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Original Research Article

Prevelance of Intracerebral Hemorrhage in Different Areas of Brain Better Diagnosed by CT in the Population of Gujranwala

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Abstract: ***Background:*** ICH is the second most frequent variant of stroke following ischemic stroke with the prevalence of 10- 20% in patients with hypertension, their families and society in general. The primary imaging modality suggested for the initial emergency diagnosis of acute stroke is noncontrast CT imaging of the brain. ***Objective:*** To accentuate the use of CT scan in investigating the prevalence of ICH in different areas of brain as a gold standard imaging tool in patients with HTN and acute stroke in the population of Gujranwala. ***Material and Method:*** This research was conducted at the Gondal Medical Complex Center in Gujranwala, Pakistan, that includes 100 HTN patients of all ages who presented to the hospital CT department with symptoms of headache, vertigo, and nausea from August to December 2020. ***Results:*** In the population of 100 patients, the ICH was seen in different brain areas of brain i.e., lobar region, basal ganglia, thalamus, cerebellum and brain stem. On CT scan, the most common site of hemorrhage was Lobar (40%), then Basal Ganglia (35%), Thalamus (12%), Cerebellum(8%) and Brain stem(5%). ***Conclusion:*** CT scan has proven to be the excellent, non-invasive and safe imaging modality to localize the exact location of intracerebral hemorrhage. CT has great sensitivity to bleed it will rule out any other type of bleed including SAH, IVH.

Key words: Ischemic Stroke, Hypertension, Computed Tomography, Subarachnoid Hemorrhage, Intra-ventricular Hemorrhage.

1. INTRODUCTION

A hemorrhage is a rapid loss of blood from a swelling blood vessel. Minor bleeding can occur when the skin's superficial vessels are weakened, resulting in petechiae and ecchymosis [1, 2]. It may also be important, resulting in a more vague set of symptoms such as alterations in vital signs and impaired state of mind [1]. External or internal hemorrhaging can occur. External bleeding happens as a result of a body orifice or a traumatic wound. Internal bleeding entails a reasonable degree of clinical caution, which can be established through a clear history and physical exam, lab tests, scanning, and close supervision of vital signs [1]. Intracerebral hemorrhage (ICH) happens as a result of breaking small arteries into the cerebral parenchyma accounts for nearly 10% of all strokes in the United States and has dramatically increased morbidity and mortality [3, 4]. ICH is a symptom of many disorders, the most common of which is long term hypertension [3]. When hemorrhage grows in the absence of preexisting vascular deformity or brain parenchymal lesion is also referred to as primary ICH. Secondary ICH leads to hemorrhage that complicates the lesion [3]. Primary ICH is the most prevalent form of hemorrhagic stroke, accounting for about 10% of all strokes with a frequency of between 7 and 17 per 100,000 [3]. The biggest and most important and predominant controllable risk factor for so-called incidental, primary, or hypertensive ICH is hypertension, which makes up the bulk of ICH preventable attributable risk [5]. The brainstem, putamen, sub-cortical white matter, cerebellum, thalamus are most common typical anatomic sites for hypertensive ICH [5, 6]. Another major, visible, and possibly treatable source of parenchymal ICH is underlying systemic lesions [5]. Parenchymal blood can be detected in up to 10% of ruptured aneurysms. Other underlying systemic lesions that induce a limited proportion of apparent random ICH in recorded sequence include ateriovenous malformations, cavernous angiomas, and tumors (with intratumoral hemorrhage). Vascular malformations, in fact, are responsible for 4% to 5% of ICHs [5]. Stroke is the world's main cause of death, with the vast bulk of stroke-related deaths happening in low- and middle-income countries [7]. In 2002, 5.5 million people died from strokes globally, with South Asia responsible for nearly 20% of these deaths. The rate of stroke deaths is expected to rise to 7.8 million by 2030, with the majority occurring in the world's poorest countries [7]. CT scan is the best modality to confirm the presence of intracerebral hemorrhage in initial stages especially [8]. A CT scan reveals acute bleed as hyperdense signal. A traumatic cause is suggested by multifocal hemorrhages at the frontal, temporal, or occipital poles [9]. The presence of intracranial blood on CT scanning is determined by density variations that arise over time, representing clot production, lysis, retraction and, finally, tissue death [10].

The primary imaging modality suggested for the initial emergency diagnosis of acute stroke is to use non contrast computed tomographic (CT) scanning of the brain [11]. The primary function of CT would be to preclude intracerebral hemorrhage, especially in individuals who may suffer from thrombolysis [5, 11, 12]. CT is preferred because it is rapid scanning procedure, less costly, has better resolution and is sensitive to detect the type of hemorrhage. The standard imaging modality for the initial assessment of patients diagnosed with acute stroke symptoms has been Noncontrast Computed Tomography (CT) [12]. In the hyperacute period (0 to 6 hours), the main diagnostic benefit of CT is its ability to rule out the presence of hemorrhage. Since a background of intracerebral hemorrhage precludes the usage of thrombolytic agents, accurate early identification of blood is critical [10, 12].

This research used a CT scan to determine the exact area of intracerebral hemorrhage in patients with hypertension and a history of stroke, which are more vulnerable to blood vessel rupture. As opposed to other modalities that cannot determine the exact site of bleed, CT scan is the gold standard for diagnosing ICH. This study will help the doctor to identify the region where the bleed is sooner and more quickly, because he will then be able to take the proper management for the particular section of the brain, because it will be better for the patient as he will be spared from many dangerous and unwanted radiations, as well as the high cost of scans.

2. MATERIAL AND METHODS

This cross-sectional study included patients with ICH of all ages had been assessed in the CT scan department of Gondal Medical Complex Gujranwala between august 2020 and December 2020. 120 patients came for brain CT scan in our Clinical Centre out of which 100 patients were taken for investigation and 20 patients were excluded as they did not show the symptoms related to ICH of which 2 female patients were pregnant, 1 had contrast allergy, 12 patients were diabetic, and 2 patients had renal failure and 3 had impaired renal function. All the patients of ICH were taken to the CT department to assess the exact site of bleeding and their relative complications under the supervision of a well experienced radiologist. Initially a literature review of the risk factors associated with the presence of intracerebral hemorrahge on brain CT of ICH patients was carried out. These factors were: loss of consciousness, headache, nausea and vertigo.

Computed Tomography scan of Brain

Our hospitals' CT scanning procedure for patients with head injuries provides scans with and without comparison. Two independent radiologists who were blinded to clinical evidence gathered and analyzed brain CT scans. Brain CT scan was performed using Toshiba.

Aquilion 64 Slices CT Machine

CT scan was performed on different patients with supine position; head first and landmark was set from foramen magnum to vertex with 10-mm slice thickness. The topogram direction taken was craniocaudal. The scan type performed was helical. The kvp set for brain ct was 120 and m as was 250. The SFOV was 250mm^2.

Inclusion Criteria

Patients who came with the complaints of: Unconsciousness, headache, nausea, vertigo.

Exclusion Criteria

Conscious patient, patients with extradural hemorrhage, pregnant females, contrast allergy patient, any metal implant, subarachnoid hemorrhage.

3. STATISTICAL ANALYSIS

Patients with intracerebral hemorrhage were analyzed by filling out a specially developed data collection sheet with the necessary information. The data was analyzed using the Statistical Package of Social Sciences (SPSS) version 22. Tables and pie charts were used to display the results.

4. RESULTS

In this sample of 100 patients of which 38 were females and the remaining 62 patients were male(Table.1), some of patients (36%) were hypertensive and (64%) were Non-hypertensive(Table.2), and when the region of hemorrhage was taken into consideration, the results indicated the high frequency of patients 40 out of 100(40%) had the hemorrhage at Lobar region (Table.3). Incidence of hemorrhage in basal ganglier region also showed the high frequency of 35% in selected population (Table.4). The results of this study showed that 12 out of 100(12%) patients were detected with hemorrhage in thalamus while 88 out of 100(88%) thalamus region infarct or hemorrhage was absent (Table.5). The hemorrhage in cerebellum had the frequency of 8% while it was absent in 92 out of 100(92%) patients. The hemorrhage in cerebellum was also present in lesser patients as the majority of selected population 92% had no cerebellum hemorrhage.(Figure.6). As we proceeded towards the analysis of hemorrhage present in brain stem was least, 5 out of 100(5%) patients (Table.7). The percentage of brain stem hemorrhage was comparatively low as the majority of population (95%) in this study had no hemorrhage in brain stem (Figure.7). According to the comparison Pie chart, incidence of intra-cerebral hemorrhage is highest in lobar region (40%), as compared to the other four regions. After lobar region the second most common site of bleed is basal ganglia region(35%), then in thalamic region(12%), then in cerebellum(8%), and according to our study the least incidence of bleed was to occur in brain stem region(5%) (Figure.8).

Fig-1: Non contrast CT demonstrating a large intracerebral hemorrhage involving the posterior aspect of the right cerebral hemisphere. There is extension both into the ventricles and into the subdural space. Marked midline shift is also present

Fig-2: Non-contrast CT of the brain demonstrates an acute intracerebral hemorrhage centered in the basal ganglia of the left hemisphere. There is extension into the left lateral ventricle

Table-1: Distribution of cases according to their Gender

GENDER					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	38	38.0	38.0	38.0
	Male	62	62.0	62.0	100.0
	Total	100	100.0	100.0	

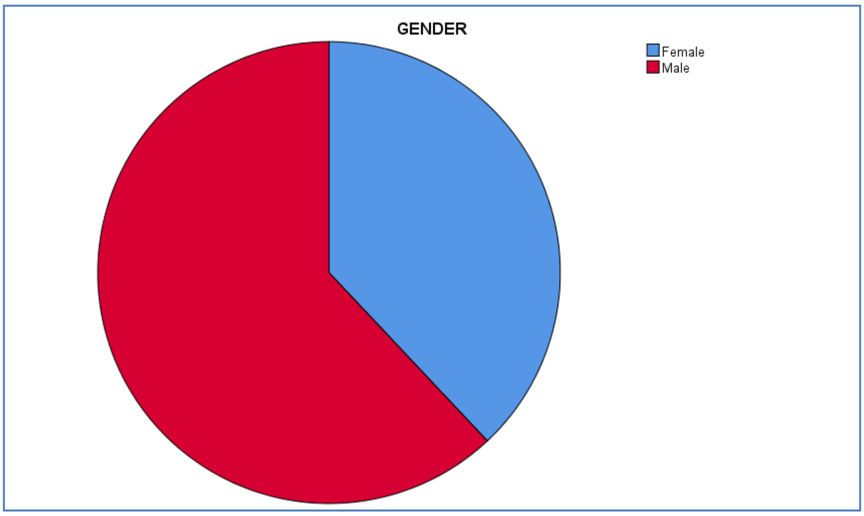

Fig-1: Distribution of cases according to their Gender

Table-2: Distribution of cases according to their Hypertension history

HTN					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	36	36.0	36.0	36.0
	No	64	64.0	64.0	100.0
	Total	100	100.0	100.0	

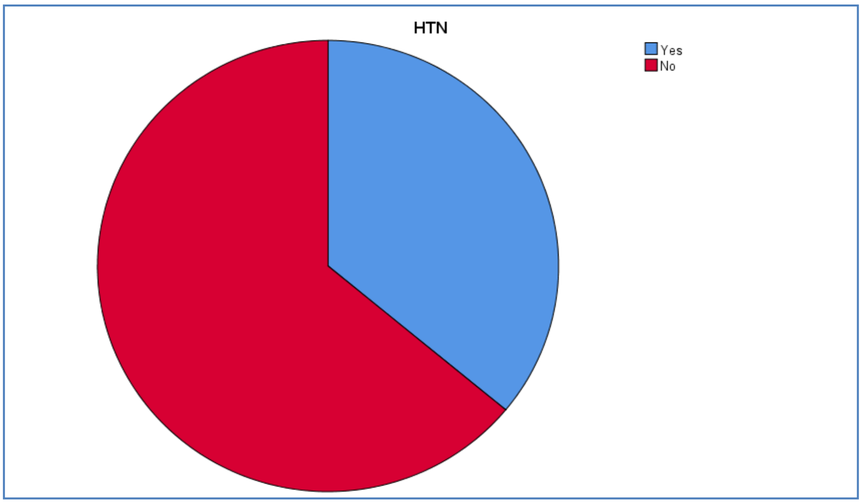

Fig-2: Distribution of cases according to their Hypertension history

Table 3: Percentage of Patients having ICH in the Lobar Area

LOBAR					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	40	40.0	40.0	40.0
	No	60	60.0	60.0	100.0
	Total	100	100.0	100.0	

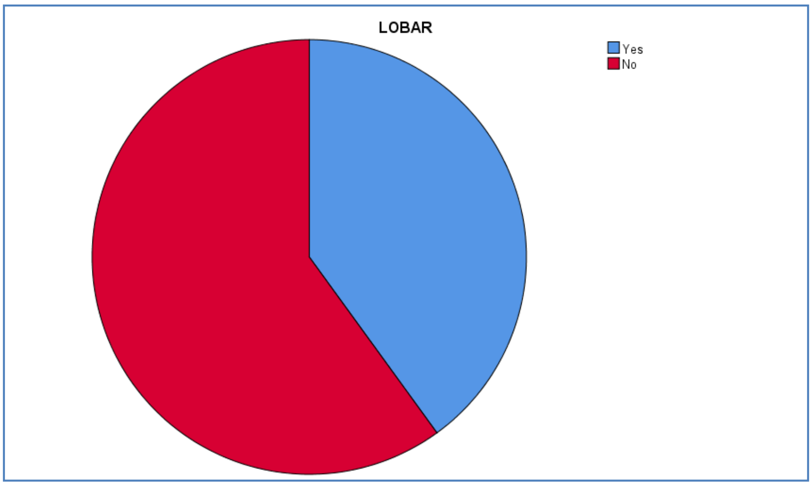

Fig-3: Percentage of Patients having ICH in the Lobar Area

Table 4: Percentage of Patients having ICH in the Basal Ganglia Area

BASAL GANGLIA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	35	35.0	35.0	35.0
	No	65	65.0	65.0	100.0
	Total	100	100.0	100.0	

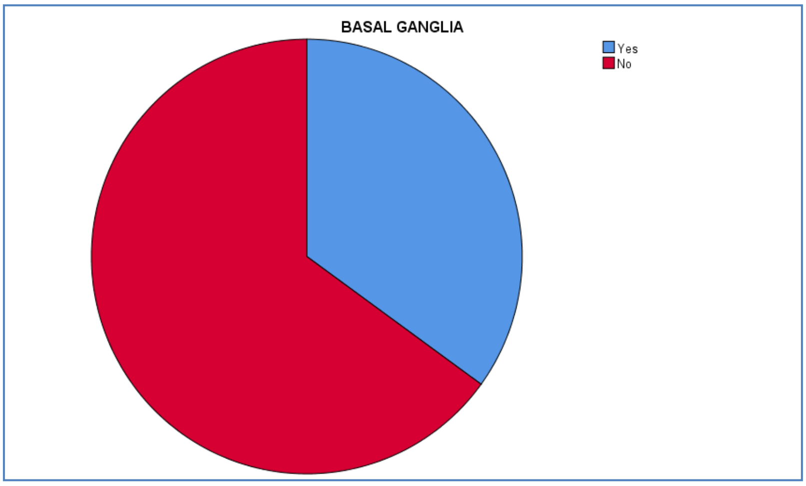

Fig-4: Percentage of Patients having ICH in the Basal Ganglia Area

Table-5: Percentage of Patients having ICH in the Thalamic Area

THALAMUS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	12.0	12.0	12.0
	No	88	88.0	88.0	100.0
	Total	100	100.0	100.0	

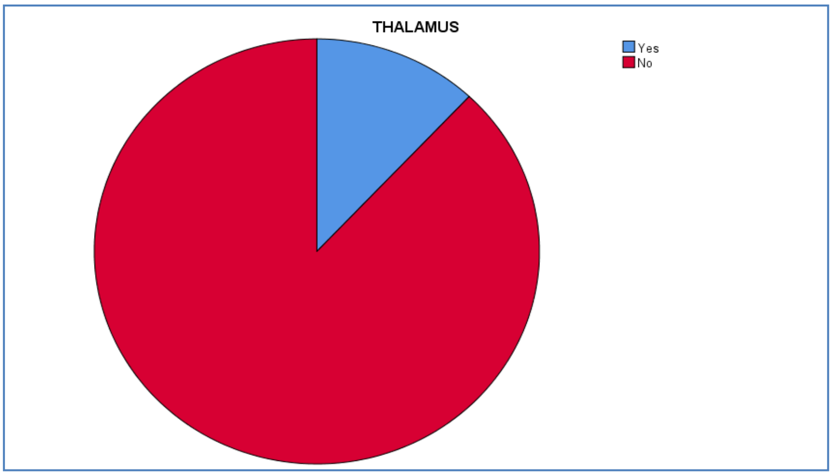

Fig-5: Percentage of Patients having ICH in the Thalamic Area

Table-6: Percentage of Patients having ICH in the cerebellum Area

CEREBELLUM					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	8	8.0	8.0	8.0
	No	92	92.0	92.0	100.0
	Total	100	100.0	100.0	

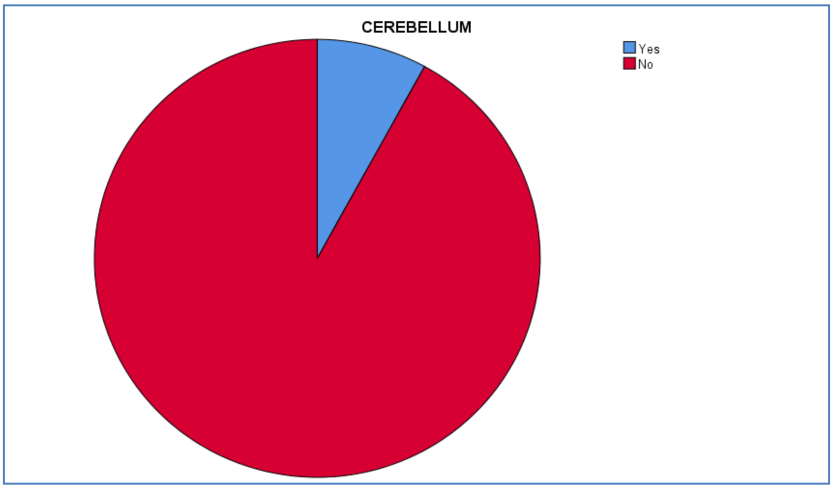

Fig-6: Percentage of Patients having ICH in the cerebellum Area

Table-7: Percentage of Patients having ICH in the Brain stem Area

BRAIN STEM					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	5.0	5.0	5.0
	No	95	95.0	95.0	100.0
	Total	100	100.0	100.0	

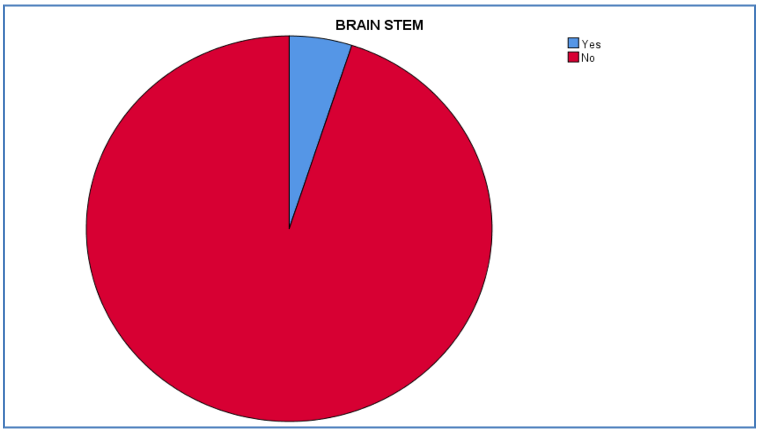

Fig-7: Percentage of Patients having ICH in the Brain stem Area

5. DISCUSSION

This research concludes that that Intracerebral hemorrhage is most commonly seen in hypertensive patients and it may appear in different areas of brain but the most common area for ICH is the lobar region and the research indicates that NCCT is the most trustworthy test to perform in the immediate case to localize the region of bleed and the size of hemorrhage.

In 2014, Federica Macellari et al. stated that; "Intracerebral hemorrhage" (ICH) refers to the unexpected leaking of blood in brain tissue. This therapeutic agent is present in 10% to 15% of all stroke cases in the Western population, with higher rates of incidence observed in Asia. It is often associated with a higher death rate than ischemic stroke (IS) or subarachnoid hemorrhage [13]. In this research, computed tomography is seen to be more accurate modality to visualize the exact location of intracerebral hemorrhage. Because of its high accuracy for predicting ICH, Non-contrast CT (NCCT) is widely used in an emergency room environment for acute stroke. Furthermore, NCCT enables precise quantification of hematoma size and monitoring of hemorrhage progression in ICH [13, 14].

In 2017, Boulouis et al. proclaimed that; in the emergency room, NCCT is nearly only used to detect ICH. NCCT biomarkers have the ability to become a low-cost, widely accessible method for classifying the likelihood of hematoma development in clinical practice and clinical trials [14, 15].

In 2020, Morotti A et al. demonstrated that; multiple NCCT ICH density and shape characteristics, of varying impact sizes, are valuable indicators for Hematoma Expansion and early diagnosis and can provide valuable information for prospective randomized clinical trials [15].

In 2010, Justine Elliott, et al. stated that; A brain CT scan reinforces the assessment, allows for the density of the blood clot to be estimated, and recognizes mass impact and intraventricular invasion. Efflux of contrast in the blood clot indicates hematoma expansion, and the trend of bleeding may suggest the possible trigger of the ICH [16].

In 2011, Flower and Smith mentioned that; CTA images will also show contrast efflux and the'spot symbol' – contrast leakage is seen as an aggregation of contrast inside the bleeding and the'spot sign' as a hyperdense patch on the CTA images [17].

6. CONCLUSION

This study concludes that CT can be used as the primary imaging modality for headache, vertigo, and nausea because it is effective, readily accessible and non-invasive. CT has a high capacity for ruling out bleeds or bleeding vessels. A thorough examination is required to specifically diagnose the source of the bleeding so that a correct diagnosis can be developed early. This enables radiologists to prepare a successful therapy for patients without hesitation, thus reducing patient anxiety.

Ethical considerations

The rules and regulations set by the ethical committee of university of Lahore will be followed while conducting the research and the rights of the research participants will be respected

Confidentiality of data

A written informed consent was taken from all the patients having low back pain. All collected data will be kept confidential for research purpose only.

Informed consent and right to privacy

Patients were given the right to withdraw their information in any step of data collection. Everything is in confidentiality and all the things that were mentioned in the article are with the permission of every single person which is considered in this article.

Financial support and conflict of interest

No financial support and we declared that there is no conflict of study in this research.

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