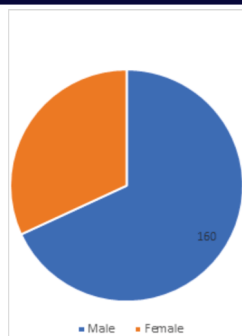
FIGURE 1: CAUSE OF DEATH

The commonest age group affected by the intracranial lesions was 21-30 years, seen in 57 cases (24.25%) and the least common age group affected was 61-70 years, seen in 15 cases (6.38%) from the total number of cases. The mean age was 41.7 years  $\pm$  17.9

TABLE 1: Age (in years) distribution in ten –year intervals (n= 235)

Age interval (in years)	No of cases
11-20	26
21-30	57
31-40	37
41-50	42
51-60	30
61-70	15
71-80	28
<b>Total</b>	<b>235</b>

Out of the 235 cases, 160 were males (68.08 %) and 75 were females (31.91%).



**FIGURE 2: Sex Distribution**

Traumatic mode of death was seen in 167 from 235 cases (71.06 %) while nontraumatic mode was seen in 48 cases (20.42%). The mode of death was unknown in 20 cases (8.51 %).

**TABLE 2: Mode of death (n= 235)**

Mode of death	No of cases	Percentage
Traumatic	167	71.06 %
Non-traumatic	48	20.42 %
Unknown	20	8.51 %
Total	235	100 %

RTAs (road traffic accidents) were the commonest cause of death represented in 90 cases (53.8%) of the total number of deaths due to traumatic causes (167), followed by fall from height, which was seen in 34 cases (20.3 %) and traumatic wounds (assaults) seen in 22 cases (13.1 %).

**TABLE 3: Traumatic causes of death (n = 167)**

Type Of head injury	Number of case	Percent
Intracranial Hemorrhage	151	90.4
Others	16	9.5

The most common type of head injury in deaths due to traumatic causes (167) was found to be intracranial hemorrhage seen in 151 cases (90.4).

**TABLE 4: Type of Head Injury (n = 167)**

Category	Number of cases	Percent
CVA	25	52 %
CNS Infection	12	25 %
Seizures	6	15.5 %
Intracranial Neoplasm	5	10.4 %
Total	48	100 %

The dominant type of intracranial hemorrhage seen in traumatic cases was subdural hemorrhage (SDH) in 131 of the total 167 cases (78.4%). Total number of deaths due to non-traumatic causes were 48, amongst it, CVAs (cerebrovascular accidents) were the commonest cause of death as seen in 25 cases (52%) followed by CNS infections in 12 cases (25%), seizures in 6 cases (12.5%) and intracranial neoplasms in 5 cases (10.4%).

**TABLE 5: Non traumatic causes of death (n= 48)**

Age	No of cases	percentage
0-20	0	0
21-30	2	8 %
31-40	0	0
41-50	0	0
51-60	5	20 %
61-70	5	20 %
71-80	13	52 %
Total	25	100 %

CVAs were most commonly noted in age group 71-80 years in 13 cases (52.0%), followed by 5 cases (20.0%) each in the age group 61-70 years and 51-60 years.

**Table 6: Age (in years) distribution in CVA (n= 25)**

Presentation	Haemorrhagic stroke		Ischaemic Stroke	
	Cases	Percentage	Cases	Percentage

Hemiparesis	4	80 %	16	80 %
LOC	4	80 %	10	50 %
Headache	3	60 %	8	40 %
Vomitting	3	60 %	8	40 %
Dysarthria	1	20 %	12	60 %

The most common clinical presentation was hemiparesis in both hemorrhagic and ischemic strokes (80.0%). Loss of consciousness (LOC) was noted in 80% of the cases of hemorrhagic stroke while in 50% of the cases due to ischemic stroke.

**Table 7: Various clinical presentations of stroke**

Out of 12 patients that died of CNS infections, 8 cases (66.6%) had meningitis, 3 cases (25%) were that of rabies encephalitis followed by 1 case (33.3%) of cerebral malaria.

**Table 8: Percentage of various CNS infections (n= 12)**

CNS Infection	No of cases	Percentage
Meningitis	8	66.6 %
Rabies Encephalitis	3	25.0 %
Cerebral Malaria	1	8.3 %
Total	12	100 %

Fever and headache were the most common clinical presentations seen in all 8 cases (100%) of meningitis followed by neck rigidity in 5 cases (62.5%) and vomiting in 3 cases (37.5%).

**Table 9: Clinical presentations in cases of Meningitis**

Presentation	Number of cases	Percentage
Fever	8	100 %
Headache	8	100 %
Neck Rigidity	5	62.5 %
Vomitting	3	37.5 %

Acute pyogenic meningitis was seen in 4 cases (50%) of the total 8 cases of meningitis followed by viral (2 cases, 25%) and tuberculous meningitis (2 cases, 25%).

**Table 10: Types of Meningitis (n=8)**

Type	Number of cases	Percentage
Acute Pyogenic	4	50 %
Viral	2	25 %
Tuberculosis	2	25 %
Total	8	100 %

Intracranial SOLs were most commonly noted in age group 41-50 years in 4 cases (33.3%), followed by 3 cases (25.0%) in the age group 31-40 years, 2 cases (16.6%) each in the 11-20 and 21-30 years age group and 1 case (8.3%) was found to be in the 51-60 years age group .

**Table 11: Age (in years) distribution in intracranial SOL (n=12)**

Age Group	Number of cases	percentage
11-20	2	16.6%
21-30	2	16.6%
31-40	3	25 %
41-50	4	33.3 %
51-60	1	8.3 %
61-70	0	0
71-80	0	0
Total	12	100 %

In deaths due to intracranial neoplasms, out of the 5 cases, Anaplastic astrocytoma was seen in 2 cases followed by 1 case each of Glioblastoma multiforme, germ cell tumor and lymphoma, accounting for 2.12% of the total number of cases

**DISCUSSION**

Intracranial causes of death trail in incidence behind cardiovascular and respiratory system pathologies in most deaths occurring in hospitals. Intracranial pathology becomes more important in troublesome cases such as sudden and unexpected deaths or where there appears to be no anatomic cause of death revealed in the general autopsy, the cause must be in the brain.<sup>(2)</sup>

According to the World Health Organization (WHO), deaths related to the head, whether traumatic or non-traumatic, represented 17% depending on global studies from different countries.<sup>(1)</sup>

The findings of the present study were concordant with that of a hospital based analysis undertaken by Al-Qazzaz MA et al.<sup>(1)</sup> in Iraq, on 119 cases from a total of 1,031 cases during the period November 2012 to May 2013, where also the intracranial causes of death attributed to 11.5% , which is in agreement with the finding of 11.1% in the present study. The results of the present study were also comparable with a study conducted by Unterberg AW et al.<sup>(5)</sup> in 2004 in Austria in which intracranial lesions represented 12% of all deaths. However, in the study conducted by Holbourn et al.<sup>(4)</sup> in England during a period of two years in the Hospital of London, intracranial lesions accounted for 15% of all cases. In another study accomplished by Hugar BS et al.<sup>(5)</sup> at the MS medico-legal institute, Bangalore, India during a 10-year period (January 2003 to December 2012), deaths due to intracranial lesions were noted to be 14.7% (43 out of the total of 291 cases). This difference in the percentage of deaths due to intracranial causes could be attributed to the sample size in both the above studies and the longer duration of the study, i.e., 10 years in the latter study.

**Table 15: Comparative study of percentage (%) of intracranial causes of death**

Authors	Intracranial Cause Percentage
Al-Qazzaz MA et al.1	11.5
Unterberg AW et al.46	12
Holbourn et al.47	15
Hugar BS et al.48	14.7
Present Study	11.1

The results of the current study were in agreement with a study conducted by Al-Qazzaz MA et al.1, Ommaya AK et al.<sup>(6)</sup> and also with the study done by Akhilesh P et al.<sup>(7)</sup> in Jaipur, India on 120 cases during the year 2003-2004.(Table 16).

**Table 16: Comparative study of age (in years) distribution**

Authors	Commonest Age Group	Least common Age group
Al-Qazzaz MA et al.1	21-30	>70
Akhilesh P et al	20-29	50-59
Ommaya AK et al.50	21-30	>70
Katayama Y et al.51	41-60	<20
Present Study	21-30	61-70

The results were in agreement with the study conducted by Al-Qazzaz MA et al.1, where 67.23 % (80 cases) were males and 32.77 % (39 cases) were females. Similar results were observed in the study done by Hugar BS et al.<sup>(5)</sup>

where 69.7% were males and 30.3% were females. In another study conducted by Ujihira N. et al.<sup>(8)</sup> on 60 cases at the Nagoya University Hospital in Japan, during the period 1976 to 1991, 36 cases (60.0 %) were males and 24 cases (40.0 %) were females. Also, in the study done by Siddique U et al.<sup>(9)</sup> on 165 cases in Peshawar, Pakistan during one year, 65.4% (108) cases were males and 34.6 % (57%) cases were females (Table 17).

**Table 17: Comparison of sex (%) distribution**

Authors	Males (%)	Females(%)
Al-Qazzaz MA et al.1	67.23	32.77
Hugar BS et al.48	69.7	30.3
Siddique U et al.53	65.4	34.6
Ujihira N. et al.52	60	40
Present study	68.08	31.91

The results of the present study were in close agreement with the study done by Al-Qazzaz MA et al.<sup>(1)</sup> (Table 18) where traumatic mode of death accounted for 74.79 % (89 cases) while non-traumatic (natural) mode accounted for 16.80 % (20 cases). Deaths due to unknown causes accounted to 8.40 % (10 cases).

**Table 18: Comparison of percentage (%) of mode of death**

Authors	Traumatic	Non-Traumatic	Unknown
Al-Qazzaz MA et al.1	74.79	16.80	8.40
Present Study	71.06	20.42	8.51

In deaths due to trauma, out of the total 167 cases in the present study, RTAs were the commonest cause of death as seen in 90 cases (53.8 %) followed by fall from height, which was seen in 34 cases (20.3 %) and

traumatic wounds (assaults) seen in 22 cases (13.1 %). The results of the present study were comparable to the studies conducted by Al-Qazzaz MA et al.<sup>(1)</sup>, Akhilesh P et al.<sup>(7)</sup>, Yattoo G et al.<sup>(10)</sup>, Tabish S et al.<sup>(11)</sup> and Siddique U et al.<sup>(9)</sup>, where also RTAs were the commonest category of death accounting for 39.4 %, 65.8 %, 44.4 %, 60.0 % and 43.1 % respectively. In the present study, amongst the deaths due to non-traumatic causes, CVAs (cerebrovascular accidents) were the commonest cause of death as seen in 25 cases ( 52.0% ) followed by CNS infections, seen in 12 cases (25.0 %). The results of the present study were concordant with the study conducted by Al-Qazzaz MA et al.<sup>(1)</sup>, wherein CVAs were the commonest category of death under non-traumatic causes, seen in 55.0% (11 cases) followed by CNS infections, accounting for 15.0 % (3 cases). However there was an equal incidence in deaths due to seizures and intracranial neoplasm, i.e., 10.0 % (2 cases) each.

**Table 19: Comparison of various clinical presentations of stroke**

Authors	Haemorrhagic Stroke		Ischaemic Stroke	
Clinical Presentation	Nur Z et al.57	Present Study	Nur Z et al.57	Present Study
Hemiparesis	85	80	80	80
LOC	80	80	53.75	50
Headache	60	60	43.75	40
Vomiting	75	60	40	40
Dysarthria	25	20	60	60

Headache, the most common presenting symptom in our study, in cases of intracranial SOLs occurred in 50% of the patients. The results of the current study were concordant with the study conducted by Soomro B et al.<sup>(12)</sup> (2014) where headache was the most common presenting symptom in 43.5% cases followed by seizures in 32.5%, vomiting in 27.5%, impaired consciousness in 25% and cognitive dysfunction in 6.5%. Fever, weight loss and trauma were seen in 52.5% cases.

## CONCLUSION

In India, postmortem examination is being done to confirm the clinical diagnosis and provide cause of death so with this motive this study was carried out in our tertiary care center. Such studies have not been conducted so far at the national and international level to the best of our knowledge. Shorter postmortem intervals (time between the death and start of necropsy) contribute to a lesser degradation of nervous tissue and greater quality of biological material.

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