

Prevalence of Hydrocephalous in the Patients, Presenting with Tuberculous Meningitis, in a Medical Institute Karachi, Pakistan

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ABSTRACT

Objective: To evaluate the frequency of hydrocephalus among patients presenting with tuberculosis bacterial meningitis.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at the Medicine and Neurology Department, Jinnah Postgraduate Medical Center (JPMC), Karachi during the period of Oct. 2019 to June 2020.

Materials and Methods: According to the selection criteria, a total of 137 patients were selected through the non-probability consecutive sampling method. A brief history, as well as demographic records, was reported into the performa. SPSS software was applied for the data analysis.

Results: In the study total of 137 patients presenting with TBM were included. The mean age and duration of symptoms in our study were 48.22 ± 7.56 years and 8 ± 3.47 days, respectively. 82 (59.9%) were male and 55 (40.1%) were female. Out of the 137 patients, 22 (16.1%) and 115 (83.9%) had TBM and did not have hydrocephalus.

Conclusion: Tuberculosis Bacterial meningitis is a frequently reported problem in our region of the world. Hydrocephalus is a common complication with other sequelae. Hydrocephalus may completely resolve in the early stages of tuberculous meningitis.

Key Words: Tuberculous Bacterial Meningitis and Hydrocephalus

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INTRODUCTION

Globally, an estimated 10 million people fell ill with tuberculosis (TB) and a total of 1.4 million people died from TB in 2019. Tuberculosis is numbered as the 10th topmost cause of death while the central nervous system (CNS) tuberculosis is the third most common manifestation of extra-pulmonary tuberculosis and has a very excessive rate of morbidity and mortality.²⁻³

Main complaints present in TBM eg; fever, weight loss, photophobia, headache, vomiting, cranial nerve palsies, and altered level of attention that can be classified on the basis of British Medical Research Council (BMRC) contemporary diagnostic criteria into three stages.⁴

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Most cases are late to the hospital because symptoms are non-specific in early stage 1 TBM.⁵ Despite the improvement of promising molecular diagnostic strategies, the prognosis of TBM is predicated in large part on microbiological methods that encompass Acid Fast Bacilli (AFB) smear on cerebrospinal fluid (CSF) or CSF culture for AFB, each of which might be tremendously insensitive, and pose a diagnostic assignment. That is a reason, why TBM is diagnosed late results in serious complications.⁶

Hydrocephalus is the most common complication of tuberculous meningitis (TBM), which is more severe, seemed in children than in adults, and the frequency of hydrocephalus among tuberculous bacterial meningitis patients is considered to be 65.5%.^{7,8}

Hydrocephalus can be broadly defined as a disturbance of the formation, flow, or absorption of cerebrospinal fluid (CSF) resulting in an increase in the volume occupied by this fluid within the CNS.⁹ It may lead to practical, behavioral, and psychological consequences.¹⁰ In the early diagnosis of CNS tuberculosis, a CT scan (modern neuroimaging) is playing a key role.¹¹ when hydrocephalus is the presenting feature, immediate neurosurgical decompression may be required.¹²

The emergence of drug-resistant strains has enhanced in many regions globally, resultant disease presents a therapeutic challenge.^{13,14} Almost 100% fatality rate

seemed in untreated TBM cases and late treatment can lead to permanent neurological damage.¹⁵ Treatment for TBM should be begun as soon as clinical doubt is supported by preliminary CSF studies.¹⁶

As a minimum four first-line drugs, preferably isoniazid, rifampin, pyrazinamide, and streptomycin or ethambutol, as well as steroids should be included in empirical treatment to reduce mortality with TBM.⁸

Rationale: The frequency of hydrocephalus among tuberculosis bacterial meningitis show variable prevalence varies from 12% to 77%.¹⁷ Such as, Chan et al and Mumtaz et al found the prevalence to be 29% and 48%.^{18,19} and TusharRaut et al study showed the prevalence of 65%.²⁰ There is a need for a study to ascertain the prevalence as delays in diagnosis and initiation of treatment can contribute to high mortality and morbidity, especially in resource-limited regions. Study data will provide the base to estimate the magnitude of this problem in our population in respect to better management protocols catering to the needs of our setup can be implemented. Ultimately this will result in improved patient outcomes and quality of life of the patients.

MATERIALS AND METHODS

Tuberculosis Bacterial Meningitis: Patients represent with any 02 or more of the following clinical characteristics in one week along with any one of the positive laboratory data were applied to label TBM.

Clinical Features: • Fever $\geq 99^{\circ}\text{F}$ (occurring at least 6 hours/day for more than one week)

• Headache dull in nature persisting VAS ≥ 6 (occurring at least 3 hours/day per day for more than one week)

• Vomiting (occurring at least 3 times per day for 3 consecutive days)

• History of contact with TB patient in the family (living in the same house or outside in last 2 years)

Laboratory Data: AFB (+ve) smear on CSF (This was marked positive while culturing any Acid Fast Bacilli (AFB) on fluorescence staining of the CSF)

• Positive AFB culture on CSF (termed positive when Mycobacterium tuberculosis isolates and assessed at 4–6 weeks after their growth on the Bactek media used for culture.

• Typical CSF showed lymphocytic pleocytosis (range 20 – 500 lymphocyte per cubic mm) along increased CSF protein ≥ 100 mg/dl and decreased CSF glucose level ≤ 60 percentage of relating plasma level analysed simultaneously as CSF inspected.

Hydrocephalus: Hydrocephalus was labeled as present on CT scan brain showing any ventricle (third, fourth, or lateral ventricle) dilated to ≥ 25 percentage of their normal value.

Hypertension: Known hypertension (> 02 years)

1- Patients taking medications (daily regularly)

SBP < 140 mmHg and < 90 mmHg (more than six months).

Diabetes Mellitus Type II: Known diabetes mellitus, Patients taking daily medications

HbA1C > 7 percentage

Smoker: Smoke 05 cigarettes / day (at least one year)

Study Design: Cross-sectional examination.

Study Setting: The study was carried out at the Neurology and Medicine wards, Jinnah Postgraduate Medical Center (JPMC), Karachi.

Sample Size: The required sample size calculated to be 137 patients By taking the frequency of hydrocephalus in tuberculosis bacterial meningitis patients at 65.5%,¹³ margin of error 5% and certainty level 95%. WHO software was used for sample size calculation.

Sampling Technique: Consecutive sampling (Non-probability)

Inclusion Criteria: Patients presenting with tuberculosis bacterial meningitis in one week as per operational definition were included.

BMRC stage ≥ 1 .

• Either gender.

• Age 30-60 years.

• **Exclusion Criteria:** Pregnant patients proven by dating scan. Patients with a history of congestive cardiac failure, COPD, CRF, stroke and malignancy. Patients with a history of administration of radioactive contrast agents. Patients with bacterial (other than tuberculosis bacterial meningitis) or viral meningoencephalitis.

Patients with a history of head trauma.

Data Collection Procedure: In the study, according to selection criteria all the consented participation was enrolled from the Medicine and Neurological wards, Jinnah Postgraduate Medical Center (JPMC), Karachi. Institutional ethical review committee permission was taken prior to conduction of study. Written consent was taken from all patients/attendants and assured them for the confidence.

A brief history regarding socio demographic and the duration of illness was taken at the time of admission from the patient or the attendant. All the confirmed tuberculosis bacterial meningitis patients according to criteria, they all were going through a brain CT scan with contrast within 02 days of admission.

All scans had been concentrating with the guide of the radiologist of the health department with more than 10 years of experience who looked for the presence or absence of hydrocephalus as per operational definition.

The out coming of quantitative factors like age and duration of symptoms and qualitative variables like sex, BMRC stages, hypertension, diabetes mellitus type II, and smoking had been entered in questionnaire proforma attached as annexure –I. Data was analyzed on SPSS Version 16.

RESULTS

A total of 137 patients presenting with TBM, regarding selection criteria were included in this study. Out of 137 patients presenting with TBM, the mean age of the patient was 48.22 ± 7.56 years and range between 20 to 60 years while the duration of symptoms in our study was 8 ± 3.47 days respectively. Gender wise 82 (59.9%) were male and 55 (40.1%) were female. Table 1

In study age-wise, frequency distribution among TBM patients showed that 34 (24.8%), 40 (29.2%), 18 (13.1%), and 45 (32.8%) patients were in the age group 20-30 years, 31-40 years, 41-50 years and 51-60 years respectively. In study the duration of symptom among TBM patients, < 1 week 67 (48.9%) and > 1 week 70 (51.1%) respectively. Table 1

Frequency distribution of BMRC stage among TBM patients showed that out of 137 patients with TBM, 24 (17.5%), 91 (66.4%), and 22 (16.1%) patients were in BMRC stage I, II, and III respectively. While the frequency of DM, HTN, and among smokers was observed 31 (22.6%), 40 (29.2%), and 23 (16.8%) respectively. Table 1

Frequency of hydrocephalus among TBM showed 22 (16.1%), while according to age wise more seemed in 20-30 years age group 11(50%), and thereafter in 30-40 age groups 08 (36.4%)($p=0.00$), and gender-wise seemed more in male group 13(59.1%) as compared to female group 09(40.9%) ($p=0.55$).Table 2
In the study, duration of symptoms < 1 week observed in hydrocephalus patients observed 15 (68.2%) while symptoms observed above 1 week in 07 (31.8%) ($p=0.04$), while in study BMRC in relation to

hydrocephalous, stage I, 02(9.1%), stage II, 17 (77.3%), stage III 03 (13.6%). P-value was 0.44. As seemed in Table 02. In study, the known diabetes mellitus type II and hypertensive patients with respect to hydrocephalus seemed in 05 (22.7%) and 07 (31.8%) ($p=0.59$, $p=0.47$) respectively. Table 02 Stratification for smoking status with respect to hydrocephalus observed that patients who smoked, 03 (13.6%), $p=0.10$, showed in table 2.

Table No.1: Frequencies of demographic and other variable of tuberculosis meningitis

Tuberculosis Meningitis demographic and other variables		
Variables		(%)
Gender	Male	82 (59.9%)
	Female	55 (40.1%)
Age	20-30 years	34 (24.8%)
	31-40 years	40(29.2%)
	41-50 years	18(13.1%)
	51-60 years	45(32.8%)
BMRC Stage in TBM	Stage I	24 (17.5%)
	Stage II	91 (66.4%)
	Stage III	22 (16.1%)
Symptom Duration	< 1 week	67(48.9%)
	>1 week	70(51.1%)
D.M Elittus	YES	31 (22.6%)
	NO	106 (77.4%)
Hypertension	YES	40 (29.2%)
	NO	97 (70.8%)
Smoking	YES	23 (16.8%)
	NO	114 (83.2%)

Table No.2: Analysis of Hydrocephalous in Tuberculosis Meningitis Patients

Hydrocephalous In Tuberculosis Meningitis Patients					
VARIABLES		HYDROCEPHALOUS		TOTAL	p-value
		YES(%)	NO(%)		
GENDER	Male	13 (59.1%)	69 (60%)	82(59.9%)	0.55
	Female	09 (40.9%)	46 (40%)	55(40.1%)	
AGE	20-30 years	11 (50%)	23 (20%)	34(24.8%)	0.00
	31-40 years	08 (36.4%)	32 (27.8%)	40(29.2%)	
	41-50 years	00 (00%)	18 (15.7%)	18(13.1%)	
	51-60 years	03 (13.6%)	42(36.5%)	45(32.8%)	
BMRC stage	STAGE I	02 (9.1%)	22 (19.1%)	24(28.2%)	0.44
	STAGE II	17 (77.3%)	74 (64.3%)	91(66.4%)	
	STAGE III	03(13.6%)	19 (16.5%)	22(16.1%)	
SYMPTOM DURATION	< 1 week	15 (68.2%)	52 (45.2%)	67(48.1%)	0.04
	>1 week	07 (31.8%)	63 (54.8%)	70(51.1%)	
D.M ELITTUS	YES	05 (22.7%)	26 (22.6%)	22(100%)	0.59
	NO	17.7(77.2%)	89 (77.4%)	115(100%)	
HYPERTENSION	YES	07 (31.8%)	15 (68.2%)	40 (29.2%)	0.47
	NO	15 (68.2%)	82 (71.3%)	97(70.8%)	
SMOKING	YES	03 (13.6%)	20 (17.4%)	23(16.8%)	0.47
	NO	19 (86.4%)	95 (82.6%)	114(83.2%)	

DISCUSSION

Our study included a total of 137 patients presenting with TBM. The mean age and duration of symptoms in our study were 48.22 ± 7.56 years and 8 ± 3.47 days respectively. 82 (59.9%) were male and 55 (40.1%) were female. Out of 137 patients with TBM, 22 (16.1%) and 115 (83.9%) had and did not have hydrocephalus.

Another study at included 80 patents with tuberculous meningitis, during presentation among them 52(65%) had observed hydrocephalus and than other new 08 patients developed hydrocephalus during follow up. Factors related to hydrocephalus included advanced stage of illness, extreme disability, duration of illness more than 02 months, diplopia, seizures, visible impairment, papilledema, cranial nerve palsy, hemiparesis, CSF total cell count more than 100 cubic/millimeter, CSF protein more than 2.5 gram/liter. CT scan neuroimaging feature that were significantly associated with hydrocephalus included basal exudates, tuberculoma, and infarcts. Multivariate analysis significantly associated with visual impairment, cranial nerve palsy, and the presence of basal exudates as predictors of hydrocephalus. Complete resolution of hydrocephalus, with early tuberculosis meningitis was seen in 13 patients. Hydrocephalus was significantly related with mortality and poor outcome.

Another study included 100 patients of TBM, among them 60 (60percentage) males and 40 (40 percentage) females (mean age of 47.23 ± 10.39 years). The case seemed more in BMRC stage II 65(65%) and 29 (29%) and 6(6%) in stage III and I of the TBM. In study 48(48%) showed hydrocephalus patients. There become no significant association in gender and age variables with p values of 0.67 and 0.58 respectively. The outcomes were significantly better in those who had stage III of TBM where it become observed in 19(65.52%) out of 29 patients in comparison to 27 (41.54%) cases in stage II and 2 (33.33%) in stage I respectively with a p-0.02. Hydrocephalus is observed almost in 50% of the cases with TBM and it is notably excessive in cases that had stage III of TBM.²¹

Another study, a total 116 identified cases of tuberculous meningitis participating during the course of study. In study 55.2% were female and 44.8% were male cases, age range was 15-73 years with means age of 45 ± 17.8 years. Complaint during presentation, were fever in 92.2% females and 88.5% male patients, headache was show in 96.8% female and 92.3% male patients, while meningism 79.7% female and 71.2% male and in coma was observed 18.7% female and 9.6% male cases respectively. Presenting complaints were fever in 92.2% females and 88.5% male cases, the headache was present in 96.8% female and 92.3% male cases, signs of meningism were present in 79.7% female and 71.2% male cases and 18.7% female and

9.6% male cases presented in a coma. CT scan findings were 67.2% of hydrocephalous cases, edema in 36.2%, and infarction in 11.2% of cases. While on MRI brain, hydrocephalous was seen in 81(69.8%) cases, tuberculomas in 86(74%), and infarcts in 14(12.1%).²²

CONCLUSION

This study showed that hydrocephalus is present in a great proportion of patients with tuberculous bacterial meningitis. Physicians needed to comprehend the significance of this association for well timed recognition and management of these events. Strategies aimed at preventing hydrocephalous cases among high risk residents want to be optimized.

Meningitis is the mostly lethal form of TB, specifically. Early diagnosis and remedy can dramatically lessen the high mortality associated with this disease. Complications of TBM are because of the development of hydrocephalus, arteritis, and organization of exudates at the base of the brain resulting cranial nerve palsies, leading to disability and epilepsy. At present, it is accepted, anti tuberculosis drug therapy (12 to 18 months) is essential to obtain a cure. Selective use of steroid and carefully use of high dose of prednisolone should be considered in TBM treatment therapy. The study signified that the increase age of patients, late diagnosis and treatment, increase the stage of disease and the development of hydrocephalous specify the morbidity in TBM.

Thus, it is critical to recognition on a comprehensive manner of management of TBM cases and their co morbidities relatively than initially treating the neurological signs and symptoms.

Author's Contribution:

Concept & Design of Study:	Kanwal Melwani
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Final Approval of version:	Kanwal Melwani

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REFERENCES

1. <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
2. Idris MN, Mirgani SM, Zibair MA, Ibrahim EA, Abadaltif MA, Rida RM, et al. Tuberculous meningitis in HIV negative adult Sudanese patients: clinical presentation and outcome of management. Sudan Med J 2010;46(3):121-31.
3. Raut T, Garg RK, Jain A, Verma R, Singh MK, Malhotra HS, et al. Hydrocephalus in tuberculous

- meningitis: incidence, its predictive factors and impact on the prognosis. *J Infect* 2013;66(4):330-37.
4. Alva R, Alva P. A study of CT findings in children with neurotuberculosis. *Int J Biomed Res* 2014; 5(11):685-87.
 5. Chandir S, Hussain H, Amir M, Lotia I, Khan A J, Salahuddin N, Ali F. Extra-pulmonary tuberculosis: A retrospective review of 194 cases at a tertiary care hospital in Karachi. *J Pak Med Assoc* 2010;60:105-9.
 6. Fazel PA, Makki KU, Haroon H, Soomro IB, Afzal U. Clinical spectrum and outcome of patients with tuberculous meningitis. *Med Channel* 2006;12: 21-3.
 7. Rajshekhar V. Management of hydrocephalus in patients with tuberculous meningitis. *Neurol Ind* 2009;57(4):368–374.
 8. Raza MH, Rashid M, Yasmeen K. Frequency of Hydrocephalus in Cases of TBM. *Ann Punjab Med Coll* 2017;11(4):272-75.
 9. Rekate HL. A contemporary definition and classification of hydrocephalus. *Semin Pediatr Neurol* 2009;16(1):9-15.
 10. Christensen AS, Andersen AB, Thomsen VO, Andersen PH, Johansen IS. Tuberculosis meningitis in Denmark: a review of 50 cases. *BMC Infect Dis* 2011;11:47.
 11. Sobri M, Merican JS, Nordiyana M, Valarmathi S, Al-Edrus SA. Neuroimaging features of tuberculous meningitis. *Med J Malaysia* 2006;61: 36-40.
 12. Rajshekhar V. Management of hydrocephalus in patients with tuberculous meningitis. *Neurol India* 2009;57:691.
 13. Global WH. Tuberculosis report 2017. Geneva: World Health Organization; 2018.
 14. Hsu PC, Yang CC, Ye JJ, Huang PY, Chiang PC, Lee MH. Prognostic factors of tuberculous meningitis in adults: a 6-year retrospective study at a tertiary hospital in northern Taiwan. *J Microbiol Immunol Infection* 2010;43(2):111-8.
 15. Katti MK. Pathogenesis, diagnosis, treatment, and outcome aspects of cerebral tuberculosis. *Med Sci Monit* 2004;10:RA215–29.
 16. Salekeen S, Mahmood K, Naqvi IH, Akhter SH, Abbasi A. Clinical course, complications and predictors of mortality in patients with tuberculous meningitis an experience of fifty two cases at Civil Hospital Karachi, Pakistan. *J Pak Med Assoc* 2013;63(5):563-67.
 17. Nabi S, Khattak S, Badsha M, Rajput HM. Neuroradiological manifestations of tuberculosis meningitis. *Pak J Neurol Sci* 2014;9(2):16-21.
 18. Chan KH, Cheung CY, Fong KI, Tsang W, Mak SI. Clinical relevance of hydrocephalus as a presenting feature of tuberculous meningitis. *Q J Med* 2003;96:643–48.
 19. Mumtaz S, Aslam MA, Qadeer S. Frequency of hydrocephalus in cases of tuberculosis meningitis syndrome patients. *J Sheikh Zayed Med Coll* 2018; 9(1):1312-14.
 20. Raut T, Garg RK, Jain A, Verma R, Singh MK, Malhotra HS et al. Hydrocephalus in tuberculous meningitis: Incidence, its predictive factors and impact on the prognosis. *J Infect* 2013;66(4):330-7.
 21. Mumtaz S, Aslam MA, Qadeer S. Frequency of hydrocephalus in cases of tuberculosis meningitis syndrome patients. *J Sheikh Zayed Med Coll* 2018; 9(1):1312-14.
 22. Ayyaz AHM, Zulfiqar V, Kayani S. Incidence and presentation of tuberculous meningitis. *ISJ Theoretical App Sci* 2018;09(65):134-38.