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Prevalence of Comatose Patients and Disability Status in Relation to the Level of Consciousness in Belgaum City-An Observational Study

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Abstract

Background: Coma is characterized as a state of deep unconsciousness resulting from neuronal failure caused by a reduced supply of glucose or oxygen to the brain. Limited data exist on the prevalence of comatose patients in India. Evidence suggests that early rehabilitation significantly improves functional outcomes. This study aims to address the knowledge gap by exploring the prevalence of comatose patients and their disability status concerning levels of consciousness in densely populated regions with developing healthcare systems, such as India.

Objective: To determine the prevalence of comatose patients in Belgaum city and their disability status, highlighting the need for early physiotherapy and Coma Arousal therapy to reduce disability and improve survival.

Method: Data were collected on day 1 using the Glasgow Coma Scale (GCS) and the Full Outline of Unresponsiveness (FOUR) score. Disability status was evaluated on day 7 using the Disability Rating Scale (DRS) at tertiary care setups in Belgaum.

Results: A total of 96 comatose patients were screened according to GCS were included in the study. The most common level of consciousness, graded using the FOUR score, was 1, while the average DRS on day 7 was 24.

Conclusion: A high prevalence of comatose patients in Belgaum city, along with concerning mortality rates and severe disability among survivors, underscores the urgent need for early physical rehabilitation to enhance patient outcomes.

Keywords: Coma; Full outline of unresponsiveness; Prevalence; Disability rating scale; Disability status

Introduction

Coma, which is defined as a deep trance is characterized by severe unconsciousness an absence of a regular sleep-wake cycle and closed eyes in individuals who are unable to be awakened. If not properly identified and treated, a coma frequently results in death or an unfavorable prognosis coma can be brought on by a variety of traumatic and non-traumatic brain lesions [1] the neuronal failure brought on by a reduction in the brains blood supply of glucose or oxygen is acknowledged as the pathophysiology of a coma. Any clinical condition that results in circulatory collapse or severe hypoxia may present as a coma [2]. The FOUR (Full Outline of Unresponsiveness) score has four components. It is easier to remember than the GCS as it evaluates crucial brainstem reflexes and its focus on the respiratory system is lacking in GCS. The FOUR score is a validated and more reliable coma scale as an alternative to GCS in the evaluation of the level of consciousness [3,4]. The disability rating scale was created to quantitatively evaluate disability in individuals with severe brain injury. From coma to complete recovery, individuals can be evaluated using this scale. The scale is generally used for individuals with traumatic brain injuries but a few studies have also employed it as an outcome measure for patients with non-traumatic causes of severe brain injury [5,6].

Knowing the percentage of individuals who are affected by a condition or syndrome is one of the first things that must be known to fully comprehend its impact [7]. Kowalski et al. stated the important disabilities in comatose patients who survived were associated with physical and cognitive deficits that lead to the loss of independence [8]. The level of disability can be minimized by timely assessment [9].

There is a paucity of data concerning the prevalence of comatose patients in India or for that matter Asia and the vast majority of the data amassed so far are from the US or other European nations [10].

Most studies conducted so far have measured disability status beyond 3 months [11]. There is evidence stating that early rehabilitation improves functional outcomes [6,7]. Determining and distinguishing between different levels of consciousness is one of the essential steps in predicting disability, providing care and assessing recovery because it enables us to discover the severity of the condition [3,12]

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Prolonged unconsciousness and delayed early rehabilitation interventions, contributes to adverse functional outcomes [12]. Hence, the early initiation of physical rehabilitation, even in patients with reduced consciousness, could improve recovery trajectories and reduce disability burden. Given this dearth of information, it is crucial to shed light on how many patients are comatose, their disability status concerning their level of consciousness at an early stage in nations with dense populations and improving health systems, like India.

Hence the purpose of this study is to find the prevalence of comatose patients and disability status in relation to the level of consciousness in Belagavi city.

Materials and Methods

A descriptive, cross-sectional observational study was conducted over a period of 6 months and the primary data was collected at tertiary care centres in Belagavi city, Karnataka. The study was approved by the Institutional Ethical Committee at KAHER Institute of Physiotherapy. Informed consents were taken from patient caregivers prior to the study commencement in their native language that declared their voluntary agreement to participate in the study. By using the principle of non-probability sampling with a sample of convenience, a total of 96 comatose individuals above 18 years of both genders were screened using GCS score [3-8] and included by the principal investigator. Patients who were completely unresponsive were excluded. Demographic details were recorded and all participants. Their consciousness was assessed using the Full Outline of Unresponsiveness (FOUR) score on the same day of screening. The FOUR score has four components namely eye response, motor response, brainstem reflexes and respiration. Each component has sub-scoring ranging from 0-4. The lower the score, the lesser the level of consciousness [13]. This scale was considered as it is superior to the GCS as it is easier to remember and an acronym helps. FOUR scores evaluate brainstem reflexes and respiratory component that is lacking in the GCS and disability was evaluated using the Disability Rating Scale (DRS) on day 7 following the recruitment of the patients in the study by the same investigator.

Disability Rating Scale (DRS was used to quantitatively evaluate disability in individuals with severe brain injury. From a coma to complete recovery individuals can be evaluated using this scale. The scale is generally used for individuals with traumatic brain injury, but a few studies have also employed it as an outcome measure for patients with nontraumatic causes of severe brain injury. The DRS is more sensitive than the Glasgow outcome scale in detecting and measuring clinical changes in individuals with coma [6,14].

Statistical analysis

The data were collected and coded in master datasheets. Descriptive statistics were used for the analysis. SPSS software was used to perform the statistical analysis. Karls Pearson co-relation analysis was conducted to find if there was any correlation between disability status and consciousness level using the FOUR score and DRS.

Results

A total of 96 comatose patients were included in the study between age 18-85 years and the prevalence of comatose patients, their consciousness level and disability rate at day 7 was evaluated using the FOUR score and Disability Rating Scale (DRS). Apart from this the cause of comatose and GCS was evaluated.

Out of the 96 comatose patients (62 males and 34 female), 40 were trauma caused by RTA, 36 were due to stroke, other neurological condition, cardiorespiratory conditions, other conditions (metabolic, poisoning, etc.).

Table 1 describes the number of male and female comatose individuals recruited. 62 were male gender while 34 were female of a total 96 participants included. The age variation of the comatose individual recruited ranged from 18 years to 84 years with a mean range of 44 +/- 18 years.

Gender	**Frequency**		**Percent**	
Male	62		65	
Female	34		35	
Total	96		100	
	Minimum	**Maximum**	**Mean**	**Std. deviation**
Age	18	84	44.6	18.3

Table 1: Frequency of male and female comatose patients.

This pie chart illustrates the distribution of causes by frequency (Figure 1). The largest proportion is attributed to traumatic causes, representing 41.7% of the total, followed closely by stroke at 37.5%. Other neurological conditions account for 9.4%, while cardiorespiratory conditions make up 6.2%.

A smaller segment, categorized as "others," constitutes 5.2% which included patients with infection, cellulitis and diabetic coma. The chart highlights that traumatic and stroke-related causes dominate, comprising nearly 80% of the total.

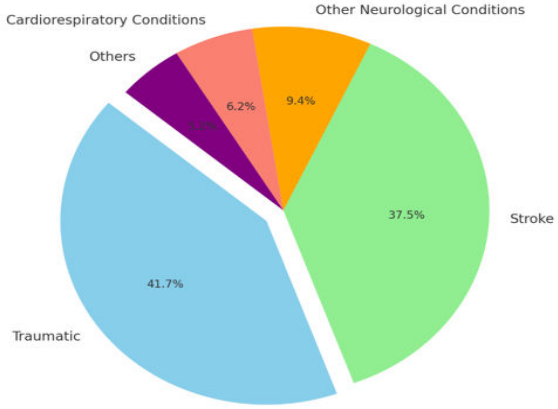

Figure 1: Comparison of causes by frequency.

The most common cause of comatose among the population were due to traumatic cause and least were due to cardiorespiratory conditions (non-traumatic). The average FOUR score ranged from 1-7.5 and DRS. Scores ranged from 06-29 stating that traumatic cases had more disability than non-traumatic cases (Table 2).

Cause	Four score	DRS
Traumatic	1.2	29.1
Stroke	6	14
Other neurological conditions	5.4	10
Cardiorespiratory conditions	1	27.5
Others	7.5	6
Note: FOUR: Full Outline of Unresponsiveness; DRS: Disability Rating Scale		

Table 2: The cause of comatose, the average DRS and FOUR scores.

Figure 2 represent the consciousness level of comatose patients using FOUR score. A lower score states the severity of loss of consciousness. 34 participants were found to have a score of 1 while higher scores represent better consciousness level and only 1 participant had a score of 10.

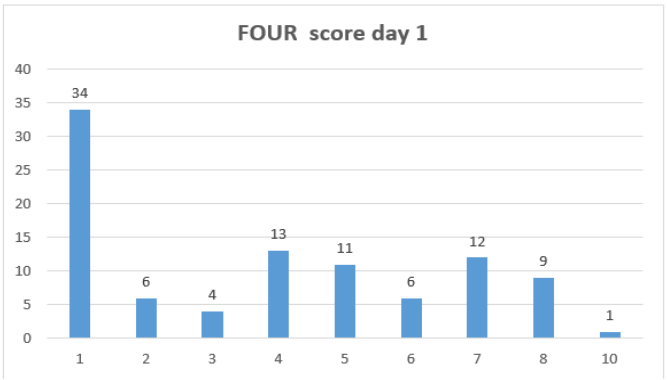

Figure 2: The consciousness level of comatose patients using FOUR score.

Figure 3 represents the disability status of the comatose individuals on day 7. A total of 43 participants died and 7 participants had a score of 29 referring to severe disability status while 4 participants had a minimum score of 3 representing minimal disability. Higher scores relate to the severity of the disability status.

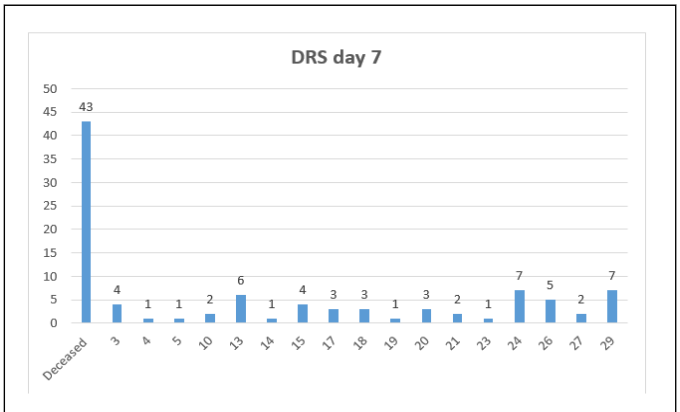

Figure 3: The disability status of the comatose individuals on day.

Karls Pearson correlation analysis was done between the following variables listed in Table 3.

Variable X	Variable Y	r-value	p-value	Results
FOUR score	DRS day 7	0.273	0.007*	Significant at 5% linear association
Note: FOUR: Full Outline of Unresponsiveness; DRS: Disability Rating Scale				

Table 3: Karls Pearson correlation analysis.

The correlation coefficient r-value for the FOUR score on day 1 and DRS on day 7 has been recorded as 0.273 which is statistically significant at 5% level with the linear association. It means that the lower the FOUR score higher the disability status of the individual.

Discussion

This study presents preliminary data from tertiary care hospitals in Belgaum City, involving 96 comatose patients admitted over a 6-month period from November 2022 to April 2023. The patients' consciousness levels ranged from 1 to 13 on the FOUR score, while their disability ranged from 3 to 29 on the Disability Rating Scale (DRS by day 7, with a high mortality rate (43%.

The findings indicate that the majority of comatose individuals were due to Traumatic Brain Injury (TBI caused by Road Traffic Accidents (RTA. This aligns with data from Matthew Philip, who highlights the high prevalence of RTAs among the male population in India, particularly in Belgaum [15]. Patients with TBI exhibited severe consciousness loss (FOUR score 1-3 and a mean DRS of 29 on day 7, indicating significant disability. These findings contrast with international data, such as a study conducted in Italy by Leonardi et al., which identified non-traumatic causes, particularly stroke and metabolic conditions, as the leading contributors to comas [16]. This disparity may stem from differences in traffic discipline, population density and the availability of safety measures between India and Italy.

Interestingly, while cardiorespiratory conditions were less frequent in causing comas, they were associated with severe disability and higher mortality. Many patients lacked access to physiotherapy rehabilitation, which is crucial in reducing complications. In India, there is still a perception that physiotherapists primarily manage pulmonary issues in critically ill or ventilated patients [17]. A shift toward incorporating physiotherapy into comprehensive coma management could improve outcomes.

The high mortality rate (44%) in this study underscores significant gaps in early rehabilitation and critical care infrastructure. Studies by various authors have emphasized that early rehabilitation plays a vital role in improving prognosis and reducing disability [18,19]. Our findings show a high DRS [20] among survivors by day 7, indicating severe disability. The lack of early physiotherapy interventions further contributes to poor outcomes.

The correlation between the FOUR score and Disability Rating Scale (DRS) ($r=0.273$, $p=0.007$) is statistically significant, indicating a moderate positive relationship between a patient's level of consciousness and their disability outcomes. This correlation suggests that higher consciousness levels, as measured by the FOUR score, are associated with lower disability ratings on the DRS. Clinically, this finding is crucial as it underscores the importance of early assessment of consciousness levels in comatose patients. Given that the FOUR score assesses both neurological and respiratory status, it provides a comprehensive tool for tracking patient recovery, especially in the early stages. In patients who score higher on the FOUR scale, clinicians may anticipate better recovery trajectories and should therefore consider early rehabilitation strategies to optimize outcomes. Conversely, patients with lower FOUR scores may benefit from more intensive management and early intervention, as their risk for higher disability is greater. This relationship between the FOUR scores and DRS aligns with findings from various studies that emphasize the prognostic value of early consciousness levels in determining recovery potential. According to studies by Johnson et al. and Gupta et al., early monitoring and intervention, particularly in patients with lower consciousness levels, can significantly reduce long-term disability and improve recovery trajectories [21]. As coma recovery is often unpredictable, utilizing tools like the FOUR score can guide clinicians in making informed decisions regarding the timing and intensity of rehabilitation. By recognizing the link between consciousness and disability, healthcare providers can prioritize interventions, such as coma arousal therapy and non-invasive brain stimulation, particularly in patients with lower FOUR scores, to potentially enhance their recovery and reduce long-term disability [22,23].

One potential intervention for improving outcomes in comatose patients is coma arousal therapy, which has been shown to enhance arousal and consciousness levels in patients with traumatic brain injury. Pravin Kumar et al. demonstrated that coma arousal therapy significantly improved GCS and CRS scores in TBI patients when compared to those who did not receive the therapy [24]. Another promising intervention is non-invasive brain stimulation, which has been shown to have a positive effect on coma recovery, even in patients who remain unconscious for extended periods [25-29]. These therapies can stimulate neural activity, potentially leading to faster recovery and reduced disability.

A comparison of FOUR scores and DRS in this study revealed a direct relationship between improved consciousness and reduced disability. Non-invasive brain stimulation and coma arousal therapy could be incorporated into early rehabilitation plans to improve patient outcomes. These therapies, when initiated early, are expected to enhance consciousness levels, accelerate recovery and reduce the long-term disability of survivors.

This study highlights the need for structured early interventions to reduce ICU stay durations and improve recovery. Effective physiotherapy, combined with pharmacological and surgical interventions, could significantly enhance patient outcomes. Furthermore, strict enforcement of traffic laws and public awareness campaigns could reduce the incidence of RTAs, the leading cause of traumatic comas in this study. Future multicenter studies could validate these findings, assess the impact of early rehabilitation and explore regional differences in causes and outcomes. Coordinated efforts among healthcare providers, policymakers and the public are essential to achieving these goals. Applicability of this research can only be drawn if similar studies or a large-scale study is conducted across India to validate the current findings and bring about the above-mentioned outcome.

Conclusion

The study concluded that the disability rate among comatose individuals in the early days is more and should be given coma arousal therapy/early physiotherapy interventions to prevent death and reduce the disability status at a faster pace among the surviving individuals.

Limitation of the study

The time period of the person in the comatose state will bring about clarity in deciding prognosis and physiotherapy treatment protocol which was not done in this study. Participants recruited in this study were from a single center. It limits the generalizability of the findings.

Future scope of the study

Future studies may be done by recruiting and assessing more comatose individuals across multicenter hospitals/centers across India in various states and cities. The time duration of the patient in comatose state should also be considered.

Conflict of Interest

None.

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