COMPARISON OF GLASGOW COMA SCALE AND MEDICAL RESEARCH COUNCIL SCORES AS PREDICTORS OF IN-HOSPITAL MORTALITY IN TUBERCULOUS MENINGITIS.

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ABSTRACT

Objective: To compare Glasgow Coma Scale and Medical Research Council staging systems as predictors of mortality in tuberculous meninigits patients.

Study Design: Cross-sectional comparative study.

Methodology: This study was done in departments of Medicine in Hayatabad Medical Complex, Khyber Teaching Hospital and Lady Reading Hospital in Peshawar from 1st October, 2013 to 31st March, 2014. Hundred (100) patients with TBM meeting the inclusion and exclusion criteria were assessed in hospital and followed for six months using MRC and GCS scoring systems.

Results: A total of 100 patients were enrolled in this study. Male patients outnumebered female. Sixty-seven patients were male and 37 were female. On admission, 22 patients had MRC stage I, 44 had stage II and 34 stage III. The mean GCS was 2.1. Overall, 28 patients had GCS above 12, 31 had between 9 to 12 and 41 had below 9. Discharge outcome was graded according to the Glasgow Outcome Scale (GOS). Five patients died during hospital stay, 3 showed MRC stage III and 2 with severe GCS. Total 23 had persistent vegetative state, 16 with MRC III and 18 with severe GCS. Among 28 severe disable, 22 had MRC stage II while 15 had GCS between 9 to 12. Out of 35, all 22 with MRC I showed good recovery as compared to 28 patients with mild GCS. The difference in the mean scores of GCS and MRC systems is .o1 (t value=0.13)

Conclusion: Our study demonstrates that the GCS system is as effective as MRC in predicting the discharge outcome in patients with tuberculous meningitis.

Keywords: Tuberculous Meningitis, Medical Research Council staging system, Glasgow Coma Scale, Outcome.

INTRODUCTION

Tuberculosis (TB) is a bacterial infection caused by the organisms belonging to Mycobacterium tuberculosis complex (MTBC) and is spread by droplet infection. It is an ancient disease well known for the last 5000 years but is still a major public health problem globally, infecting 1/3 of the world population[1]. TB ranks second only to HIV as a cause of death from an infectious agent[2]. Globally, roughly two billion people are infected by Mycobacterium Tuberculosis and roughly 2 to 3 million people die from active TB each year despite the fact that it is curable[3]. Tuberculosis is the seventh most important cause of global premature mortality and disability[4].

Although TB is an important cause of ill health, little epidemiological data is available for Pakistan[1]. According to WHO, the estimated TB incidence, prevalence and mortality in Pakistan respectively are 230, 310 and 39 per100,000 population[5]. TB manifests as pulmonary and extrapulmonary TB (Extra-Pulmonary TB). Pulmonary TB is far common but there is a significant incidence of Extra-Pulmonary TB in Pakistan. 45443 (18%) of the newly notified cases in Pakistan in 2010 were Extra-Pulmonary TB[6].

Tuberculous meningitis is an important serious extra-pulmonary complication of TB, related with high mortality and morbidity in developing countries[7] and have recently shown resurgence in developed ones[8].

Presentation of TBM is often nonspecific, early recognition of this potentially treatable disease remains a challenge to clinicians[9]. It occurs in 7 to 12% of tuberculous patients and has high fatality despite availability of effective chemotherapy and delay in diagnosis is directly related to neurological sequelae in 20% of patients who do not receive early treatment[10].

Various factors and scoring models have been developed to predict the outcomes of TBM, and these are used in the evaluation of different treatment regimens. The British Medical Research Council (MRC) staging system, based on neurological deficits and consciousness levels, has been applied to patients with TBM since 1948. Recently, the Glasgow Coma Scale (GCS) score have been proposed for predicting the outcomes of adult patients with TBM[11]. This study was done to compare GCS[12] Scoring System and MRC[13] as predictors of mortality in patients with meningeal TB.

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MATERIAL AND METHODS

- Study design: Cross-sectional comparative study
- Study Setting: Departments of Medicine of Tertiary Care Hospitals i-e HMC, LRH. KTH in Peshawar.
- Study Duration: October 2013 to March 2014.
- Sample Size: 100 TBM patients of different age groups.
- Sampling Technique: Consecutive sampling.
- Sample Selection

INCLUSION CRITERIA

Patients having fever, constitutional symptoms (malaise, vague ill health, headache, vomiting), nuchal rigidity with altered mental and behaviour changes confirmed from CSF findings and neuroimaging findings confirming TBM are included in the study.

EXCLUSION CRITERIA

1: Patients already receiving anti-tuberculous treatment for more than 2 weeks.

2: Patients having other comorbid conditions leading to independent increase in mortality.

3: CSF not suggestive of TBM.

The above conditions will be excluded to control bias in the study.

OPERATIONAL DEFINITIONS

1: Glasgow Coma Scale

It is composed of three parameters: Best Eye Response, Best Verbal Response, Best Motor Response. The Glasgow Coma Score (GCS)[12] is scored between 3 and 15, 3 being the worst, and 15 the best.

- 13 or above = mild brain injury
- 9 to 12 = moderate brain injury
- 8 or below = severe brain injury

2: Medical Research Council Score:[13]

I: Fully conscious and no focal deficits.

II: Conscious but with inattension, confusion, lethargy and focal neurological signs.

III: Comatose, multiple cranial nerve palsies, or complete hemiparesis or paralysis.

3: Glasgow Outcome Score:[14]

1. Death: Severe Injury or death without recovery of consciousness
2. Persistent Vegetative State: Severe damage with prolonged state of unresponsiveness and a lack of higher mental functions.
3. Severe Disable: Severe injury with permanent need for help with daily living.
4. Moderate Disable: No need for assistance in everyday life, employment is possible but may require special equipment.
5. Good Recovery: Light damage with minor neurological and psychological deficits.

DATA COLLECTION PROCEDURE

After approval from ethical committee, patients who filled our inclusion criteria admitted in medicine departments of HMC, KTH and LRH in Peshawar were included in the study. Purpose of the stud was explained and informed consent was taken from 100 patients. Patients' demographic data, clinical features, neurological manifestations, laboratory and radiological data, anti-tuberculosis treatment, adjunctive treatment such as corticosteroids or surgery, and outcome on basis of Glasgow Outcome Scale were recorded. Questionnaires were filled by attending physicians on the basis of on admission examination, history and base line investigations. Later admitted patients' neuroimaging findings and CSF findings were seen. Anti-tuberculous treatment was started and patients were continuously monitored during their hospital stay for any of the improvement signs i-e increase in appetite, weight gain, regain of

SIGNS AND SYMPTOMS	FREQUENCY
Fever	100%
Neck stiffness	86%
Altered LOC	86%
Headache	89%
Vomiting	58%
Focal Neurological signs	32%
Behavioral changes	69%
Fits	52%
Photophobia	12%

M R C Stage		Frequency
I	Fully conscious and no focal deficit	22
II	Conscious with confusion and focal signs	45
III	Comatose, palsies and paralysis	34

GCS Score		Frequency
Mild	13 or above	28
Moderate	9 to 12	31
Severe	8 or less	41

MRCstage GCStotalScore Crosstabulation

	GCStotalScore			Total
	13 or above..... Mild	9 to 12..... Moderate	8 or less..... Severe	
fully concious and no focal deficit	18	0	4	22
MRCstage conscious with confusion and focal signs	10	18	16	44
comatose or palsies or paralysis	0	13	21	34
Total	28	31	41	100

GOS stage		Frequency
1	Death	3
2	Persistent Vegetative State	23
3	Severe Disable	28
4	Moderate Disable	9
5	Good Recovery	35

consciousness etc. 100 patients were assessed as per the questionnaire and predictors of mortality were determined. Discharge outcome was graded according to the Glasgow Outcome Scale (GOS)[14].

DATA ANALYSIS

Data collected were enetered into SPSS version 20.0 for statistical analysis. Frequensies and percentages of hospital stay duration, illness time, symptoms and neurological findings were calculated and comparison was done between GCS and MRC on the basis of GOS.

RESULTS

A total of 100 patients were enrolled in this study. male patients outnumbered females. 63 patients were male and 37 were female. The average duration of symptoms before hospitalisation was 19.5 days (Range 2 - 90). The mean duration from admission to the beginning of anti-tuberculosis treatment was 8.7 days. (Range 3 - 30)Previous history of Tb was present in six patients. (6%) and only two (2%) patients had epilepsy history. 46 patients had positive Tb contact history. Among the co-morbid conditions, 11 patients were hypertensive and only 1 was diabetic. Out of 100, 1 patient had smoking habit. 27 patients were not previously vaccinated.

Fever (100%), headache (89%) and altered concious level (86%) were the most common symptoms. 15 patients had cranial nerve palsies. Abducent nerve was most commonly involved (13%) and occulomotor was involved in only 2 patients. 3 develop severe disability and 3 remain in same vegetative state. Papilloedema was present in 17 patients.

Among CT and MRI results, the most common finding of meningeal enhancement was identified on admission in 76 patients. 42 patients had hydrocephalus and 3 among them underwent ventriculoperitoneal shunt. 15 patients had cerebral edema and 4 died during hospital stay. 11 patients had infarction and 3 were diagnosed with tuberculoma, which didn't show good recovery and were dependent. (GOS: 3) Dexamethasone was given to reduce inflammation in all patients (100%). Only 4 patients showed adverse side effects to anti-tuberculous drugs.

Cerebral edema(11%), infarct (15%) and tuberculoma(3%) were bad predictors of mortality. 3 patients with edema died during hospital stay while 10 and 3 patients with infarct and tuberculoma were severly disable respectively.

On admission, 22 patients had MRC stage I, 44 had stage II and 34 stage III. Among 34 comatose and paralysed patients, 21 had GCS below 9 and 13 have more than 9. Similarly, 44 patients with MRC stage II have GCS between 9 to 12 and 10 have above 12. Only 16 out of 44 have below 9. 22 patients were fully concious and exhibit no focal deficit and so 18 of them have GCS above 13. 4 have below 9.

The mean GCS was 2.1. Overall, 28 patients had GCS above 12, 31 had between 9 to 12 and 41 had below 9. Out of 28 patients with mild GCS, 18 had MRC stage I and 10 had stage II. 31 patients had GCS between 9 to 12 and 13 of them were comatose or had palsies. With below 9 GCS, 21 had MRC stage III and 4 were fully concious.

Discharge outcome was graded according to the Glasgow Outcome Scale (GOS). 5 patients died during hospital stay, 3 showed MRC stage III and 2 with severe GCS. 23 had persistent vegetative state 16 with MRC III and 18 with severe GCS. Among 28 severe disable, 22 had MRC stage II while 15 had GCS between 9 to 12. Out of 35, all 22 with MRC I showed good recovery as compared to 28 patients with mild GCS. The difference in the mean scores of GCS and MRC systems is .o1 (t value=0.13)

DISCUSSION

Tuberculous meningitis (TBM) is the most common form of CNS tuberculosis and is characterized by a slowly progressive granulomatous inflammation of the brain that results in death if left untreated. An early diagnosis and in time start of anti tuberculosis drugs contributes to improve outcome from tuberculous

meningitis, yet associated anomalies can lead to severe disabilities.

As compared to the previous research work done comparing different scoring systems of TBM, our study shows similar results regarding the characteristics and natural course of TBM. In our study 100 patients of different age groups were selected with male predominance as is shown by many other studies[15,16] only Qureshi et al[17] revealed a slight female preponderance.46% patients were unvaccinated and 27% had positive history of Tb contact which match results by Fazel et al[15] (40%) and Malik et al[16] (32.5%).

Fever (100%), headache (89%) and altered concious level (86%) with neurological symptoms or signs of infection benefit in early recognition of the existence of meningitis and initiation of treatment to influence the outcome. Nevertheless, absence of fever or headache was not consistent with the finding of a predictive value in the study by Lu et al[11].

Cranial nerves most commonly invovled in our study were sixth (13%)and third nerves (2%) which contradicts with Khalid et al[18] whose study showed sixth, third, second and seventh nerves involvement, with cranial nerve involvement being more in stage-III. However, in our study out of 15 patients 7 showed good recovery during hospital stay. Only those patients with concomitent infarct develop disability.

Basal enhancement and hydrocephalus were found as the most frequently reported radiographic abnormalities in our patients (> 40%) like many other studies[19]. However, the study by Amin *et al*[20] conducted at Shaukat Khanum Memorial Hospital, Lahore, surprisingly found hydrocephalus and vasculitis in less than 10% of their cases.

In our study, all patients were treated similarly i-e with steroid and anti-tuberculous drugs. Only 4 patients showed drug induced hepatitis. the motality rate during hospital stay in our study was 5% while study carried out by Sirajus Salakeen[19] in Karachi reported 8 death in hospital out of 92 patients. The low mortality rate is probably because tuberculosis is more common in our country so physicions diagnose it on high suspicion bases. However, our 23 patients were discharged in same vegetative state and 28 develop severe disability. This is because we have limited beds available in our tertiary care hospitals so we discharge patients early and people from far areas due to financial and transport problems can't afford long hospital stays. Our mean duration of hospital stay is 8.7 days.

Majority of patients in this series were found to have stage-II disease at the time of admission followed by stage-III and stage-I patterns respectively. This mode of presentation is not too different from recent studies from Pakistan[21] which found stage-II pattern at the time of presentation in 50 – 55% of cases. However, Rim Abdelmalek et al. also found similar pattern of presentation in 23 out of 29 patients with tuberculous meningitis in Tunisia[22] Majority of patients who remain severly disable with stage-II and III develop cerebral edema or had infarct or tuberculoma. In our study, cerebral edema, infarction and tuberculoma were bad predictors of mortality which is same as depicted by Khalid et al[18] in 93 TBM patients.

The mean GCS score in our study was 2.1. Like other studies, GCS below 8 was considered a bad predictor of mortality. As is well known, patients with a status of brain dysfunction, such as complex seizure, may present with altered sensorium or even as comatose, and will be categorised as advanced in the MRC staging system. On the other hand, disturbance of consciousness among patients with a lower GCS score that was not ascribed to seizures brought about a closer association with unfavourable outcome than those with a higher MRC score[11].

Our study shows that GCS is as good as MRC system in predicting discharge outcomes. Our results differ the work done by Van Toorn R et al[23] who showed 'refined MRC' better than GCS. But study done by Chou et al[11] who compared APACHE 2 GCS and MRC places GCS superior to MRC. This difference in results can be due to high incidence of TB in our region, short followup duration, long duration between illness and treatment start and poor drug compliance.

CONCLUSION

Our study shows GCS system is as good as MRC in predicting outcome of the patients with TBM. Furthermore, cerebral edema, infarct and tuberculoma were bad predictors of mortality and GCS system provides more accurate assessment of patients with associated neurological damage. Further studies are needed on TBM patients treated with standard anti-tuberculosis protocol and with long followup durations to verify the mortality rate in TBM patients.

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