Original Article

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Clinico-aetiological Profile of Meningoencephalitis: A Prospective Observational Study in a Tertiary Care Centre, Hubli, Karnataka, India

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ABSTRACT

Introduction: Meningoencephalitis is a syndrome leading to fatality and neurological damages. Worldwide, infection of the central nervous system is the most common cause of meningoencephalitis. In encephalitis, a leptomeningeal involvement along with inflammation of brain parenchyma is invariably present and the clinical symptoms reflect both diffuse and focal cerebral pathology as well as meningitis. Correct immediate diagnosis and introduction of early symptomatic and specific therapy has a dramatic influence upon survival and reduces the extent of permanent brain injury and also has major impact on the outcome.

Aim: To study the clinical profile and aetiological causes of meningoencephalitis and also to analyse the mortality and morbidity due to meningoencephalitis in a tertiary care centre.

Materials and Methods: It was a prospective observational study conducted between December 2018 to December 2020 in a tertiary care centre, Karnataka Institute of Medical Sciences, Hubali, Karnataka, in which 184 patients of meningoencephalitis who fulfilled inclusion criteria were included. Detailed history and clinical examination was done followed by laboratory investigations, complete haemogram, serum electrolytes, liver function tests, Fundoscopy, Electroencephalography (EEG). Cerebrospinal Fluid (CSF) analysis including CSF culture and Cartridge Based Nucleic Acid Amplification Test (CBNAAT), Computed Tomography (CT)/Magnetic Resonance Imaging (MRI) brain were also done and results analysed. Microsoft (MS) Excel and MS word was used to obtain various types of graphs such as bar diagram, pie diagram. Percentages and means were calculated using Statistical Package for Social Sciences (SPSS) statistics software version 22.0.

Results: Out of 184 patients, majority of patients were in the age group of 31 to 50 years accounting for 85 (46.2%) of cases. Majority of patients were males (n=113) than females (n=71). Tubercular aetiology was found in 51.6%, viral cause in 25%, bacterial cause in 21.2%, fungal cause in 2.17% of patients. Out of 184 patients of meningoencephalitis, 50% patients recovered, 27.17% patients recovered with residual neurological deficit, 11.95% patients died and 10.86% were discharged.

Conclusion: Detailed history and clinical examination along with appropriate investigations are necessary to confirm the diagnosis of meningoencephalitis. Tubercular (TB) Meningitis was common with high morbidity and mortality.

Keywords: Bacterial, Fungal, Leptomeningeal, Tubercular, Viral

INTRODUCTION

Meningoencephalitis is a medical emergency [1]. Meningitis is a serious infection of the meninges that surround the brain and spinal cord [2]. Encephalitis is a serious form of neurological disease with inflammation of the brain parenchyma [3]. Meningoencephalitis refers to the inflammation of meninges and brain and is considered as a neurological emergency. The infection may be caused by bacteria such as *Streptococcus pneumoniae, Hemophillus influenza* and *Mycobacterium tuberculosis* etc; viruses like *Herpes simplex* virus, fungi like *Cryptococcus neoformans* or parasites like plasmodium [4]. Bacterial meningitis is an acute purulent infection within subarachnoid space that is followed by a central nervous system inflammatory reaction that causes coma, seizure, raised intracranial pressure and stroke. The meninges, subarachnoid space and the brain parenchyma are all involved in the inflammatory reaction, hence meningoencephalitis is a more accurate descriptive term [5]. In encephalitis a degree of leptomeningeal inflammation is invariably present [2]. Tubercular meningitis is a very critical disease in terms of fatal outcome and permanent sequelae, requiring rapid diagnosis and treatment. Death may occur as a result of missed diagnosis and delayed treatment.

Meningoencephalitis is a severe neurological condition that results in significant morbidity and mortality [6]. Early diagnosis and treatment can have major impact on the ultimate outcome for a patient with meningoencephalitis [7]. Correct early diagnosis and administration of symptomatic and specific treatment will lead to increased influence upon survival and also decreases the extent of neurological consequences [8]. Distinguishing the aetiologies and identification of specific agent helps in terms of both reducing antibiotic usage, prognosis, hospital bed occupancy and reassuring contacts of cases and healthcare staff [9]. So, present study focuses on mortality and morbidity of admitted patients with meningoencephalitis in a tertiary care center. The objective of the present study was to observe the clinical profile and aetiological causes of meningoencephalitis and to analyse the mortality and morbidity due to meningoencephalitis in a tertiary care center.

MATERIALS AND METHODS

The prospective observational study was conducted in the Department of Medicine at Karnataka Institute of Medical Sciences, Hubli, Karnataka, India, between December 2018 and December 2020 after obtaining the Institute Ethical Committee clearance (reference number KIMS:ETHICSCOMM:1084:2021).

Inclusion criteria: Patients with age 12 years to 80 years admitted with signs and symptoms suggestive of Meningoencephalitis (fever, headache, vomiting, seizures, altered sensorium, neurological deficits, neck rigidity) [4] were included.

Exclusion criteria: Cases of metabolic encephalopathy, cerebrovascular accident and patients or relatives who did not give consent for the study were excluded from the study.

Sample size calculation: Sample size calculation was done by using the following formula, $n=(z)^2pq/d^2$ where, n=sample size, z=static for a level of confidence, p=prevalence, q=1-p, d=precision, Confidence Intervals (CI)=95%, d=0.05, z=1.96, p=0.08, q=0.92.

prevalence (p)=number of meningoencephalitis cases (1280)/total number of patients admitted in Medicine Department per year (16000), p=1280/16000, p=0.08

$n=(1.96)^2\times0.08\times0.92/(0.05)^2$

n=113

minimum sample size was 113 but the final sample collected was 184.

Procedure

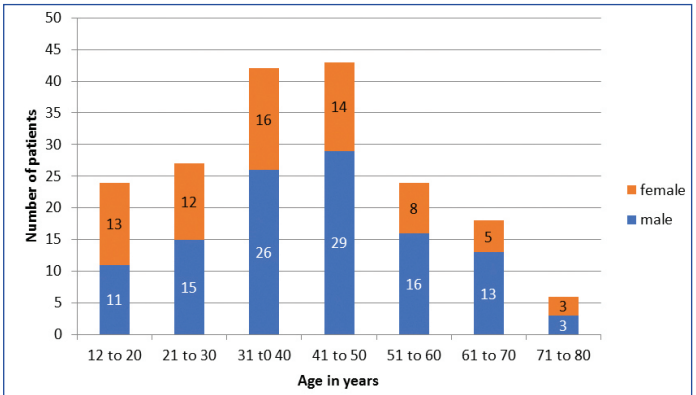
A total of 184 cases who met inclusion criteria were included, after taking written informed consent from patients/relatives. Patient's demographic and medical details were entered in preformed proforma sheet designed for the study. Detailed history was taken, clinical examination was done and mental status was assessed and staged as per modified Medical Research Council (MRC) criteria as stage 1 with Glasgow Coma Scale (GCS) of 15 and without any neurological deficits, stage 2 with GCS of 11-14 or GCS of 15 with neurological deficits and stage 3 with GCS below 10 [10]. It was followed by laboratory investigations like complete haemoglobin [11], random blood sugar, total count, platelet count, urea, creatinine, serum electrolytes [12], Arterial Blood Gas (ABG) analysis [13], Liver function tests [14], Fundoscopy [15], chest X ray [16], CT Brain, EEG [17], CSF analysis [18,19,20] included CSF culture, CSF CBNAAT and MRI brain. Diagnosis of CNS infection was made from clinical history examination, CSF analysis, blood investigations, neuro imaging and clinical response to appropriate treatment (antitubercular drugs/antibiotics/antiviral/antifungal).

STATISTICAL ANALYSIS

The information collected regarding all the selected cases were entered in masterchart. Microsoft word and Microsoft excel were used to generate tables, graphs, bar diagram and pie diagram. Data analysis was done with the help of computer using SPSS statistics software version 22.0 (International Business Management (IBM) SPSS Statistics, Somers New York, United States of America). Percentages means were calculated using this software.

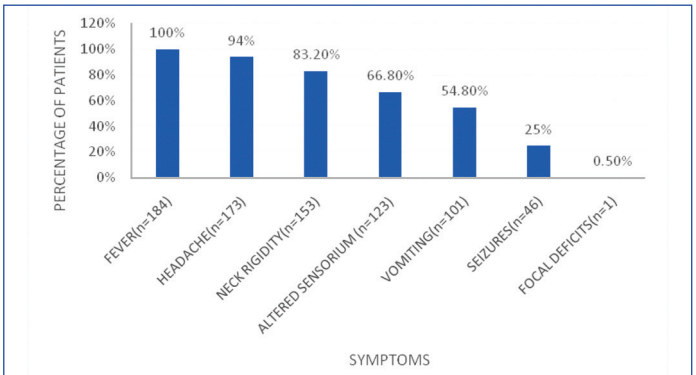
RESULTS

In the present study, patient's age ranged from 12 years to 80 years. Mean age among males were 42.1±15.65 years and mean age among females were 38.43±14.23 years. Majority of patients were in the age group of 41 to 50 years, accounting to 43 (23.36%) followed by 31 to 40 years accounting to 42 (22.8%) of cases hence the age range had a peak in 31 to 50 age group accounting to 85 (46.2%) and male to female ratio was 1.59:1 [Table/Fig-1].



[Table/Fig-1]: Bar diagram showing age and sex distribution.
X=age in years; Y=number of patients in percentage

In the present study, out of 184 patients, all 184 (100%) patients had fever, 173 (94%) patients had headache, 153 (83.2%) patients had neck rigidity, 123 (66.8%) had altered sensorium, 101 (54.8%) had vomiting, 46 (25%) had seizures and 1 (0.5%) had focal deficits [Table/Fig-2].



[Table/Fig-2]: Bar diagram showing symptoms distribution.

In present study, including 184 cases of acute meningoencephalitis, 25.5% (n=47) patients had Diabetes Mellitus (DM) but Random Blood Sugar (RBS) was >140 in 115 non diabetic patients which could be due to administration of Intravenous (i.v.) fluids before referring to this hospital or could be transient hyperglycaemia due to stress and infection. A total of 34 (18.5%) patients had hypertension, 12 (6.5%) patients had Human Immunodeficiency Virus (HIV), 4 (2.1%) patients had Hepatitis B surface Antigen (HBsAg) and 2 (1.08%) had both HIV and HBsAg, 63 (34.2%) had history of substance abuse in the form of alcohol intake and smoking, 2 (1.08%) had history of otitis media.

Out of 184 patients, 69 (37.5%) patient's Body Mass Index (BMI) was below 18.5, 115 (62.5%) patient's BMI was between 18.5 to 24.9. Out of 184 patients, 26 (14.1%) patients had normal temperature at the time of admission which could be due to administration of antipyretics before referring to our hospital and 158 (85.9%) patients had raised temperature of above 37.7°C. A total of 150 (81.5%) had tachycardia and 34 (18.4%) had normal pulse rate at the time of admission. At the time of admission, all patients (n=184) had normal blood pressure. Out of 184 patients, 28 (15.21%) patients had GCS below 10, 93 (50.54%) patients had GCS between 11 to14 and 63 (34.23%) patients had GCS of 15 on examination at the time of admission.

Out of 184 cases, 71 (38.58%) patients had anaemia, 4 (2.2%) patients had thrombocytopenia, 5 (2.7%) patients had leucopenia, 36 (19.6%) patients had leukocytosis, 30 (16.3%) patients had abnormal serum electrolytes, 115 (62.5%) patients had hyperglycaemia and 3 (1.6%) patients had abnormal serum creatinine. EEG was done for 46 (25%) patients who presented with seizures, of them 28 (15.21%) patents had abnormal EEG [Table/Fig-3].

Out of 184 CSF samples from 184 study participants, 145 (78.80%) CSF samples showed lymphocyte predominance, 39 (21.20%) showed neutrophil predominance. In 6 (3.26%) samples cell count was between 1 to 100, 46 (25%) samples showed between 101 to 500, 91 (49.45%) samples showed between 501 to 1000 and 41 (22.28%) samples showed >1001. In 46 (25%) samples, CSF protein was less than 40 mg/dL, 118 (64.13%) samples CSF protein was between 41 to 300 mg/dL and 20 (10.86%) samples, CSF protein was >301 mg/dL. In 45 (24.45%) samples CSF glucose was normal, 47 (25.54%) samples showed increased CSF glucose levels and 92 (50%) showed decreased glucose levels. In 89 (48.36%) samples, CSF Adenosine Deaminase (ADA) was <11 and 95 (51.63%) samples showed CSF ADA >12. Out of six positive samples of CSF culture, *Streptococcus pneumoniae* was found in 3 (1.63%), *Staphyloccus aureus* in 2 (1.08%) and *Klebsiella pneumonia* in 1 (0.5%). Out of 184 patients CSF samples, 95 (51.63%) samples of patients with CSF analysis suggestive of tubercular aetiology were subjected for CSF CBNAAT, of them 18 (9.78%) showed Mycobacterium tuberculosis (MTB) detected and 41.84% showed MTB not detected [Table/Fig-4].

Parameters		Number (n)	Percentages (%)
Haemoglobin (gm/dL) [11]	Female Hb ≤12	34	18.47%
	Female Hb >12	37	20.11%
	Male Hb ≤13	37	20.11%
	Male Hb >13	76	41.30%
Total count [per cubic millimeter] [12]	≤4500	5	2.7%
	4501 to 11000	143	77.7%
	≥11001	36	19.6%
Platelet count (lakhs per microliter of blood) [12]	≤1.50	4	2.2%
	≥1.51	180	97.8%
Random Blood Sugar (RBS) (mg/dL) [12]	≤140	69	37.5%
	≥141	115	62.5%
Urea (mg/dL) [12]	≤20	35	19.0%
	21 to 39	116	63.0%
	≥40	33	17.9%
Creatinine (mg/dL) [12]	≤0.8	24	13.0%
	0.9 to 1.4	157	85.3%
	≥1.5	3	1.6%
Serum sodium (mEq/L) [12]	120 to 135	20	10.9%
	136 to 145	164	89.1%
	≥146	0	0
Serum potassium (mEq/L) [12]	≤3.5	10	5.4%
	3.6 to 4.9	174	94.6%
	≥5	0	0
Arterial Blood Gas analysis [13]	Normal	184	100.0%
	Abnormal	184	0
Liver function tests [14]	Normal	184	100.0%
	Abnormal	0	0
Fundoscopy [15]	Normal	164	89.13%
	Abnormal	20	10.86%
Chest X-ray [16]	Normal	176	95.6%
	Abnormal	8	4.34%
EEG [17]	Normal	18	9.78%
	Abnormal	28	15.21%

[Table/Fig-3]: Laboratory findings.
EEG: Electroencephalogram

Parameters		Count	%
Cell type	Lymphocyte predominant	145	78.80%
	Neutrophil predominant	39	21.20%
Cell count (Cells per cubic mm) [18]	1 to 100	6	3.26%
	101 to 500	46	25.00%
	501 to 1000	91	49.45%
	≥1001	41	22.28%
Protein (mg/dL) [19]	≤40	46	25.00%
	41 to 300	118	64.13%
	>301	20	10.86%
Glucose (mg/dL) [19]	50-80	45	24.45%
	≥81	47	25.54%
	≤49	92	50.00%
Adenosine Deaminase (ADA) (U/L) [20]	<11	89	48.36%
	>12	95	51.63%
CSF Culture	Positive	6	3.26%
	Negative	178	96.73%
CSF CBNAAT*	MTB detected	18	9.78%
	MTB not detected	77	41.84%

[Table/Fig-4]: CSF analysis findings.
*Out of 184 patients CSF samples, 95 samples of patients with CSF analysis suggestive of tubercular aetiology were subjected for CSF CBNAAT of them 18 showed MTB detected and 77 showed MTB not detected; CSF CBNAAT: Cerebrospinal fluid (CSF) Cartridge based nucleic acid amplification test (CBNAAT); MTB: Mycobacterium tuberculosis

Imaging was done for 184 patients, of them 150 neuroimaging (CT/MRI) showed normal findings, 8 patients had temporal hyperintensity in T2 MRI image, 3 patients showed obstructive hydrocephalus, 12 patients showed tuberculoma, 1 patient had vasculitic infarcts features suggestive of TB meningitis, 1 patient had bilateral thalamic lesions,1 patient had features of diffuse cerebral atrophy on neuroimaging [Table/Fig-5].

Findings of CT/MRI	Number (n)	Percentages (%)
Normal	150	81.52%
Temporal hyperintensity in T2 MRI Image	8	4.35%
Obstructive hydrocephalus	3	1.63%
Tuberculoma	12	6.52%
Vasculitic infarcts f/s/o TB meningitis	1	0.54%
f/s/o meningitis	8	4.35%
b/l thalamic lesions	1	0.54%
Diffuse cerebral atrophy	1	0.54%

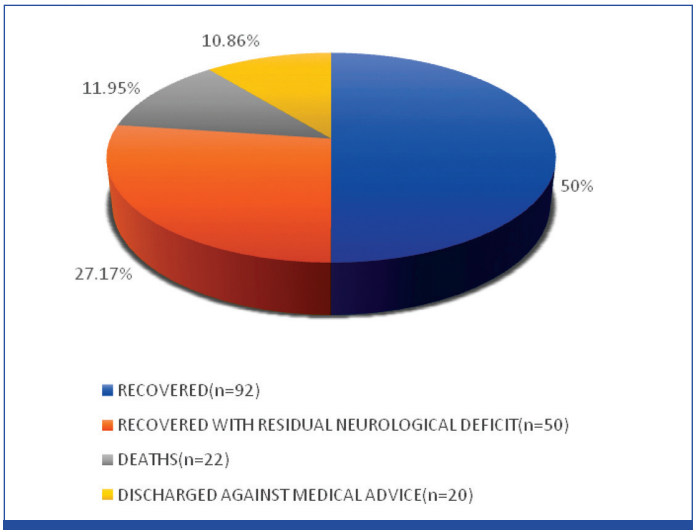
[Table/Fig-5]: Neuroimaging findings.
MRI: Magnetic resonance imaging; TB: Tuberculosis

The diagnosis for 184 cases in the present study was done by history, clinical examination, investigations and imaging. Of them 39 (21.2%) had bacterial meningitis, 4 (2.2%) had cryptococcal meningitis, 1 (0.5%) had dengue encephalitis, 9 (4.9%) had HSV encephalitis, 1 (0.5%) had japanese encephalitis, 95 (51.6%) had TB meningitis of which MTB was detected in CSF CBNAAT in 18 (9.78%) patients, 20 (10.9%) had viral encephalitis, 4 (2.2%) had viral meningitis, 11 (6%) had viral meningoencephalitis [Table/Fig-6].

Aetiological analysis of cases	Count	Percentage
Bacterial Meningitis	39	21.2%
Cryptococcal Meningitis	4	2.17%
Dengue Encephalitis	1	0.5%
Herpes Simplex Virus (HSV) Encephalitis	9	4.9%
Japanese Encephalitis	1	0.5%
Tuberculosis (TB) Meningitis	95	51.6%
Viral Encephalitis	20	10.9%
Viral Meningitis	4	2.2%
Viral Meningoencephalitis	11	6.0%

[Table/Fig-6]: Probable aetiology distribution done by history, clinical examination, investigations and imaging.

Out of 184 patients of meningoencephalitis during the course of hospital stay, 92 (50%) patients recovered, 50 (27.17%) patients recovered with residual neurological deficit in the form of memory and cognitive impairment, 22 (11.95%) patients died and 20 (10.86%) were discharged against medical advice [Table/Fig-7].



[Table/Fig-7]: Pie diagram showing outcome during the course of hospital stay.

DISCUSSION

The present study included 184 study participants admitted in a tertiary care center and results were analysed and compared with other similar studies. Majority of patients were in the age group of 41 to 50 years accounting to 23.36% (n=43) followed by 31 to 40 years accounting to 22.82% (n=42) of cases. The age range had a peak in 31 to 50 years age group accounting to 46.2% (n=85). In this study, males were the predominant sex in the study group with male to female ratio of 1.59:1. In a study done by Sarvepalli AK and Dharana PK [21] 19.5% patients were in 21 to 40 years age group, 43.9% patients were in 41 to 60 years age group, 36.52% patients were aged >60 years. In a study done by Dey A et al., [22] 6% patients were in the age group of below 20 years and 50% patients were in the age group of 21 to 40 years age group, 30% patients were in 41 to 60 years age group, 14% patients were aged >60 years. In a study done by Pandey D and Mahale RL [23] 28% patients were in the age group of below 20 years and 45% patients were in the age group of 21 to 40 years age group, 23% patients were in 41 to 60 years age group, 3% patient were aged >60 years. In the present study, 13% were in the age group of below 20 years and 37.5% patients were in the age group of 21 to 40 years age group, 36.4% patients were in 41 to 60 years age group, 13.1% patients were aged >60 years. Meningoencephalitis was common in age group of 31-50 years age group in present study which is in concordance with study done by Pandey D and Mahale RL [23] and Dey A et al., [22] and in discordance with study done by Sarvepalli AK and Dharana PK [21]. The reason for increased incidence of meningoencephalitis in 31 to 50 years age group could be probably due to selection bias as less than 12 years age group has not been included in present study.

In a study done by Tan K et al., [7] male to female ratio was 1.27:1, Sarvepalli AK and Dharana PK [21] male to female ratio was 1.39:1, Houseein N et al., [6] male to female ratio was 2:1, Xie Y et al., [24] male to female ratio was 1.76:1, Yerramilli A et al., [25] male to female ratio was 1.45:1. In the present study, the male-to-female ratio was 1.59:1 which is in concordance with the other studies.

In present study, fever was present in 184 (100%) patients, headache was present in 173 (94%), vomiting in 101 (54.8%), convulsions in 46 (25%), altered sensorium in 123 (66.8%) of patients. [Table/Fig-8] is showing comparison of symptoms in present study with similar studies [9,21,23-26].

Study and year of publishing	Symptoms				
	Fever	headache	Vomiting	Seizures	Altered sensorium
Xie Y et al., [24] 2015, Guangxi, China	90.2%	43.9%	45.9%	45.9%	26.8%
Sarvepalli AK and Dharana PK [21] 2017, Andra Pradesh, India	66.6%	68.7%	65.9%	13.4%	30.4%
Giri A et al., [26] 2013, Kathmandu, Nepal	89%	64%	60%	18%	42%
Pandey D and Mahale RL [23] 2018, India	100%	97%	90%	47%	73%
Bhagawati G et al., [9] 2014, Assam, India	92.7%	61.7%	56.3%	57.5%	74.3%
Yerramilli A et al., [25] 2017, India	80.9%	57.8%	43.5%	28.5%	46.9%
Present study 2018-20, India	100%	94%	54.8%	25%	66.8%

[Table/Fig-8]: Distrubution of symptomatology in different studies.

In a study done by Khan FY et al., [27] including 110 study participants, 9 (7.7%) patients had diabetes mellites, 4 (3.4%) patients had history of substance abuse in the form of alcohol intake, i.v. drug abuse and smoking, 2 (1.7%) patients had immunosuppression (Sexually Transmitted Disease (STD), malignancy, others) and 5 (4.3%) had history of otitis media. In a study done by Tan K et al., [7] including 116 study participants, 12 (10%) patients had diabetes mellites, 6 (5%) patients had history of substance abuse in the form of alcohol intake and smoking, 32 (34%) patients had immunosuppression (STD, malignancy, others) and none had history of otitis media. In a study done by Bhagawati G et al., [9] including 316 study participants, 14.24% patients had diabetes mellites, 14.4% patients had history of substance abuse in the form of alcohol intake and smoking, 15.84% patients had immunosuppression (STD, malignancy, others) and none had history of otitis media. In present study including 184 study participants, 47 (25.5%) patients had diabetes mellites, 63 (34.2%) patients had history of substance abuse in the form of alcohol intake and smoking, 8.6% (n=18) patients had HIV, HBsAg and 2 (1.08%) had history of otitis media which is in concordance with the study done by Bhagawati G et al., [9] and in discordance with the study done by Khan FY et al., [27] and Tan K et al., [7].

CSF culture was positive in six samples and organisms isolated were *Streptococcus pneumoniae* in 1.63% (n=3), *Staphylococcus aureus* in 1.08% (n=2) and *Klebsiella pneumonia* in 0.5% (n=1). Hence most common organism isolated in CSF Culture was *Streptococcus pneumonia* in the present study which is in concordance with study done by Fouad R et al., [28].

Liver function test, renal function tests, serum sodium tests were done in order to rule out common causes of encephalopathy like hepatic encephalopathy, uraemic encephalopathy and hyponatremic encephalopathy.

Distribution of aetiology of meningoencephalitis in different studies

In a study by Tan k et al., [7], in which 116 patients were recruited, tubercular aetiology was found in 3.4%, bacterial cause in 31.0%, viral cause in 53.4%, fungal cause in 12.06% and other causes in 5.1%. In a study by Modi S and Anand AK [29], in which 120 patients were recruited, tubercular aetiology was found in 4.2%, bacterial cause in 36.7%, viral cause in 28.3%, fungal cause in none of the cases and other causes in 30.8%. In a study by Pandey D and Mahale RL [23], in which 100 patients were recruited, tubercular aetiology was found in 54%, bacterial cause in 38.0%, viral cause in 8%, and fungal cause in none of the cases.

In a study by Yerramilli A et al., [25], in which 147 patients were recruited, tubercular aetiology was found in 28%, bacterial cause in 28.1%, viral cause in 39%, fungal cause in 3% and other causes in 2.1%. In the present study, in which 184 patients were recruited, tubercular aetiology was found in 51.6% (n=95), bacterial cause in 21.19% (n=39), viral cause in 25% (n=46), fungal cause in 2.17% (n=4). In the present study, Tuberculosis was the major cause of meningoencephalitis which is in concordance with study done by Pandey D and Mahale RL [23] and is in discordance with study done by Tan K et al., [7], Modi S and Anand AK [29] and this discordance could be due to variation in geographical distribution, social factors, methodology of the study. Distribution of aetiology of Acute meningoencephalitis in different studies is shown in [Table/Fig-9] [7,23,25,29].

In a study done by Pandey D and Mahale RL [23] imaging (CT/MRI Brain) findings suggestive of tuberculoma was seen in 26% cases, vasculitic infarcts seen in 10% cases, hydrocephalus in 8%, features suggestive of meningitis in 89% cases. In the present study out of 184 cases neuroimaging findings suggestive of tuberculoma was seen in 6.5% cases, vasculitic infarcts seen in 0.5% cases, hydrocephalus in 1.6%, features suggestive of meningitis in 4.3%, Temporal hyperintensity in T2 MRI in 4.3% cases, bilateral (b/l) thalamic lesion in 0.5%, diffuse cerebral atrophy in 0.5% cases. These findings are in discordance with study done by Pandey D and Mahale RL [23].

Authors Name, Year of study, Place	Patients recruited	Tubercular aetiology	Bacterial aetiology	Viral aetiology	Fungal aetiology	Others
Tan K et al., [7] 2008, Baltimore	116	3.4%	31.0%	53.4%	12.06%	5.1%
Modi S and Anand AK [29] 2013, India	120	4.2%	36.7%	28.3%	0	30.8%
Pandey D and Mahale RL [23] 2018, India	100	54.0%	38.0%	8.0%	0	0
Yerramilli A et al., [25] 2017, Andra Pradesh, India	147	28.0%	28.0%	39.0%	3.0%	2%
Present study 2018-20, India	184	51.63%	21.19%	25.0%	2.17%	0

[Table/Fig-9]: Distribution of aetiology of Acute meningoencephalitis in different studies.

Limitation(s)

In many patients of meningoencephalitis definite diagnosis/causative organism could not be made due to non availability of specific investigations in the institute. Majority of bacterial meningitis cases, CSF culture did not yield any growth. This could be due to the use of antibiotics before lumbar puncture in primary care centers before referring the cases to our institute and administration of i.v. antibiotics in Emergency ward when patient arrived at the institute in odd hours.

CONCLUSION(S)

Meningoencephalitis is a disease with high morbidity and mortality and considered as medical emergency. In the present study, most of the patients were reported with fever and headache. Lymphocytes were the predominant cells found in CSF analysis. A total of 6.52% patients reported tuberculoma in CT/MRI. TB Meningitis was the most common aetiology with high morbidity and mortality. Early recognition and if treated appropriately increases the survival rate and also neurological sequelae secondary to meningoencephalitis can be minimised to some extent which adds on to the quality of patients life. In tertiary care centers where referred and critical cases are more, detailed history and clinical examination along with appropriate investigations are necessary to confirm the diagnosis of meningoencephalitis. Sensitive, rapid and affordable investigations are required for the accurate and early diagnosis.

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