



## Original Article

## Frequency, Causes and Findings of Brain Computed Tomography Scan at University of Lahore Teaching Hospital

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## ABSTRACT

Cranial computed tomography (CT) is the most generally utilized diagnostic method for the emergent evaluation of head trauma (TBIs) because it is readily accessible, quick, and sensitive for clinically relevant traumatic brain injuries as well as non-traumatic abnormalities.

**Objective:** To determine the frequency, causes, and findings of brain computed tomography scan at The University of Lahore teaching hospital. **Methods:** A descriptive study was conducted at The University of Lahore Teaching Hospital. A sample of 202 brain CT scans from a total of 933 participants seen in the CT department was obtained using a suitable sampling technique. Data analysis was done using SPSS version 21.0. **Results:** There were 78 (38.6%) female patients and 124 (61.4%) male patients out of 202 total patients. The mean age of the patients was 47.1± 23 years. The most prevalent of them, brain atrophy, was observed in 63 (31.2%) of the patients. 51 (25.2%) patients had infarction, 36 (17.8%) had sinusitis, 24 (11.9%) had ischemic demyelination, and 16 (7.9%) had fractures and hemorrhages. In 8 (4.0%) patients, mastoiditis, tumors, and carcinoma were reported. 7 patients (3.5%) had cysts, 6 patients (3.0%) reported contusions, and 2 patients (1.0%) had abscesses. **Conclusions:** According to our research, the vast majority of individuals who underwent CT scans had a history of headache and falls and the most frequent observation in the patients was brain atrophy. Other major findings found were sinusitis and infarction.

## INTRODUCTION

Years ago, plain film radiography was the primary imaging technique used to assess trauma victims [1]. The public introduction of computed tomography (CT) occurred in 1972 with a scan performed on patient at Wimbledon's Atkinson Morley Hospital, U.K., revealing a cystic frontal lobe tumor [2]. This was a significant advancement in the diagnostic options available to physicians during the 1970s [3]. After this, CT was immediately welcomed by the medical community [4]. CT has developed into a potent and popular diagnostic imaging technology, with almost 70 million exams carried out in the US alone [5]. Computed

tomography became the first non-invasive method for obtaining images of the human body's interior that were not skewed by the superposition of different anatomical components with the aid of computer software. The clinician can observe pathology from a variety of angles, free from other anatomical structures, and can change contrast to focus on the soft-tissue and hard-tissue pathology in turn, when x-ray attenuation data is reconstructed into an image. Three-dimensional imaging of anomalies and anatomy is now possible because of technological advances in computer software. Therefore,

when compared to traditional radiography, CT produces images with substantially higher contrast [6]. As it is easily accessible, rapid, and sensitive for clinically significant traumatic brain injuries, cranial computed tomography (CT) is the most often used diagnostic technique for the urgent evaluation of head trauma (TBIs). Although cerebral bleeding and skull fractures can be found using cranial CT, it is also sensitive to a variety of non-traumatic abnormalities that the patient or their family may not be aware of. CT can reveal soft-tissue abnormalities such as disc herniation, soft tissue bleeding, and ligamentous rupture [7]. Due to its widespread availability and sensitivity to hemorrhage, computed tomography (CT) is used by the vast majority of institutions as the initial imaging test for patients with acute cerebral ischemia [8]. In the United States, traumatic head injuries afflict more than 1.7 million people annually, including about 500,000 children. 52,000 people pass away as a result [9]. Adults under the age of 45 and children up to the age of 15 years both suffer from head injuries more frequently than other causes. Neuronal and vascular tissue are compressed and sheared at the moment of impact in a head injury patient due to mechanical stresses. Further abnormal occurrences could result in brain damage. In this sense, a quick diagnosis and better patient care depend on the use of CT [10]. Around 7.5 million visits in patient care settings occur due to dizziness each year, and it is one of the most frequent presenting ailments in the emergency room (ED). Vertigo is the most prevalent type of dizziness, accounting for about 54% of complaints [11]. CT is routinely employed as a first-line imaging modality to rule out posterior fossa bleeding or a big mass as a cause of vertigo [12]. Most people experience headaches at some point in their existence. They are a frequent symptom. Between 70 and 95 percent of Americans get headaches at least every other year [13]. An examination of the physical and neurological systems is necessary for the evaluation of headache. Patients who are clinically determined to have secondary headaches should undergo neuroimaging, with CT being the initial suggested study due to its affordability and ability to detect the majority of secondary headache causes [14]. Although there are significant radiation exposure dangers associated with CT, it is nevertheless employed for radiological diagnosis due to its accessibility, affordability, higher sensitivity, and flexibility to allow for patient movement. It is well recognized that computed tomography (CT) is less sensitive than magnetic resonance imaging (MRI) for the early identification of certain pathologies. However, a variety of factors, including patient mobility, the longer imaging time, and the more expensive nature compared to CT have made CT the centre of emphasis for excluding particular disorders [15]. The

following study contributed to the body of knowledge by finding the frequency, causes and findings of brain Computed Tomography scan at The University of Lahore Teaching Hospital in Pakistan. The results of this study indicated the true burden of diseases affecting brain in our population which will be beneficial for policy making and awareness campaigns in our population.

## METHODS

In this descriptive study, during the time period of 4-month, 202 (21.6%) of the 933 patients examined by the CT department of The University of Lahore Teaching Hospital underwent a brain CT scan. TOSHIBA Aquilion CXL 128 slices CT scanner was used. Brain CT Scan followed by proper brain CT protocols was performed on these patients. Inclusion criteria involved both genders. Patients who visited the hospital's radiology department were included in the study and underwent a physical evaluation. Patients of all age groups were included in this study. Patients with the following causes i.e., fall, RTA, vertigo, headache, nausea and vomiting, body weakness, drug abusers, loss of consciousness were included. Exclusion criteria focused on uncooperative patients and any other finding other than the brain. After the approval of synopsis, descriptive study was done at The University of Lahore Teaching Hospital, Lahore. Quantitative variables i.e., age, gender was recorded on data collection sheets. All collected data was entered in SPSS version 21.0. After determining if the patient needed a CT scan, the technologist sent the patient to the radiology department, where he or she was scanned in accordance with the CT guidelines. The data was analyzed and presented in the form of tables, pie charts and histogram.

## RESULTS

There were 78 (38.6%) female patients and 124 (61.4%) male patients out of 202 total patients. The mean age of the patients was  $47.1 \pm 23$  years. The table 1 shows that 202 (21.6 percent) of the 933 CT scans that were performed were of the brain, while the remaining 731 (78.3 percent) were of the rest of the body.

CT scan	Frequency (%)
Other CT scans	731 (78.3%)
Brain CT Scans	202 (21.6%)
Total	933 (100%)

**Table 1:** Frequency of Brain CT scan in University of Lahore Teaching Hospital

The table 2 illustrates the causes, their frequency and percentage of the Brain Computed Tomography Scans performed at University of Lahore Teaching Hospital. The table 2 also represents that 20 (9.9%) of the 202 patients had a history of falling. 17 (8.4%) out of 202 patients experienced RTA. 7 (3.5%) patients out of 202 overall

patients had a history of vertigo. 23 (11.4%) had headaches. 6 (3.0%) had a history of nausea and vomiting. 15 (7.4%) patients experienced body weakness. 2 (1.0%) patients had a history of vertigo while 14 (6.9%) had loss of consciousness.

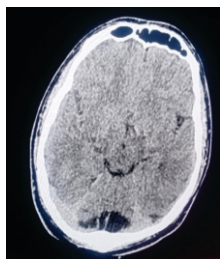
Causes	Frequency (%)
Fall	20 (9.9%)
RTA	17 (8.4%)
Vertigo	7 (3.5%)
Headache	23 (11.4%)
Nausea and vomiting	6 (3%)
Body Weakness	15 (7.4%)
Drug Abuser	2 (1%)
Loss of consciousness	14 (6.9%)

**Table 2:** Causes with frequency and Percentage of Brain Computed Tomography Scans

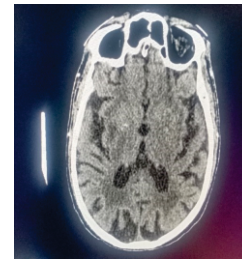
The table 3 illustrates the findings, their frequency and percentage of the Brain Computed Tomography Scans performed at University of Lahore Teaching Hospital. The table represents that there were 202 patients in total, 16 (7.9%) of whom had fractures. Infarction was identified in 51 (25.2%) patients. 24 (11.9%) developed ischemia demyelination. Cyst were identified in 7 (3.5%) of the 202 individuals overall. 63 (31.2%) had brain atrophy. Out of 202 patients in all, 16 (7.9%) experienced hemorrhage. Sinusitis was detected in 36 (17.8%). 2 (1.0%) patients developed abscess. 8 (4.0%) had mastoiditis while contusions were identified in 6 (3.0%). 8 (4.0%) patients had a diagnosis of carcinoma and tumors.

Findings	Frequency (%)
Fracture	16 (7.9%)
Infarction	51 (25.2%)
Ischemic Demyelination	24 (11.9%)
Cyst	7 (3.5%)
Cerebral Atrophy	63 (31.2%)
Hemorrhage	16 (7.9%)
Sinusitis	36 (17.8%)
Abscess	2 (1%)
Mastoiditis	8 (4%)
Contusions	6 (3%)
Carcinoma & Tumors	8 (4%)

**Table 3:** Findings with frequency and Percentage of Brain Computed Tomography Scans



**Figure 1:** The following image shows Hemorrhage. Age of the patient was 22 years and had a history of RTA



**Figure 2:** The following image shows brain atrophy. Age of the patient was 76 and had a history of headache

## DISCUSSION

The aim of our research was to determine the frequency, potential causes, and results of brain computed tomography scans at the University of Lahore Teaching Hospital. A descriptive study was done for the diagnostic purposes of the anomalies associated with the brain. Variables like age, gender, history of falls, and RTA etc. were asked about in-depth with patients who were entirely compromised. A total of 202 patients of all ages and genders who underwent CT were included in the data, including 78 (38.6%) female patients and 124 (61.4%) male patients. According to our research study, the most prevalent findings were brain atrophy which was observed in 63 (31.2%) of the patients, 51 (25.2%) patients had infarction, 36 (17.8%) had sinusitis, 24 (11.9%) had ischemic demyelination, and 16 (7.9%) had fractures and hemorrhages. However, mastoiditis, tumors, and carcinoma were reported in 8 (4.0%) patients and other 7 patients (3.5%) had cysts. 6 patients (3.0%) reported contusions and 2 patients (1.0%) had abscesses. A study was conducted by Mebrahtu-Ghebrehiwet et al., at Orotta Hospital in Asmara, Eritrea with the aim to evaluate "the profile of CT scan findings in cases of severe head trauma". A total of 110 patients with acute head trauma underwent cranial CT scan between the time period of January through March 2006, along with November until December 2007 where the average age of the patients were 32.5 years old. According to radiological report, in 60 cases (54.5%), aberrant CT findings were found, and in 50 cases, normal CT findings (45.5 percent). The most prominent CT results were intra cerebral hemorrhages, which were found in 22% of cases and cerebral contusions or lacerations, which were found in 16% of cases. It was determined that head trauma was primarily caused by accidents involving falls [16]. In our study, falling is the second most common reason for a CT scan (9.9%), and men are more likely to need one. This is due to the fact that men use motor vehicles more frequently than women in Pakistan and disregard safety measures like helmet use and the most common finding was brain atrophy which was observed in 63 (31.2%) of the patients. A research study was conducted by

Haghighi et al., Taba Radiology Center in Shiraz, Iran from April 2010 to August 2011. The aim of the study was to examine the frequency of anomalous results in pediatric brain CT scans as well as the causes of requests for brain CT scans. A total of 167 children were included in this study and 84 of them were males and 83 were females that accounted for 50.3% and 49.7% respectively. The reported complaints to perform head CT scan were headache in 73, head injury in 14, and seizure in 12 patients. Among 73 (60.8%) patients with headaches only 2.7% reported abnormal findings. The most often discovered aberrant findings included arachnoid cysts in 4 patients, cerebral hemorrhages in 3, atrophic alterations in 3 patients, hydrocephaly in 3 patients, and congenital underdevelopment in 2 patients [17]. Hemorrhage is the third most frequent finding in our study (7.9%), with subdural haemorrhage being the most frequent. Subdural bleeding originates in the veins, which is why it affects older people more commonly than younger people. Therefore, this form of haemorrhage results from the weakening of our blood vessels that occurs as we age. Additionally, our study revealed that extradural hemorrhages are more likely in men. Due to their higher risk of assault and traffic accidents, extradural bleeding occurs more frequently in men and younger people. Research was carried out by Wang et al., in Emergency Department at McMaster University, Canada from January 2004 to June 2006 in patients with age who are at least 18 years old and have not experienced trauma. The main purpose of the study was to look at computed tomography pictures to figure out the indicators of clinically significant atypical outcome in patients who came at emergency department of the hospital who had not suffered trauma. Out of 29469 consecutive head CT images, only 3967 were able to qualify for this research. Among them, 548 revealed clinically important abnormalities which makes 13.8%. There were 6 clinical predictors of significant abnormal findings on head CT scans, with the most significant ones being focal neurologic deficit, changed mental status, history of malignancy, nausea/vomiting, and abnormalities in coagulation profile [18]. In contrast, our research revealed that the most common cause to request CT scan was for the patients with headache i.e., 11.4% of the cases. In the other studies, women had a higher prevalence of headaches. However, more men than women had it in our study. Because Pakistan is an under-developed nation and its society is not very wealthy, the populace is under stress. Tension headaches result from persistent stress. Between the years of 2005 and 2015, Razavi-Ratki et al., did a study at Yazd Shahid Rahnemoun Hospital. The study's focus was on incidental CT findings in patients with head injuries. This study's objective was to evaluate how frequently incidental discoveries on CT scans of head trauma patients occurred

between 2005 and 2015. The most frequent incidental finding on CT scans that contributed to the study was calcifications, which were discovered in 3.3 percent of cases. Dandy walker malformations were found in 0.02 percent of cases. 1.60 percent of people had sinusitis, 1.20 percent had big cisterna magna, and 1 percent of people showed signs of infarction. The most frequent incidental finding on CT scans that contributed to the study was calcifications, which were discovered in 3.3 percent of cases. Dandy walker malformations were found in 0.02 percent of cases. 1.60 percent of people had sinusitis, 1.20 percent had big cisterna magna, and 1 percent of people showed signs of infarction [19]. In contrast, our study showed that infarction was found in 51 (25.2%) individuals. Infarction was more prevalent in men than in women because women have estrogen and progesterone, two hormones that operate as a protective barrier for them and help to prevent infarction [20]. In a study conducted by Simpson et al., where 4404 computed tomography exams that general practitioners sought between 1999 and 2007, there was a 10.5% positive rate. Among this, 9.1 percent of total of the anomalies were believed to be coincidental in origin, while 1.4% of the CT findings were considered to have aberrations that might be related to headaches [21]. When compared to the research we conducted, headache was the most typical reason for CT scans, accounting for 23 (11.4%) of the 202 (21.6%) patients who had a brain CT. Falls are the second-leading cause of unintended traumatic mortality over all age groups, right behind vehicle accidents [22]. According to all available data in the research conducted by Cooke et al., assaults, falls, and traffic accidents are the primary causes of brain injuries. However, there is wide regional variance, with the percentage of admissions attributable to traffic accidents ranging from 24% in Scotland to 90% in Taiwan [23]. There is further research that link head trauma from falls to brain injury with 29% present in Chicago and 30.5% in Massachusetts [24, 25]. Falls have a substantial impact on the morbidity and mortality of elderly individuals. In a retrospective case study of 318 patients in Massachusetts who were 60 years of age or older, 189 (or 59%) suffered brain injuries as a result of falls [26].

## CONCLUSIONS

According to our research, the vast majority of individuals who underwent CT scans had a history of headache and falls and the most frequent observation in the patients was brain atrophy. Other major findings found were sinusitis and infarction.

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