

The Profile of Head CT Scan Findings in Patients at Sebha Medical Center, Libya

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ABSTRACT:

Background: Computerized tomography (CT) is one of the most widely available and used methods of imaging. There are no known results published to show the most frequent findings on CT Scans of head in Sebha Medical Center in South Libya or the incidence of the different findings detected on the scans done in our region.

Objectives: To study the characteristics of patients who underwent CT scan of head in our center, to investigate the most common findings in these patients, and to describe the distribution of the findings in relation to patients' age and sex.

Materials and Methods: This was a retrospective observational descriptive study that involved reviewing the CT scans of 255 patients who underwent Head CT in our center in the period between the 8th of March 2015 and 9th of April 2015. The collected data were analyzed using SPSS program (version 20).

Results: Patients' age ranged from one month to 89 years of age. Almost equal numbers of male and females were found (129 and 126 respectively). Sixty eight percent of the cases had normal scans. The most common abnormalities were: brain infarction (11.2%), brain edema (6.1%), intracerebral hemorrhage (4.7%) and hydrocephalus (3.6%). Other findings were: skull fractures (3.2%), subdural hematomas (3.2%), masses (1.8%), subarachnoid hemorrhage (1.1%) and intraventricular hemorrhage (1.1%).

Conclusion: Most of the cases that undergo CT scan of head in south Libya have no detectable abnormalities by CT. The most common abnormalities seen are: infarctions (both old and new ones), brain edema, intracerebral hemorrhage and hydrocephalus.

Keywords: Head CT, South Libya, infarctions, intracerebral hemorrhage, intraventricular hemorrhage, subdural hematoma, skull fracture, brain edema, hydrocephalus, intracranial masses.

Computed tomography (CT) is a widespread and powerful imaging tool. Since its invention more than four decades ago its uses had grown rapidly and it became an essential tool to diagnose many conditions and help in guiding their management in different age

groups¹. In particular, CT scan of the head had proved to be a valuable tool in the diagnostic workup of conditions such as head trauma^{1,2}, brain tumours^{3,4} and epilepsy⁵.

The number of CT scans done in the United States is estimated to be more than sixty million scan per year⁶. In our medical center and during the period of this study (one month), about 578 scan were done. CT scans of head represent about 45% of these scans. We deal with almost all neuroimaging cases at Sebha Medical Center, the sole neuroimaging center in South. We believe that studying frequency of findings on head CT scans done in our

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center can give a good idea about the most common intracranial pathologies in our region and surrounding area in addition to outlining the characteristics of patients having them.

PATIENTS AND METHODS:

This is a retrospective observational descriptive study. It took place in the radiology department of Sebha Medical Center which is 480 beds teaching hospital in south Libya. This center serves the needs of Sebha district population which was estimated to be about 116,016 in 2012⁷ and receives referred cases from other districts in south Libya such as Wadi ash-Shati (82,505), Wadi al-Hayaa (73,872), Murzuq (81,791) and Ghat (23,929)⁷ for further investigations and management.

In this study, we reviewed all the scan for the cases that underwent CT scan in the

period between the 8th of March 2015 and the 9th of April 2015 (587 cases) on our CT Scanner hard disk and chose the ones that underwent head CT (with or without contrast) which were 255 cases. We collected patients’ ages, genders and referring department name from the Scanners log and reviewed the images to identify the abnormal findings. These data were analyzed using SPSS software (version 20).

RESULTS:

The total number of the patients who underwent head CT scan in the study period was 255 patients, their age ranged from 1 month to 89 years of age. This group included 129 male patients (50.6% of the total) and 126 female patients (49.4%). Figure 1 provides the demographics characteristics of the study group.

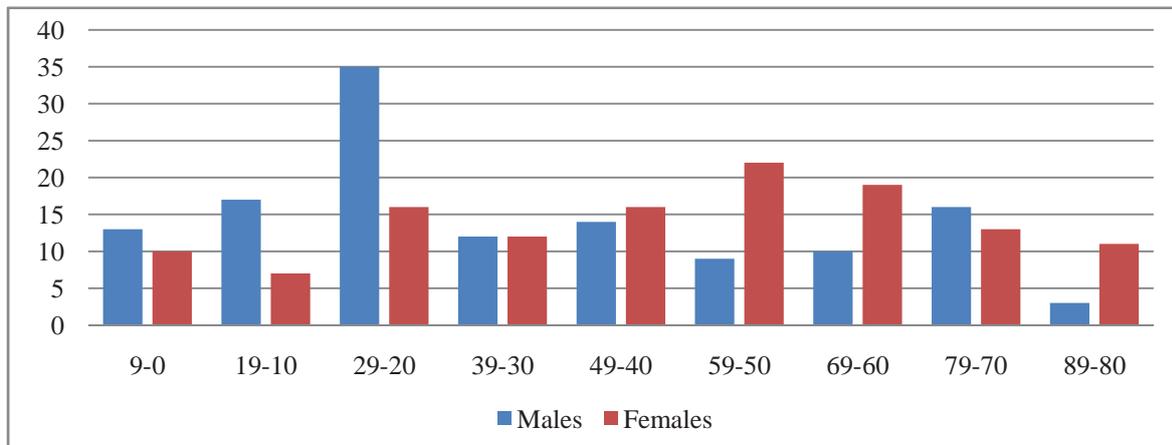


Figure 1: The gender and age groups of the studied patients

As for referring departments, most of the patients (58% of cases) came as outpatients from clinics and private practices, followed by the department of Internal Medicine (21% of cases) and Trauma Department (12%). The department that referred the least number of cases is the department of obstetrics which had sent only one patient (0.4%) (Figure 2).

Most of the scans done didn’t show any abnormalities (64% of cases). The most

common abnormalities seen are infarction including new and old ones (11.2% of cases) followed by brain edema (6.1% of cases) and then by intracerebral hemorrhage (4.7% of cases). The least common findings in our sampled population are Intraventricular hemorrhage and Subarachnoid hemorrhage which were both found in 1.1% of cases (Table 1).

When findings are studied in relation to patients’ age groups (Table 2), it is noted that the very young group (0-9 years) and

the very old groups (70-79 and 80-89) are the ones least likely to have normal scan. The pattern of abnormalities differs from one group to another. The most common abnormalities found in patients who are 9 years of age or less and from 10 years to 19 years are brain edema (due to trauma) and hydrocephalus, while in patients

between 20 and 29 years of age they are brain edema and skull fractures (both are caused by trauma). Above these ages, infarctions (both old and new) are the most common findings, and they increase progressively with age till they become the finding seen in 57.1% of the cases above 80 years of age in our study population.

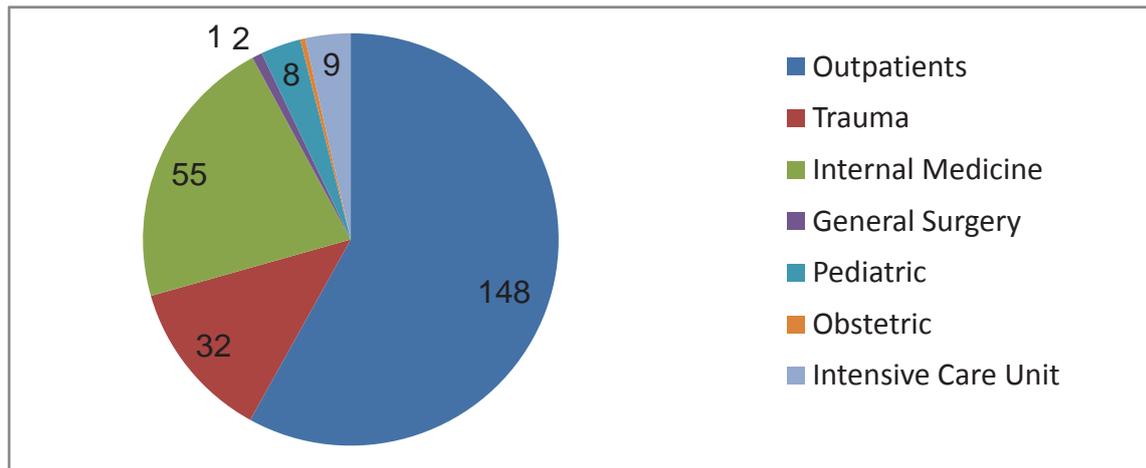


Figure 2: Distribution of studied patients per departments
 Table 1: Number and percentage of studied patients with each finding on their CT scans.

Finding	Number of patients	
	N	Percent
Normal Scan	178	64.0%
Intracerebral hemorrhage	13	4.7%
Intraventricular hemorrhage	3	1.1%
Subarachnoid hemorrhage	3	1.1%
Subdural Hematoma	9	3.2%
infarction (old or new)	31	11.2%
Mass	5	1.8%
Brain edema	17	6.1%
Hydrocephalus	10	3.6%
Skull fracture	9	3.2%

Some of the findings were more common in males and others were more common in females (Table 3). Intracerebral

studied patients per departments hemorrhages for example were found in 12 males and only one female. Skull fractures, subarachnoid hemorrhage, subdural hemorrhage and brain edema were also more common in males than in females. On the other hand, infarction and masses were found in female patient more than males. Hydrocephalus was found in equal numbers of male and females.

DISCUSSION:

In our study we found that only 36% of the cases that undergo CT scan of the brain had pathologies that could be identified by CT. The remaining 64% of cases were either normal or they had abnormalities that needed other imaging modalities, like MRI, to identify them.

The most common findings we encountered were infarctions (in about 11.2% of cases). We believe that our patients had a larger number of infarctions than that we identified. This belief is based on the fact that silent infarcts are common, but CT is less sensitive for them than

Table 2: CT scan findings per age group among the studied patients

Finding	Patients age									
	0 - 9 yrs	10 - 19 yrs	20 - 29 yrs	30 - 39 yrs	40 - 49 yrs	50 - 59 yrs	60 - 69 yrs	70 - 79 yrs	80 - 89 yrs	
Normal Scan	12 (52.2%)	20 (83.3%)	35 (68.6%)	19 (79.2%)	23 (76.7%)	27 (87.1%)	22 (75.9%)	15 (53.6%)	5 (35.7%)	
Intracerebral hemorrhage	2 (8.7%)	0 (0.0%)	6 (11.8%)	0 (0.0%)	1 (3.3%)	1 (3.2%)	1 (3.4%)	1 (3.6%)	1 (7.1%)	
Intraventricular hemorrhage	1 (4.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.1%)	
Subarachnoid hemorrhage	1 (4.3%)	0 (0.0%)	1 (2.0%)	0 (0.0%)	1 (3.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Subdural Hematoma	0 (0.0%)	1 (4.2%)	3 (5.9%)	1 (4.2%)	0 (0.0%)	0 (0.0%)	1 (3.4%)	2 (7.1%)	1 (7.1%)	
infarction (old or new)	0 (0.0%)	0 (0.0%)	1 (2.0%)	2 (8.3%)	3 (10.0%)	2 (6.5%)	5 (17.2%)	10 (35.7%)	8 (57.1%)	
Mass	0 (0.0%)	2 (8.3%)	1 (2.0%)	0 (0.0%)	2 (6.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Brain edema	5 (21.7%)	0 (0.0%)	9 (17.6%)	1 (4.2%)	0 (0.0%)	1 (3.2%)	0 (0.0%)	0 (0.0%)	1 (7.1%)	
Hydrocephalus	4 (17.4%)	1 (4.2%)	0 (0.0%)	1 (4.2%)	2 (6.7%)	0 (0.0%)	1 (3.4%)	1 (3.6%)	0 (0.0%)	
Skull fracture	1 (4.3%)	1 (4.2%)	7 (13.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Total	23	24	51	24	30	31	29	28	14	

Table 3: Frequency of findings in relation to patients' sex among the studied group

Finding	Patient Sex		Total
	Male	Female	
Normal Scan	81 (45.5%)	97 (54.5%)	178
Intracerebral hemorrhage	12 (92.3%)	1 (7.7%)	13
Intraventricular hemorrhage	3 (100.0%)	0 (0.0%)	3
Subarachnoid hemorrhage	2 (66.7%)	1 (33.3%)	3
Subdural Hematoma	8 (88.9%)	1 (11.1%)	9
Infarction (old or new)	12 (38.7%)	19 (61.3%)	31
Mass	1 (20.0%)	4 (80.0%)	5
Brain edema	14 (82.4%)	3 (17.6%)	17
Hydrocephalus	5 (50.0%)	5 (50.0%)	10
Skull fractures	9 (100.0%)	0 (0.0%)	9

MRI^{8,9}. Hemorrhagic strokes (Intracerebral hemorrhage and Subarachnoid hemorrhage) were seen in 16 patients (6.3% of cases). The distribution of those findings correlates with the incidence and prevalence of their causes in the patients. Infarcts start to appear in the patients who are 30 years or older in our study population, and they increase progressively with patients' age and this correlates with the increase in risk factors for ischemic cerebrovascular accidents^{10,11}. The high number of hemorrhagic strokes in patients younger than 30 years of age is likely to be related to the high incidence of trauma in this age group and this explanation is supported by the fact that all our cases who had this findings on imaging were referred from the trauma department and by the fact that this group of patients had also the highest number of brain edema and skull fractures found in our study.

There are some limitations in our study. The first one is its retrospective nature which limited the information we could obtain. The second of them is the relatively small sample size which didn't allow for the detection of rare conditions that could be visualized on CT scan of the head. The third limitation is that it didn't include detailed recording of new and old infarcts as we grouped them together in the data collection stage and in the analysis.

As far as we know, our study is the first one that tries to study these findings on CT imaging and it can serve as a starting point for more studies to evaluate the findings in CT scans of the head and other regions of the body in term of their frequencies in the imaged cases.

CONCLUSION:

Most of the cases that undergo CT scan of head have no abnormalities that can be detected by CT scan. The most common

abnormalities found are infarctions, brain edema, intracerebral hemorrhages and hydrocephalus.

ETHICAL CONSIDERATIONS:

Permission from the ethical and scientific committee of Sebha Medical Center was taken, patients consent was not needed because the study was retrospective, didn't involve any collection of new data or intervention of any sort. Patients' privacy was maintained by anonymization of the collected data.

COMPETING INTEREST:

No competing interests.

AVAILABILITY OF DATA UPON REQUEST:

Data available on request.

AUTHORS' CONTRIBUTION:

1. Mahmoud Hussein Milad: Study concept and design, revising the article critically for important intellectual content.
2. Abdalla Mutwakil Gamal: acquisition, analysis, interpretation of data, drafting the article.

REFERENCES:

1. Chandrapal T, Palled ER. Assessments of Role of CT scan in Patients with Cranio- Cerebral Trauma. *IJRSTAT*. 2014; 10(2):290-3.
2. Lee B, Newberg A. Neuroimaging in Traumatic Brain Imaging. *NeuroRx*. 2005 Apr; 2(2): 372-383.
3. Taghipour ZS, Rezaei SM, Dehghani F. Evaluation of Diagnostic Value of CT Scan and MRI in Brain Tumors and Comparison

- with Biopsy. *Iran J PedHematolOncol*. 2011;1(4):121-5.
4. Bailey M, Qureshi A, Kamaly-Asl I. The role of CT body scans in the investigation of patients with newly diagnosed brain tumours. *Br J Neurosurg*. 2014 Jun;28(3):347-50.
5. Maytal J, Krauss JM, Novak G, Nagelberg J, Patel M. The role of brain computed tomography in evaluating children with new onset of seizures in the emergency department. *Epilepsia*. 2000 Aug;41(8):950-4.
6. Thompson RJ, Wojcik SM, Grant WD, Ko PY. Incidental Findings on CT Scans in the Emergency Department. *Emergency Medicine International*. 2011;2011:4 pages. doi:10.1155/2011/624847
7. Brinkhoff T. Libya: Districts & Major Cities - Population Statistics in Maps and Charts [Internet]. City Population; c2015 Feb 7 [updated 2015 Mar 7; cited 2015 Apr 13]. Available from: <http://www.citypopulation.de/Libya.html>
8. Bhadelia RA, Anderson M, Polak JF, et al. Prevalence and associations of MRI-demonstrated brain infarcts in elderly subjects with a history of transient ischemic attack. *The Cardiovascular Health Study. Stroke*. 1999 Feb;30(2):383-8.
9. Price TR, Manolio TA, Kronmal RA, et al. Silent Brain Infarction on Magnetic Resonance Imaging and Neurological Abnormalities in Community-Dwelling Older Adults .*The Cardiovascular Health Study. Stroke*. 1997; 28: 1158-1164
10. Panel, Sacco RL, Benjamin EJ, Broderick JP, et al. Risk Factors. *Stroke [Internet]*. 1997 Jul 1;28(7):1507-17. Available from: <http://stroke.ahajournals.org/content/28/7/1507.short>
11. Sacco RL. Risk factors and outcomes for ischemic stroke. *Neurology*. 1995 Feb;45(2 Suppl 1):S10-4.