

# Prevalence of Hydrocephalus in Tuberculous Bacterial Meningitis Patients Presented at our Hospital: a cross Sectional Study

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## ABSTRACT

**Aim:** To determine the prevalence of hydrocephalus in tuberculous bacterial meningitis patients

**Study Design:** Cross sectional study

**Place and duration:** This study was conducted in Pakistan Institute of Medical Sciences Islamabad, Pakistan From September 2019 to December 2020

**Methodology:** The technique of nonprobability, sequential sampling, was used. After a thorough examination, patients with tuberculous bacterial meningitis (TBM) were included. At the time of admission, a brief history of socio-demographics and the length of the illness was taken. The proforma was filled up with the results. The data were analyzed using SPSS Version 22.

**Results:** Out of 120 patients, males made up 59.16 % cases. The age groups 20-30 years, 31-40 years, 41-50 years, and 51-60 years were represented in the study by 28 (23.33 %), 37 (30.83%), 17 (14.16 %), and 38 (31.66%) patients, respectively. The prevalence of hydrocephalus among TBM was 16.66%, with the 20-30 year age group having the most cases (50 %). Significant differences have been identified ( $X^2= 12.43$ ,  $P=0.006$ ) in age grouping. Cases with hydrocephalus with symptoms that lasted less than a week were discovered in 70 %, whereas those with symptoms that lasted more than a week were detected in 30% of patients ( $X^2=4.51$ ,  $P=0.033$ ).

**Conclusion:** Hydrocephalus was seen in a substantial percentage of patients with tuberculous bacterial meningitis.

**Keywords:** Tuberculosis, Meningitis, Hydrocephalus, Prevalence

## INTRODUCTION

In 2020, an estimated 10 million individuals became ill with tuberculosis (TB), with 1.4 million people dying due to TB. Most patients are admitted late to the hospital because their symptoms are vague at first. Despite the advancement of promising molecular diagnostic procedures, TBM diagnosis is still primarily based on microscopic logical methods such as Acid Fast Bacilli (AFB) smears on CSF or CSF culture for AFB, both of which can be highly insensitive and provide a diagnostic challenge. Mostly TBM is detected late, for this reason, resulting in significant problems. (1, 2)

One of the most common complications of tuberculous meningitis is hydrocephalus, linked to a poor prognosis. Hydrocephalus is described as an increase in the volume occupied by fluid in the CNS due to a disruption in the generation, flow, or absorption of cerebrospinal fluid (CSF). It has the potential to cause physiological, behavioural, and psychological problems. In patients with tuberculous meningitis, there are two types of hydrocephalus: communicating and obstructive. The obstructive type of hydrocephalus develops when basal exudates and leptomeningeal inflammation block the fourth ventricular outlets or when the aqueduct is obstructed. (3, 4) When the cerebrospinal fluid (CSF) is produced in excess or the absorption of CSF in the subarachnoid space is impaired, communicating hydrocephalus develops. Hydrocephalus that is communicated is more common.

Medical treatment for mild to moderate hydrocephalus is effective, but surgery is required when symptoms of elevated intracranial pressure develop. The preferred surgical treatment is a ventriculoperitoneal shunt. Endoscopic third ventriculostomy, external ventricular drainage, and Ommaya reservoir implantation are some of the other surgical options for hydrocephalus management. There are ongoing brain impairments in untreated TBM instances and late treatment cases. Treatment for TBM should begin as soon as preliminary CSF results confirm clinical uncertainty. (5-8)

To minimize mortality with TBM, ethambutol, and steroids should be included in the empirical treatment. According to studies, the prevalence is 29% and 48 %, respectively. (4, 9). Another study observed a frequency of 65 %.(10)

Since delays in diagnosis and treatment can lead to significant mortality and morbidity, especially in resource-poor areas, the study's findings will serve as the foundation for estimating the scope of the problem in our population and developing better management strategies. Those that cater to our setup's requirements can be applied. Patients will benefit from improved patient outcomes and quality of life. Hence the current research aims to determine the prevalence of Hydrocephalus in TBM in Pakistan Institute of Medical Sciences Islamabad, Pakistan.

## METHODOLOGY

This study was conducted in Pakistan Institute of Medical Sciences Islamabad, Pakistan From September 2019 to

December 2020. Nonprobability, consecutive sampling technique was applied. Patients of Tuberculous meningitis (TBM) with any two or more of the following clinical characteristics in the past one week and any positive laboratory data were included.

Clinical Characteristics include Fever that lasts at least 6 hours per day for more than a week. Headache is dull in nature and occurring at least 3 hours a day for the last 7 days and vomiting at least three times a day for the last three days. History of contact with tuberculosis patients either living in the same house or outside in the last two years. Positive AFB smear on CSF.

Typical CSF exhibited lymphocytic pleocytosis (range 20-500 lymphocytes per cubic mm) as well as increased CSF protein (100- 1000 mg/dl) and decreased CSF glucose level (60 percentage of corresponding plasma level was observed concurrently as CSF inspected).

On the CT scan brain, hydrocephalus was labelled as present if any ventricle (the third, fourth, or lateral ventricle) was dilated to 25% of its normal value. Hypertension: Hypertension that has been present for more than two years or Patients taking medications regularly, SBP 140 mm Hg and 90 mmHg (over six months). HbA1C > 7 were labelled as diabetic.

Included Patients who presented with tuberculous bacterial meningitis (TBM) within one week, according to the operational definition, were included. Patients with a history of congestive heart failure, COPD, chronic renal failure, cancer patients, persons suffering from bacterial (other than tuberculous bacterial meningitis) or viral meningitis patients and with a history of head trauma were excluded from the study.

A brief history regarding socio-demographics and the duration of the illness was taken at the time of admission by the patient or attendant. According to criteria, all confirmed tuberculosis bacterial meningitis patients underwent a brain CT scan with contrast within two days of admission.

All scans were conducted under the guidance of the radiologist, looking for the presence or absence of hydrocephalus as per operational definition. The results were entered into the proforma and SPSS Version 22 was used to analyze the data.

**RESULTS**

This study included a total of 120 patients who presented with TBM and met the selection criteria. The mean age of the patients with TBM was 47.45 ± 6.88 years and ranged from 20 to 60 years, while the length of symptoms was 9 ± 4.18 days.

In terms of gender, 71 males (59.16%) and 49 females (40.83%) were present. In the study age-wise, frequency distribution among TBM patients revealed that 28 (23.33%), 37 (30.83%), 17 (14.16%), and 38 (31.66%) patients were in the age groups 20-30 years, 31-40 years, 41-50 years, and 51-60 years, respectively. (As shown in Table 1)

The prevalence of hydrocephalus among TBM was 22 (16.66%), with more cases seen in the 20-30 year age group 10 (50%), and then in the 30-40 year age group 07 (35%). Significant differences have been observed (**X<sup>2</sup>= 12.43, P= 0.006**). In males, 12 (60%) as compared to

female group 08 (40%). However, the difference is not significant. (**X<sup>2</sup>= 0.0069, P= 0.933**). (As shown in Table 2)

Table 1: Characteristics of the Study Participants (n=120)

	Number	Percentage
<b>Gender</b>		
Male	71	59.16
Female	49	40.83
<b>Age Group (Years)</b>		
20-30	28	23.33
31-40	37	30.83
41-50	17	14.16
51-60	38	31.66
<b>Symptom Duration</b>		
Less than 1 week	58	48.33
More than 1 week	62	51.66
<b>Smoking</b>		
YES	21	17.5
NO	99	82.5
<b>Hypertension</b>		
YES	35	29.16
NO	85	70.83
<b>BMRC Stage in TBM</b>		
Stage 1	21	17.5
Stage 2	79	65.83
Stage 3	20	16.66
<b>Diabetes Mellitus</b>		
YES	27	22.50
NO	93	77.50

Table 2: Prevalence And Association of Hydrocephalus in different variables

	Hydrocephalus			X2	P-Value
	Present	Absent	Total		
Total	20 (16.66%)	100 (73.44%)	120		
<b>Gender</b>					
Male	12	59	71	0.0069	0.933
Female	08	41	49		
<b>Age Group (Years)</b>					
20-30	10	18	28	12.43	0.006
31-40	07	30	37		
41-50	01	16	17		
51-60	02	36	38		
<b>Symptom Duration</b>					
Less than 1 week	14	44	58	4.51	0.033
More than 1 week	06	56	62		
<b>Smoking</b>					
YES	3	18	21	0.1822	0.66
NO	18	81	99		
<b>Hypertension</b>					
YES	06	29	35	0.0081	0.92
NO	14	71	85		
<b>BMRC Stage in TBM</b>					
Stage 1	02	19	21	1.117	0.57
Stage 2	15	64	79		
Stage 3	03	17	20		
<b>Diabetes Mellitus</b>					
YES	04	23	27	0.086	0.769
NO	16	77	93		

We further evaluated that hydrocephalus patients with symptoms lasting less than a week were found in 14 (70%),

while those with symptoms lasting more than a week were found in 06 (30%) ( $\chi^2= 4.51$ ,  $P= 0.033$ ). While in the BMRC study, Stage I: 02 (10%), stage II: 17 (75%), and stage III: 03 (15%). The difference is insignificant ( $\chi^2= 1.117$ ,  $P= 0.57$ ). Moreover, no significant difference is observed between TBM patients with Hydrocephalus with Diabetes Mellitus and Hypertension. ( $p>0.05$ ). (As shown in Table 2)

## DISCUSSION

A total of 120 individuals were enrolled in our study, all of whom had TBM. We found that hydrocephalus was present in 16.66 % of TBM patients. Various studies in the past have reported the incidence of hydrocephalus ranging from 17 to 95%. (11-13) In contrast to the finding of our study, another study comprised 80 tuberculous meningitis patients. During the presentation, 52 patients (65%) had hydrocephalus, while the remaining eight new patients developed hydrocephalus during follow-up. Hydrocephalus is caused by an advanced stage of illness, extreme disability, illness lasting more than two months and it can cause diplopia, seizures, visible impingent, papilledema, cranial nerve palsy, hemiparesis etc. (14)

In the current study, though a higher number of males were suffering from TBM, the prevalence of hydrocephalus among the gender was not significant. The factors of gender and age have substantial correlations. Similar findings were reported in other studies. (15)

The situation looked greater in BMRC stage II, in TBM stages III and I, respectively. In another study, hydrocephalus affected 48 (48%) of the patients in the study. (9) Meningitis is the most dangerous if it is due to tuberculosis. Early diagnosis and treatment can dramatically reduce the death rate linked with this condition. The development of hydrocephalus, a retreat, and exudates at the base of the brain, resulting in cranial nerve palsies, leading to impairment and epilepsy, are complications of TBM. Anti-tuberculosis medication therapy (12 to 18 months) is now widely acknowledged as necessary for a cure. (16)

The study found that patients' age and late diagnosis and therapy all contribute to the progression of the disease and the development of hydrocephalus in case of TBM.

The small sample size in this study is a drawback, and more research into the clinical characteristics of TBM with complications, including more sites and hospitals, is needed. Despite the limitations, our findings can be utilized to reference hydrocephalus and TBM in Pakistan's rural areas

## CONCLUSION

According to the study, hydrocephalus was seen in a large percentage of patients with tuberculous bacterial meningitis. To recognize and manage these events promptly, physicians needed to understand the relevance of this link. The effectiveness of strategies to avoid hydrocephalus in high-risk patients has to be improved.

**Conflict of interest:** None

**Permission:** It was taken from the ethical review committee of the institute

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