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Correlation of Early Cognitive Impairment in Intracerebral Haemorrhage from Tertiary Care Hospital of North Karnataka

Dhananjaya M[1*], Kiran Hukkeri[2], Sharankumar[2], Manoj[2]

[1]Associate Professor, Department of Medicine SDM University, Sattur, Dharwad-580009, State-Karnataka, India
[2]Post Graduate Student, Department of Medicine SDM University, Sattur, Dharwad-580009, State-Karnataka, India

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***Corresponding author:** Dhananjaya M
Associate Professor, Department of Medicine SDM University, Sattur, Dharwad-580009, State-Karnataka, India

Abstract **Original Research Article**

***Objectives*:** To identify the correlation of early cognitive impairment following intracerebral haemorrhage. ***Methods*:** A total of 30 adult patients (>15 years) with intracerebral hemorrhage were enrolled in the study. Demographic profile, clinical and radiological profile of the patients was noted. Cognitive status at discharge was assessed using Montreal Cognitive Assessment (MoCA). ***Results*:** Mean age was 63.53±12.11 years. Majority were males (56.7%). All the patients had cognitive impairment - majority (76.7%) had moderate cognitive impairment followed by severe impairment (16.7%) and mild impairment (6.7%) respectively at time of discharge. History of tobacco use showed a significant association with severe cognitive impairment. ***Conclusions*:** Mild to moderate cognitive impairment is quite frequent among intracerebral hemorrhage patients at time of discharge irrespective of the clinical, demographic and radiological profile.

Keywords: intracerebral haemorrhage, radiological profile, History of tobacco.

INTRODUCTION

Intracerebral hemorrhage (ICH) is the second most common subtype of stroke after ischemic stroke and accounts for approximately 10% to 20% of all strokes [1]. It has an overall incidence of 19.1 per 100,000 person years with a high case fatality [2]. The burden of stroke is likely to increase worldwide with increased life expectancy [3]. Middle and low income countries have this phenomena more clearly [4].

ICH is classically presented with sudden onset of a focal neurological deficit that progresses over minutes to hours associated with headache, nausea, vomiting, decreased consciousness, and elevated blood pressure. Sometimes patients present with symptoms upon awakening from sleep. Neurologic deficits are related to the site of parenchymal hemorrhage. Ataxia is the initial deficit noted in cerebellar hemorrhage, whereas weakness may be the initial symptom with a basal ganglia hemorrhage. Early progression of neurologic deficits and decreased level of consciousness can be expected in 50% of patients with ICH [5]. The progression of neurological deficits in many patients with an ICH is frequently due to ongoing bleeding and enlargement of the hematoma during the first few hours [5].

Cerebral amyloid angiopathy (CAA is primarily responsible for the cognitive dysfunction [6, 7], and causes brain edema and secondary ischemia. Presence of subarachnoid hemorrhage and involvement of hippocampal and frontotemporal regions [8, 9], also lead to vascular cognitive impairment which affects the visuospatial memory and language deficits [10]. It is postulated that in such a case vascular cognitive impairment occurs in response to the impact of subdural membrane on dural lymphatic drainage [11].

The neurological deficits in ICH patients are associated with cognitive impairment. Cognitive decline is observed in both before and after ICH [7-12]. The prevalence of cognitive impairment range between 9-29% for pre ICH and from 14-88% for post-ICH [13]. The prevalence of post-ICH mild cognitive disorders has been reported to be as high as 87.5% while major cognitive disorders have been reported to affect nearly 2.5% of the patients followed upto a median period of 4 months [12]. Even studies focused on early cognitive impairment (within 30 days) following have reported significant cognitive impairment in almost one-third ICH patients [14].

The present study was carried out with an aim to determine the early cognitive impairment in patient with ICH at a tertiary care centre in North Karnataka.

MATERIAL AND METHODS

The present study prospective observational study was carried out at Department of General medicine, tertiary care hospital of North Karnataka after getting approval from Institutional Ethics Committee and after obtaining informed consent. The study included a total of 30 adult patients (>15 years) with parenchymal hemorrhage on computed tomography (CT). The sample size projections were based on feasibility based on previous hospital trends. Patients with Pure intraventricular hemorrhages, ICH resulting from intracranial vascular malformation, intracranial venous thrombosis, oral anticoagulants, head trauma or tumor, those with Hemorrhagic transformation within an infarct or those who were lost to follow-up, not been able to assess cognitive status at discharge (including mortalities) were excluded from the study.

Demographic details such age, sex, place of residence, occupation and education were noted. Presence of vascular risk factors according to the medical history was enquired. History of previous stroke or transient ischemic attack (TIA) and atrial fibrillation was asked for. Brain computed tomographic scans was performed at admission in all the patients. The volume of the hemorrhage was calculated according to the validated AxBxC/2 method. ICH scores (Table 1) were calculated by taking in to account GCS at admission, ICH volume, presence of in traventricular hemorrhage, infratentorial origin of ICH and age of patient using the following criteria [15].

At discharge, cognitive assessment of patients was done using Montreal Cognitive Assessment (MoCA). The tests were performed by a trained research assistant. MoCA is highly validated for use in adults and displays excellent psychometric properties [16-18]. MoCA items address orientation, drawing figures, processing speed, naming objects, memory, recall, attention, vigilance, repetition, verbal fluency, and abstraction. The MoCA adds one point for those whose educational level is 12 or fewer years. Mild cognitive impairment was defined by the MoCA score between 18 and 26; moderate cognitive impairment between 10 and 17; and severe cognitive impairment <10 respectively.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. Data has been represented as numbers and percentages and mean±standard deviation (S.D.). Analysis of variance, independent samples‘t’-test and chisquare test were used to compare the data. A ‘p’ value less than 0.05 was considered to be significant.

RESULTS

Age of patients ranged from 35 to 90 years. Maximum number of cases were aged <60 years (40%) followed by those aged 61-70 years (36.7%) and >70 years (23.3%) respectively. Mean age of patients was 63.53±12.11 years. Majority of patients were males (56.7%). There were 13 (43.3%) females. Sex ratio was 1.31. Majority of patients were from rural areas (83.3%). There were only 5 (16.7%) urban patients. At discharge, all the patients had cognitive impairment - majority (76.7%) had moderate cognitive impairment followed by severe impairment (16.7%) and mild impairment (6.7%) respectively (Table 2).

Severe cognitive impairment did not show a significant association with age, sex, occupation, habitat, literacy, exercise habit, comorbid conditions, personal habits (except history of ever use of tobacco), family history, previous stroke history, migraine with or without aura and medication history. Only personal history related with ever use of tobacco was significantly associated with severe cognitive impairment (p=0.009) (Table 3). No significant association of at discharge cognitive status was observed with any of the radiological features and duration of hospital stay (Table 4). No significant correlation of age, ICH volume or duration of hospital stay was observed with early cognitive score (MoCA). However, ICH score and GCS showed a mild significant correlation with early cognition score. The correlation between GCS and MoCA scores at discharge was near moderate and positive in direction (r=0.480; p=0.007) whereas ICH scores showed a mild negative correlation with MoCA scores at discharge (r=- 0.450; p=0.013) (Table 5).

DISCUSSION

In present study, at discharge all the patients showed cognitive impairment with majority showing moderate cognitive impairment (76.7%), followed by severe impairment (16.7%). Only 2 (6.7%) patients had mild cognitive impairment.

In the previous study conducted among critically ill patients admitted to ICU even among nonstroke or brain injury patients too have shown high prevalence of cognitive impairment at discharge along with depressive symptoms [19]. Similar to findings of present study, Tembo [20], who conducted their assessment in ICU patients found that even 15 days after discharge there was some form of cognitive impairment in all the patients. They also reported that at this early stage, most of the patients felt of ‘Being in Limbo’ with three major themes of ‘Being Disrupted’, Being Imprisoned’ and ‘Being trapped’. The prevalence of cognitive impairment was the major themes ‘Being Disrupted and ‘Being Trapped’. Intracerebral hemorrhage is an acute event following which there is a sudden change in patient’s physical as well as psychological status, moreover by the time of discharge most of the patients are on psychotropic, analgesic, sedative support which also have their impact on neurocognitive functions and as such cognitive functions are not deemed to be normal at this early stage in almost all the patients and as depicted in present study too. In present study, all the patients had cognitive impairment at discharge, and majority of them had moderate cognitive impairment. This coincides with the observation of Tembo20 and shows a combined effect of ICH induced morphological changes in brain as well as the impact of in-hospital experience. Owing to these issues, the attempts to measure cognitive impairment in stroke patients, particularly ICH patients are made at a sufficient time gap after hospital discharge in order to rule out the impact of change in environment, post-critical illness psychological stress and hospital related depression and anxiety.

A high prevalence in present study is comparable to observation made by Planton *et al.*, [12], who reported cognitive impairment in 90% of ICH patients. They also reported this cognitive impairment to be generally of mild order (87.5%) and reported severe impairment in only 1 (2.5%) patient. In present study too, we found that the 3-month cognitive impairment was dominated by mild impairment only (73.3%) and only 1 (3.3%) patient had severe impairment. A high prevalence of cognitive impairment was also reported by Banerjee *et al*., [7], who reported impairment of at least one cognitive domain in as many as 84% of their patients.

In fact, there seems to be extreme variability in prevalence of post-ICH cognitive impairment in different studies. Donnellan and Werring [13], too in a recent systematic review revealed that this prevalence ranged from 14-88% in 11 studies reviewed by them.

In present study, no significant association of mean MoCA scores at discharge was observed with age, gender, presence of risk factors like diabetes, dyslipidemia, hypertension, tobacco use, smoking, alcohol use and previous history of stroke. Among different demographic, clinical and history factors, tobacco use history was seen to be significantly associated with severe grade of cognitive impairment. Angiotensin II blockers use was significantly associated with higher MoCA scores while use of any medication was seen to be significantly associated with better cognitive status. The association between tobacco use and cognitive impairment is well established even in young adults [21].

Compared to present study, Douiri *et al.*, [22], reported that older age, ethnicity and socioeconomic status have a significant association with prevalence of cognitive impairment. In contrast, in present study, majority of patients were >60 years old (60%) belonged to only one ethnicity and had no socioeconomic differences as all of them hailed from middle class, hence these differences could not be elucidated as significant factors associated with cognitive impairment.

In another study, You *et al*., [14], also found that among demographic factors - older age and female sex, prior history of stroke and higher mean systolic blood pressure had a significant association with cognitive impairment. But in present study, we did not find these associations to be significant. While present study included only 30 patients of ICH, most of the previous studies evaluating this relationship had a much larger sample size. In fact, the findings of Douiri *et al*., [22], are based on data of 271817 stroke cases. Mellon *et al*., [23], in their study had 256 stroke patients and Biffi *et al*., [24], and You *et al*., [14], had 738 and 231 ICH patients respectively in their studies. Compared to these studies, the present study could be perceived as only a pilot study verifying trends reported in previous studies and also trying to establish some new trends rather than establishing them.

Not much significance to demographic and clinical factors has been given by previous workers while studying the problem of post-ICH cognitive impairment but the focus of their assessments has been on radiological features. Owing to sample size limitation, we were unable to find any patient with radiological feature of herniation, hydrocephalus or vasospasm. There was only one case with subarachnoid bleed and two cases with intraventricular bleed. Most of the other radiological features of interest were absent in the spectrum of radiological findings in a limited sample of our study. The only features of interest were thus midline shift, extent of midline shift and hematoma size. But none of these features were found to be significantly associated with level and severity of cognitive impairment.

In current study, we found that a combined association of radiological as well as clinicodemographic factors, as projected by ICH score was significantly associated with cognitive functions, thus showing that radiological features in combination with clinicodemographic factors play a dominant role in determining the prevalence and extent of cognitive impairment in post-ICH patients. As such multifactoriality of cognitive impairment following stroke is accepted by almost all the workers and combined stroke severity scores hold relevance in it. Similar to findings of present study where higher ICH score was significantly correlated with poorer cognitive function, you *et al.*, [14], also found the NIH stroke severity score (NISS) to be significantly associated with cognitive impairment in ICH survivors.

The findings of present study showed cognitive impairment is quite prevalent post ICH, however, its relationships with different clinic-demographic and radiological features could be evalauated in a larger sample size. Cognitive impairment should be considered as a multifactorial problem in which both clinico-demographic variables and radiological features seem to have their independent as well as mutual roles as illustrated with the help of a scoring system like ICH. Further studies on a larger sample size with diversified radiological features could help in understanding the independent role of different radiological features in a better way.

CONCLUSION

Early mild to moderate cognitive impairment is quite frequent among intracerebral hemorrhage patients irrespective of the demographic, clinical and radiological profile. Further studies are required on larger sample size.

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