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A RETROSPECTIVE STUDY ON CEREBRAL INFARCTIONS AND DRUG UTILIZATION REVIEW IN MENINGITIS PATIENTS AT TERTIARY CARE HOSPITALS

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ABSTRACT

Stroke is one of the leading causes of death in world-wide. Cerebral infarction is one of the complications observed in meningitis patients. **Aim:** The primary aim of our study is to identify cerebral infarctions in meningitis patients at tertiary care hospital. **Objective:** To determine basic demographic characters (age, gender), type of cerebral infarction, regions and arteries involved in cerebral infraction, clinical manifestations, treatment. **Methods:** A total of 140 meningitis patients were collected from hospital recruited since January 2021 - August 2021. Patients were separated by stroke group and non-stroke group by computerized tomography impressions, magnetic resonance imaging impressions. The patients were selected based on inclusion criteria. **Results and Conclusion:** Our study showed cerebral infarctions are seen in 90 patients (64.2%) out of 140 patients. Mainly the ages between 20-40 and 40-60 are affected from stroke in meningitis. Males and females are nearly equal to the exposure of stroke in meningitis. Acute infracts (55.5%) are more in patients with meningitis. The most common site of exposure is in frontal lobe. Infracts are severely seen in middle cerebral artery and posterior cerebral artery. In the whole study 6 patients were dead. Rest of the patients are receiving medications such as antibiotics, anti tubercular agents, anti convulsants and medications for stroke are antiplatelets, statins and vasodialators are prescribed.

KEYWORDS

Meningitis, Cerebral infarctions, Computed tomography and Magnetic resonace imaging.

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INTRODUCTON

Meningitis is the inflammation caused to meninges. Tubercular meningitis is caused by mycobacterium tuberculosis and is the most common form of central nervous system tuberculosis. The main compliactions of TBM include cerebral stroke, hydrocephalus, and tuberculoma formation[1]. It has been reported that incidence of stroke is about 13-

57% in TBM patients, which can cause poor clinical outcome. The mortality is 3 times higher in TBM patients with stroke compared to those without[2]. The risk factors of stroke are basal meningeal enhancement, basal exudates, hydrocephalus, and hypertension.

Meningitis

Meningitis is defined as inflammation of meninges. Meninges are the three connective tissues covering and protecting the brain. Meninges are classified as follows

Dura mater

Arachnoid mater

Pia mater

Dura mater

The outermost layer, the leathery duramater, is a double layered membrane where it is surrounded by brain. The duramater is made up of fibroblasts and large amounts of extracellular collagen[3]. The duramater consists of two layers: periosteal/endosteal layer (layer of periosteum that covers inner surface of skull) and the meningeal layer which limits the rotational displacement of brain.

Arachnoid mater

The middle layer is the weblike arachnoid mater; its thread like extensions spans the subarachnoid space to attach the innermost membrane (piamater). It passes through the foramen magnum and descend descends caudally to S2 vertebral level.

Pia mater

The pia mater is the innermost layer which is delicate and attaches tightly to the surface of brain and spinal cord.

Stroke (CVA)

Stroke is a medical condition in which poor blood flow to the brain results in cell death. Stroke is one of the most common neurological disorders in clinical practice[4]. According to WHO, it is the second commonest cause of death worldwide. It is forecasted that the deaths because of the stroke will rise to 6.5 million by 2015 and 2020, stroke is expected to be the leading causes of loosing life. Stroke is responsible for around 11% of all deaths worldwide.

Study design

This was a retrospective cohort study in which information was obtained from CT, MRI scan impressions, clinical outcomes and other radiological findings in meningitis patients. The information is collected from tertiary care hospitals that are diagnosed as meningitis from January 2021 - August 2021 to evaluate the cerebral infarcts in meningitis patients

Study site

The study was carried in tertiary care hospitals of Guntur district

Study population and sampling

A sample of 140 subjects was taken into the study to find the cerebral infarctions in meningitis patients. Between 2020 and 2021, we collected data from all the patients with meningitis. Cerebral infarction is the major complication we can see in meningitis patients. Since knowledge of cause of disease is the most important factors in controlling the disease.

Study critera

Inclusion criteria

Patients who are diagnosed as meningitis

Population who were 18 years or older

Availability of MRI and CT scan impressions.

Exclusion criteria

Population who were below 18 years.

The pregnancy patients, lactating mothers

Patients who are not diagnosed as meningitis

Absence / missed CT and MRI scan reports.

METHODS

Study starts with collection of patient data as per the inclusion criteria such as basic demographic details (age, gender), computerised tomography (CT) impressions and magnetic resonance imaging (MRI) scan impressions, clinical manifestations, past medical history, personal history, lab data and present treatment.

The arteries which are undergone for infarction were categorised and examine the region of the blood supply.

The various arteries were medial lenticulostriate arteries, lateral lenticulostriate arteries, cortical branches, terminal penetrating arteries of the basilar artery and perforators of the posterior cerebral artery (PCA).

The A1 segment of the anterior cerebral artery (ACA) or the deep branches of the anterior cerebral artery give rise to the medial lenticulostriate

arteries. Medial lenticulostriate arteries supply the head of the caudate nucleus, the genu and anterior limb of the internal capsule and the anterior part of globus pallidus.

The lateral lenticulostriate arteries are branches of the horizontal M1-segment of the middle cerebral artery (MCA). These are deep penetrating branches or lenticulostriate branches of middle cerebral artery. The arteries supply the head and body of caudateStudy starts with collection of patient data as per the inclusion criteria such as basic demographic details (age, gender), computerised tomography (CT) impressions, and magnetic resonance imaging (MRI) scan impressions, clinical manifestations, past medical history, personal history, lab data and present treatment.

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Interviewers

The interviews were carried out by the students of the project members by collecting patient information from case profile forms. The interviewers were familiarized with collecting the appropriate data which includes cerebral infarction findings from CT and MRI scans. A brief introduction about the purpose and nature of the study and assurance about confidentiality were explained to the respondents prior to the interview. The interview for each respondent lasted 10 to 15 minutes on average.

Data analysis

All descriptive statistics were done with statistical package for social sciences, SPSS (Software version 11.0). Continuous variables were expressed as means and standard deviation. In addition, categorical values were expressed as freqencies and percentages.

Study variables

Outcome variable

The main outcome variable in this study was to identify cerebral infarctions in meningitispatients.

Independent variables

Two groups of independent variables were measured in relation to the attitudes towards stroke medication adherence.

Socio-demographic characteristic of the respondents

The age, gender, family history was considered and risk factors were evaluated.

Mediating Variables

Impressions of CT scan, MRI scan are evaluated to assess the cerebral infarctions in specific arteries that supply to specific organs of brain.

Ethical issues

The following ethical issues were considered in the design of the study:

The participants were briefed regarding the nature, objectives and method ofstudy and their voluntary participation acquired.

Participants were reserved the right to withdraw from the study at any point oftime.

Total confidentiality with regard to the identification of the participants and information volunteered was assured at all times during and after survey.

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RESULTS AND DISCUSSION

A total of 140 patients were admitted in hospital with the diagnosis of meningitis in which 50(35.7%) patients were excluded from the study as their CT scan impressions were normal without any cerebral infarctions, finally 90(64.2%) patients were includedin this study.

Age Distribution

A total of 90 patients were analysed in a period of 6 months study. Table No.1 explains the details of age distribution among meningitis patients with cerebral infarctions. It concludes that among 90 patients the ages between 20-40 and 40-60 are mostly effected.

Gender Distribution

Figure No.3 explains the details of gender distribution in meningitis patients with cerebral infarctions. It concludes that there is a slight difference in exposure among males and females. The percentages are as follows: Males – 43 (47.7%), Females – 47 (52.2%).

Cerebral infarcts in meningitis patients

Cerebral infarcts are classified based on intensity and location of infract. Table No.3 summarizes that patients affected with acute infract – 50 (55%), chronic infract – 20 (22%), lacunar infract (12.2%).

Figure No.5 depicts the detailed information of lobes involved in various infarcts. Acute infarcts and chronic infarcts are seen in frontal lobe, parietal lobe, temporal lobe, occipital lobe, capsulo-ganglionic region and caudate nucleus. Lacunar infarcts are majorly seen in capsulo ganglionic region and caudate nucleus.

Cerebral infarctions in arteries

The main arteries which supply blood to the brain are middle cerebral artery, anterior cerebral artery, inferior cerbral artery and posterior cerebral artery. Figure No.6 depicts the results of infarcts in respective arteries:

Middle cerebral artery (MCA) is the most effected artery in which it has several braches such as M1, M2 segments which supplies blood to medial and lateral lenticulostriate arieries, prefrontal arteries thereby organs such as caudate nucleus, genu, internal capsule, temporal, parietal lobes.

Posterior cerebral artery is the second most affected in which it supplies blood to basilar arteries, vertebral arteries and cerebellum. Anterior cerebellar aretry supplies blood through medial lenticulostriate arteries, callosal arteries to thalamus, corpus callosum, hypothalamus, gyri, caudate nucleus.

Clinical manifestations

Figure No.7 depicts the clinical symptoms observed in meningitis patients with cerebral infarctions are as follows: altered sensorium, ataxia, back pain, blurred vision, chicken pox, chills and cough, fever, froathing, giddiness, headache, loss of speech, mouth deviation, seizures, tongue bite, urinary incontinance, vertigo, vomitings, weakenss.

Drug utilization review

Table No.6 depicts the drugs which are prescribed in meningits patients. Mostly drugs such as wide range of antibiotics, anti tubercular agents, corticosteroids, anti convulsants, cognitive enhancers are prescribed. 6 patients are dead, and rest of the patients are administered with the following drugs which are listed as follows:

Drugs prescribed in meningitis patients with cerebral infarctions

Only 47 patients (52.2%) were treated for cerebral infarctions in the brain. 6 patients were subjected to death. Treatments given for cerebral infarctions in

brain were ecospirin (anitplatelet drug), atorvostatin (statins), and isosorbid dinitrate (vasodialator).

Table No.1: Age distribution in meningitis patients with cerebral infarctions

S.No	Age	No.of patients	Percentage (%)
1	20 – 40	45	50 %
2	41 - 60	18	20%
3	61- 80	12	13.3%
4	81 - 100	04	4.44%

Mean ± SD - 41.36 ± 19.86

Table No.2: Gender distribution in meningitis patients with cerebral infarctions

S.No	Gender	No. of patients	Percentage (%)
1	Males	43	47.7 %
2	Females	47	52.2%

Table No.3: Type of cerebral infarcts observed in meningtis patients

S.No	Type of infract	No. of patients	Percentage (%)
1	Acute infract	50	55%
2	Chronic infract	20	22%
3	Lacunar infract	11	12.2%

Table No.4: Arteries involved in cerebral infraction

S.No	Arteries involved	No.of patients	Percentage (%)
1	ICA	9	15.5
2	MCA	23	39.6
3	PCA	20	34.4
4	ACA	6	10.3

Table No.5: Clinical symptoms in meningitis patients

S.No	Clinical Symptoms	No. of Patients
1	Altered Sensorium	31
2	Ataxia	2
3	Back Pain	1
4	Blurred Vision	2
5	Chills and Cough	20
6	Fever	55
7	Froathing	2
8	Giddiness	15
9	Headache	54
10	Loss Of Speech	4
11	Mouth Deviation	2
12	Seizures	15
13	Toungue Bite	1
14	Urinary Incontinence	1
15	Vertigo	2
16	Vomitings	51
17	Weakness	16

Table No.6: Mostly prescribed drugs in meningitis patients

S.No	Class of Drug	Drug Name	No.of Patients Prescribed
1	Antituberculosis	Ethambutol	62
		Isoniazid	64
		Pyrazinamide	69
		Rifampicin	69
2	Corticosteroid	Prednisolone	80
		Naproxen Sodium	16
		Deflazocort	7
3	Anti Convulsants	Levitracetam	38
		Phenobarbitol	7
		Clobazam	13
		Clonazepam	5
		Phenytoin	33
		Acetazolamide	3
4	Cognitive Enhancers	Cerecetum	9
5	Antibiotics	Cephalosporins	42
		Meropenum	4
		Vancomycin	4
		Acyclovir	6
		Antifungal	5
		Aminoglycosides	13
		Flouroquinolones	12

Table No.7: Treatment for cerebral infarctions

S.No	Class of drug	Name of drug	No. of patients
1	Antiplatelet	Aspirin	35
2	Statins	Atorvastatin	18
3	Isosorbid Vasodialators dinitrate		9

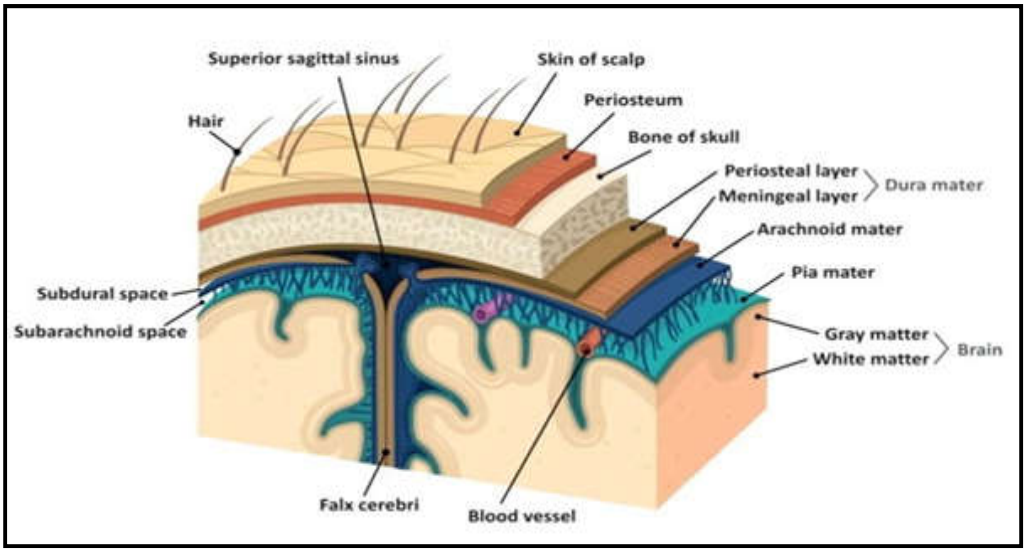
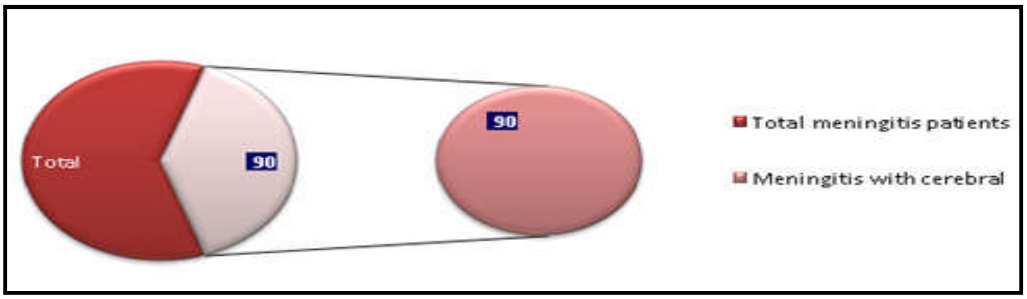
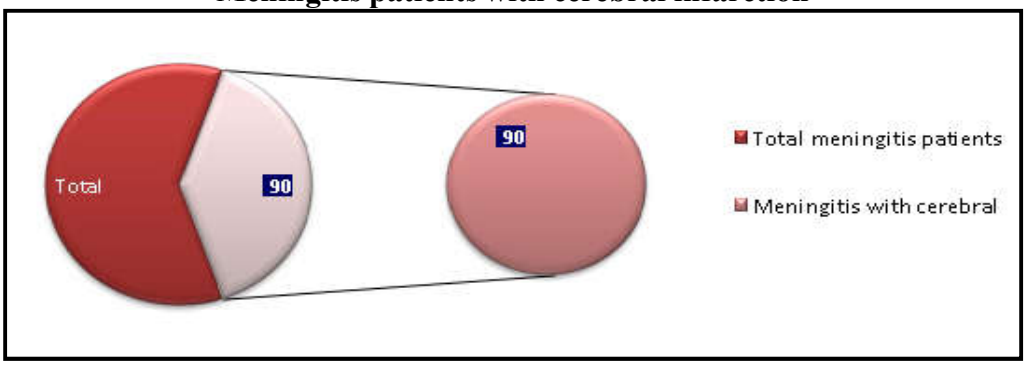


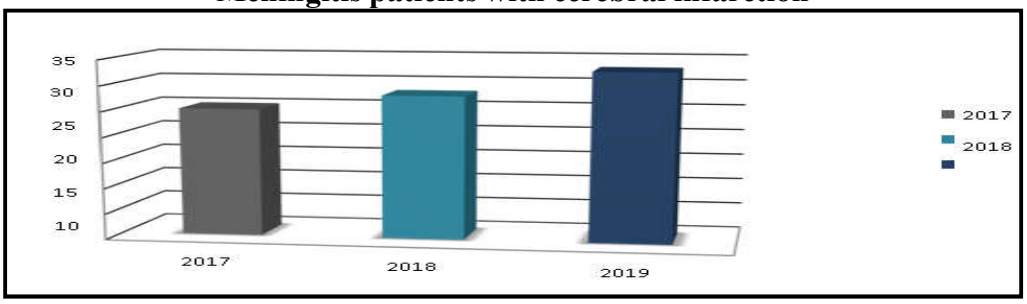
Figure No.1: Types of meninges



Meningitis patients with cerebral infarction



Meningitis patients with cerebral infarction



Cerebral infarctions in meningitis patients 2017 – 2019

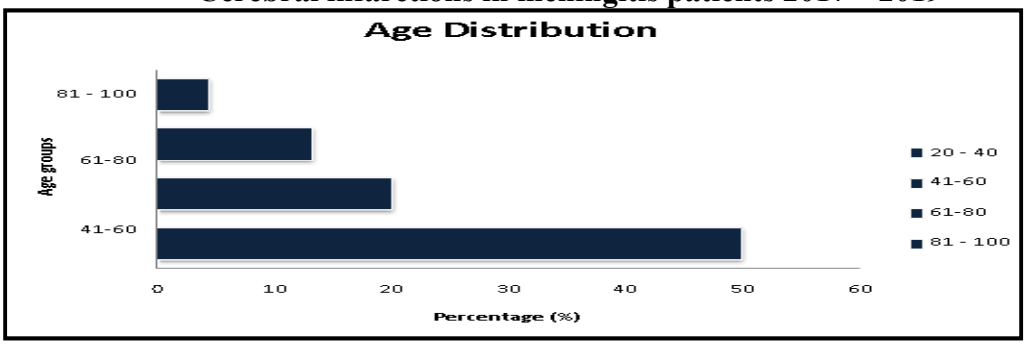


Figure No.2: Age distribution in meningitis patients with cerebral infarcts

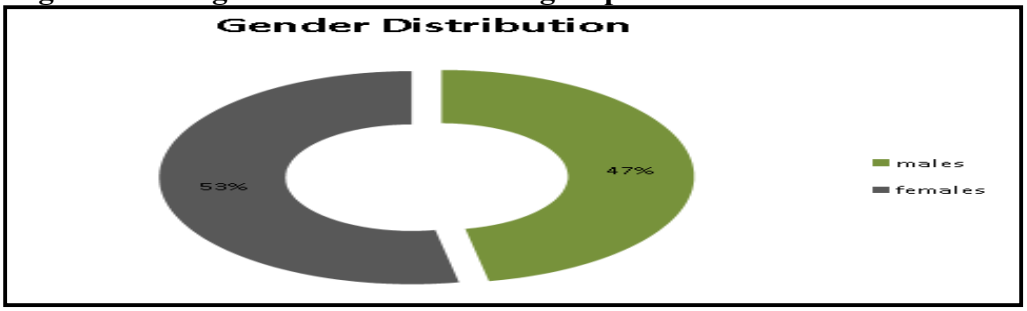


Figure No.3: Gender distribution in meningitis patients with cerebral infarcts

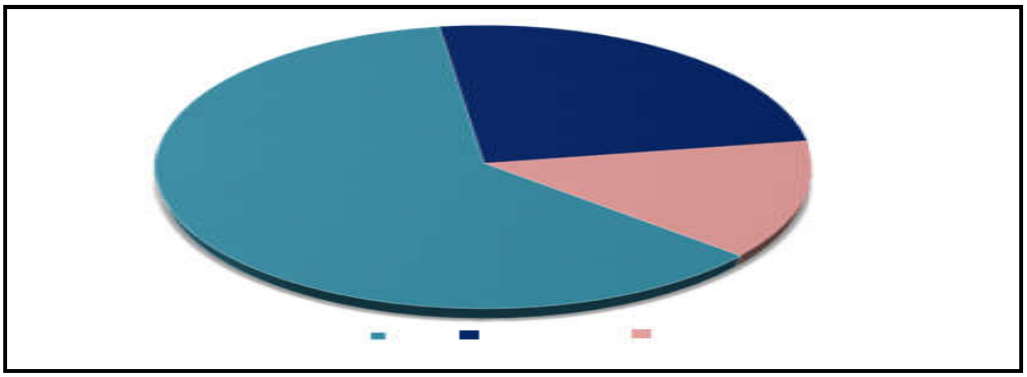


Figure No.4: Cerebral infarcts in meningitis patients

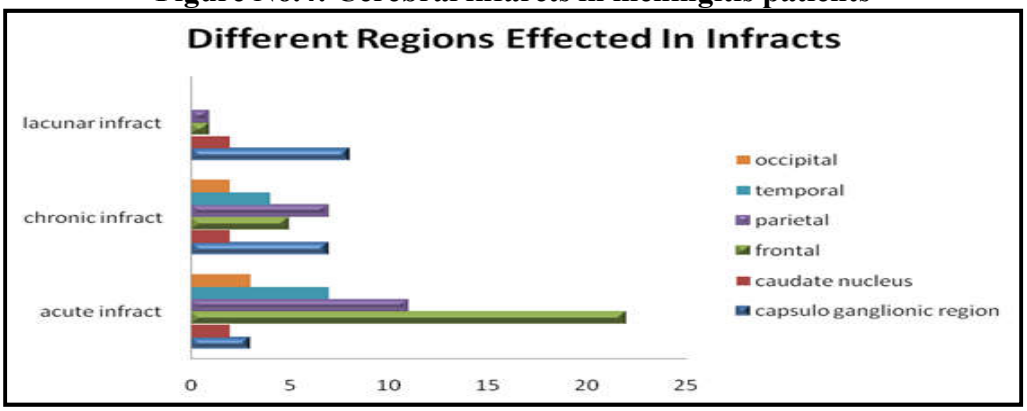


Figure No.5: Different regions affected in infarcts

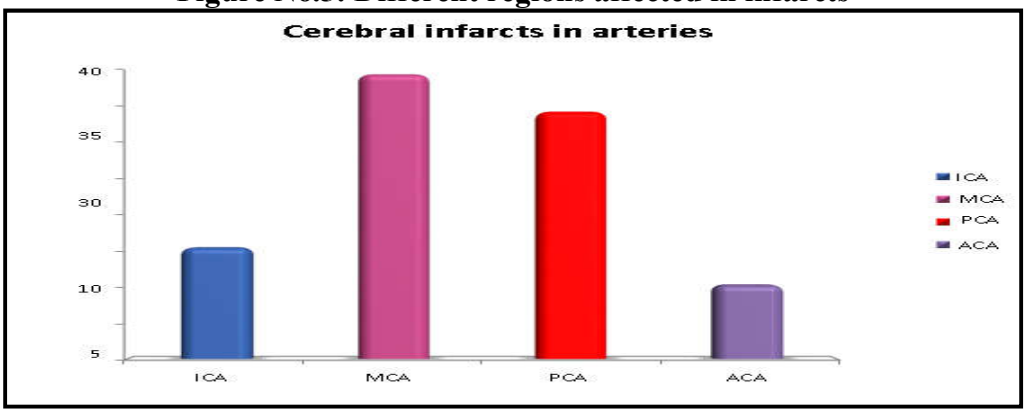


Figure No.6: Cerebral infarcts in arteries

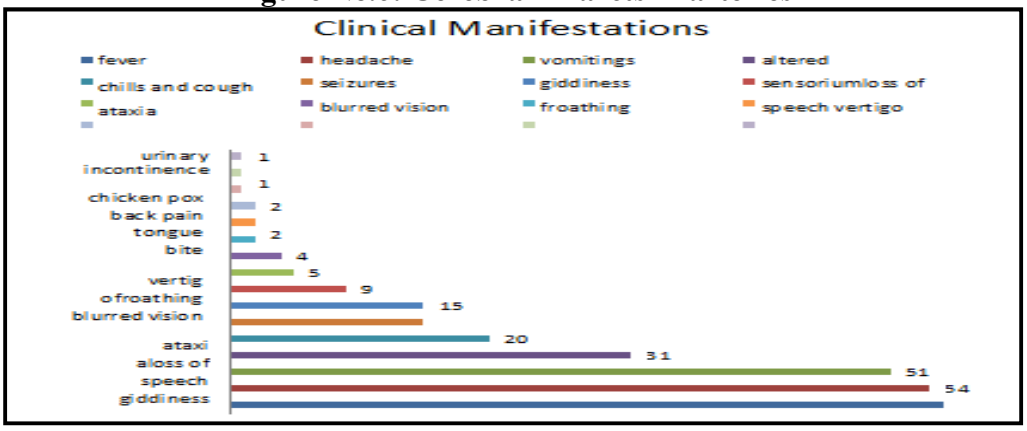


Figure No.7: Clinical manifestations

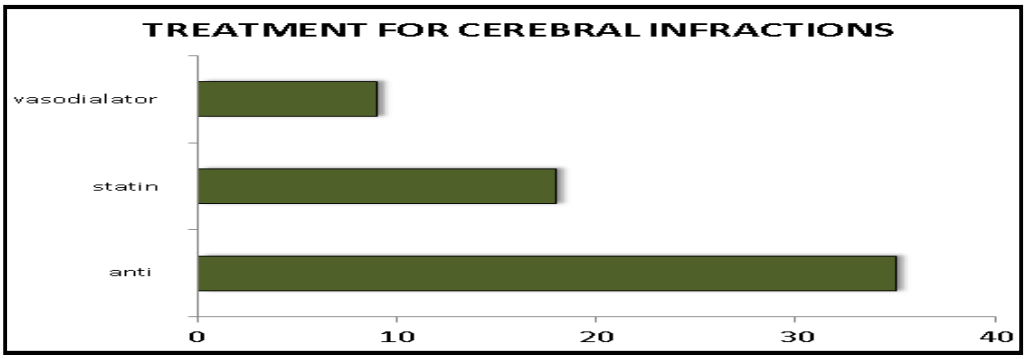


Figure No.8: Treatments given for cerebral infarctions

CONCLUSION

Stroke is one of the leading causes of death in world-wide. It has been reported that several infectious diseases such as meningitis are leading to stroke. This was a retrospective cohort study in which information was obtained from CT, MRI scan impressions and clinical outcomes in meningitis patients. The information is collected from territory care hospitals that are diagnosed as meningitis from January 2021 – August 2021 to evaluate the cerebral infarcts in meningitis patients. A sample of 140 subjects was taken into the study to find the cerebral infarctions in meningitis patients. Between 2020 and 2021, we collected data from all the patients with meningitis. Cerebral infarction is one of the complication we can see in meningitis patients. Since knowledge of cause of disease is the most important factors in controlling the disease.

A total of 140 patients were admitted in hospital with the diagnosis of meningitis in which 50(35.7%) patients were excluded from the study as their CT scan impressions were normal without any cerebral infractions, finally 90(64.2%) patients were included in this study. Mainly the ages between 20-40 and 40-60 are affected from stroke in meningitis. Males and females are nearly equal to the exposure of stroke in meningitis. The results are as follows: males (47%), females (53%).

Acute infracts (55.5%) are more in patients with meningitis, chronic infracts (22%), lacunar infracts (12.2%). The most common site of exposure is in frontal lobe in which it is full of dopamine sensitive neurons that are responsible for attention, memory, planning, motivation, ataxia, and movements. Infracts are severely seen in middle cerebral artery (39.6%), posterior cerebral artery (34.3%), anterior cerebral artery (10.3%), inferior cerebral artery (15.5%).

Infracts in specific arteries leading to decreased blood supply in basal ganglia, thalamus, hypothalamus, capsulo-ganglionic region, gyri, cerebellum in which leading to impairment of brain functions. Clinical symptoms observed in meningitis patients with cerebral infractions are as follows: altered sensorium, ataxia, back pain, blurred vision, chicken pox, chills and cough, fever, froathing, giddiness, headache, loss of speech, mouth deviation, seizures, tongue bite, urinary incontinance, vertigo, vomitings, weakenss.

In the whole study 6 patients were dead. Rest of the patients are receiving medications such as antibiotics (cephalosporins, meropenum, vancomycin, antiviral, antifungal, macrolide antibiotics, aminoglycosides), anti tubercular agents (isoniazid, rifampIcin, pyrazinamide, ethambutol), corticosteroids (wysolone, deflazocort, naproxen sodium), anti convulsants (phenytoin, levitracetam, clobazam, clonazepam, phenobarbitol) and medications for stroke are antiplatelets (ecospirin), statins (atorvostatin), vasodialators (isosorbid dinitrate).

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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