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Interobserver Agreement in Coma Scales - A Study in Tertiary Care Center in South India.

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Abstract: *Head injuries are commonly encountered in clinical practice.Assesment and monitoring of the level of consciousness in head injury is a very important tool in managing these cases.In 1974 Teasdale and Jennett devised a very objective and quantitative method for assessment of level of consciousness known as the Glascow Coma Scale (GCS).Ever since various other scales have been devised with their own limitations,a major limitation in any coma scale has been the differences in assessment by various persons,otherwise called inter-observer variation.Hence an attempt has been made to compare the coma scales - Glascow coma scale and Innsbruck coma scale with regard to inter-observer agreement among them.*

Keywords*: Glascow coma scale, Head injury, Innsbruck coma scale, Inter-observer agreement.*

I. Introduction

In acute brain insults - traumatic or non traumatic, coma scales determine the interventions and provides a baseline to know the progress towards recovery. Teasdale and Jennett (1,2) in Glascow in 1970 studied severe head injury patients and outcomes of coma from non traumatic brain insults. This led to the publication of Glascow coma scale of 1974 (3). Though there are many limitations such as untrained observers, no response to stimulation due to flaccid eye muscle in deep coma, impaired verbal response due to a focal lesion in the speech areas in the dominant hemisphere, swollen and shut eyes etc, Glascow coma scale is widely followed. Benzer et al, (4) in 1991 published the Innsbruck coma scale (ICS) for assessing victims of trauma. It has eight items with a maximal score of 23.It is similar to the GCS, but excludes verbal response and includes pupillary size, movement , reaction, position of the eyes and oral automatisms. In this study, an attempt has been made to compare the coma scales - Glascow coma scale, Innsbruck coma scale with regard to inter-observer agreement among them.

II. Materials and Methods

This study is a prospective study conducted in the Department of Neurosurgery, Government Tirunelveli Medical College and Hospital, Tamilnadu, India, over a period of 1 year on 100 cases. The patients with head injury with different GCS scores were taken up for study. Pediatric head injuries and polytrauma were not included in the study. Four observers who were well versed with the coma scales – the Glascow coma scale (GCS) and The Innsbruck coma scale (ICS), assessed the cases independently within a time duration of thirty minutes. After data collection, the findings were subjected to statistical analysis. Baseline statistics, Correlation agreement, Sign test and Kappa statistics have been used for analysis of data.

Glascow Coma Scale (Gcs)

Eye opening	Best verbal response	Best motor response
Spontaneous (4)	Oriented and coherent (5)	Obeys commands (6)
To command (3)	Confused conversation (4)	Localizes (5)
To pain (2)	Inappropriate words (3)	Withdrawal (4)
No response (1)	Incomprehensible sounds (2)	Flexor (3)
	No response (1)	Extensor (2)
		No response (1)

Maximum total score is 15.

Innsbruck Coma Scale (Ics)

Item	Factor	Score
Eye opening	Spontaneous	3
	To acoustic stimuli	2
	To painful stimuli	1
	None	0
Reaction to acoustic stimuli	Turning towards stimuli	3
	Better-than-extension movements	2

	Extension movements	1
	None	0
Reaction to pain	Defensive movements	3
	Better-than-extension movements	2
	Extension movements	1
	None	0
Body posture	Normal	3
	Better-than-extension movements	2
	Extension movements	1
	None	0
Pupil size	Normal	3
	Narrow	2
	Dilated	1
	Completely dilated	0
Pupil response to light	Sufficient	3
	Reduced	2
	Minimum	1
	None	0
Position and movements of the eyeballs	Fixing of the eyes	3
	Sway of eyeballs	2
	Divergent	1
	Divergent fixed	0
Oral automatisms	Spontaneous	2
	To external stimuli	1
	None	0

Maximum total score is 23.

III. Results

Of 100 cases of head injury, 89 cases (89%), were male patients and 11 cases (11%) were female patients.

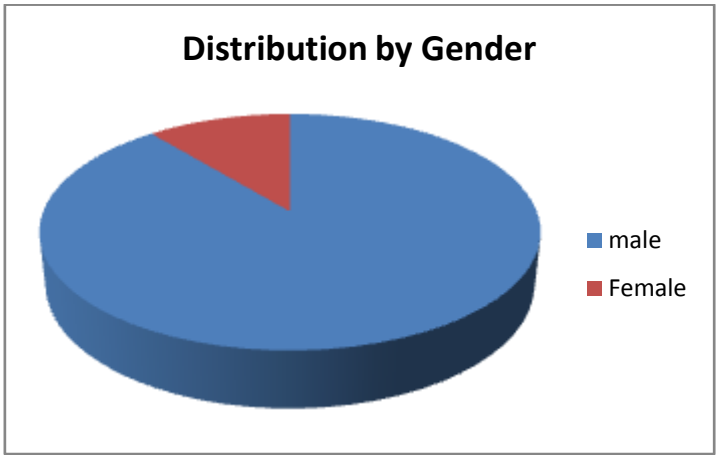

Figure 1: Distribution by Gender

Table 1: Age Distribution.

Age in years	Total	Percentage
< 25	13	13%
25-45	45	45%
46-65	26	26%
> 65	16	16 %

Among the total of 100 cases studied, 13% were in the age group < 25 years, 45 % between 25 to 45 years, 26% between 46-65 years and 16% were more than 65 years.

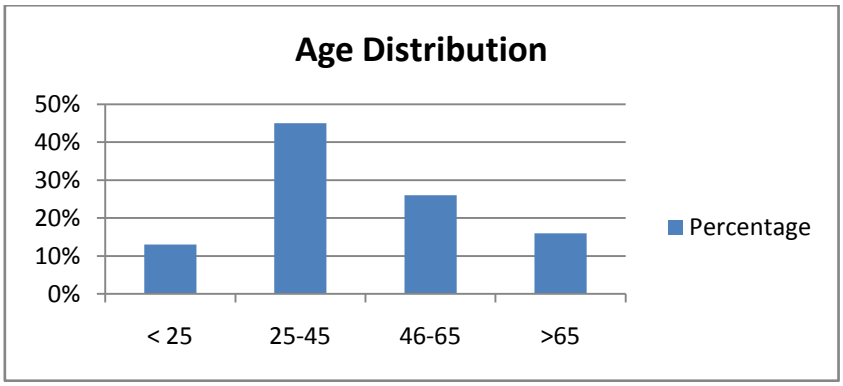

Figure 2: Age Distribution.

The analysis of Glascow coma scale (GCS) scores inter observer agreement showed the following results.

Table 2: GCS score inter observer agreement

Score	Complete agreement (%)	Complete disagreement (%)
3-8	12	6
9-12	46	5
13-15	26	5

In the Glascow coma scale (GCS) score of 3-8, complete agreement was observed in 12 % and in 6% of cases there was complete disagreement. In the GCS score of 9-12, complete agreement was observed in 46 % and in 5% of cases there was complete disagreement In the GCS score of 13-15, complete agreement was observed in 26 % and in 5% of cases there was complete disagreement

Table 3: ICS score inter observer agreement

Score	Complete agreement (%)	Complete disagreement (%)
1-7	2	2
8-14	15	19
16-23	34	28

Analyzing the Innsbruck coma scale (ICS) score the ICS score of 1-7, complete agreement was observed in 2 % and in 2% of cases there was complete disagreement. In the ICS score of 8-14, complete agreement was observed in 15 % and in 19% of cases there was complete disagreement In the ICS score of 16-23, complete agreement was observed in 34 % and in 28% of cases there was complete disagreement.

Table 4: Comparison of GCS and ICS.

Coma scale	Complete agreement (%)	Complete disagreement (%)
GCS	84	16
ICS	51	49

Comparing the inter observer agreement and disagreement of Glascow coma scale (GCS) and Innsbruck coma scale (ICS), GCS showed complete inter observer agreement in 84 %and complete disagreement in 16% of cases and ICS showed complete inter observer agreement in 51 %and complete disagreement in 49 % of cases.

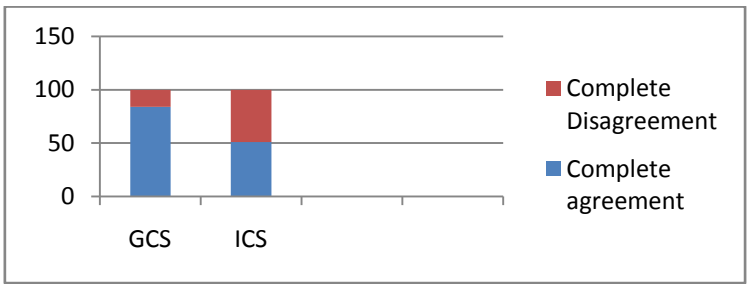

Figure 5: Comparison of GCS and ICS.

IV. Discussion

Various coma scales have been devised to facilitate the assessment of level of consciousness, especially in head injury cases. Since 1974, the Glasgow Coma Scale has provided a practical method for bedside assessment of impairment of conscious level, the clinical hallmark of acute brain injury. The scale was designed to be easy to use in clinical practice (5), not only in neurosurgical and intensive care units, but in other departments dealing with acute brain insults, traumatic and non traumatic and to replace previous ill-defined and inconsistent methods. Later, the Glasgow Coma Scale has become an integral part of clinical practice and research worldwide. The salient feature of GCS is the independent assessment of graded response in three behavioral domains – eye opening (E), motor response (M) and verbal activity (V). If any type of response is untestable, due to periorbital swelling or endotracheal intubation, there are other responses to assess. Also, numbering various response levels is a useful tool in triage (6). The disadvantages in GCS is the failure to incorporate brain stem reflexes and difficulty in assessment in intubated patients.

The Innsbruck coma scale (ICS) is similar to the Glasgow Coma Scale (GCS), but excludes verbal response and includes pupillary size, movement, reaction, the position of the eyes and oral automatisms. The disadvantage of ICS is that the score rates fixed pupils of greater severity (lower score) than midposition nonreactive pupils (7). Thus, patients with brain death (where midposition pupils are generally the rule) would achieve a better score than other patients.

In a study by Graham Teasdale et al, (5) on the Glasgow Coma Scale, he states that the scale was easy to use in clinical practice in general and specialist units and become an integral part of clinical practice and research worldwide. In the study of Benzer A et al, (4) on Innsbruck Coma Scale - Prediction of non-survival after trauma, 421 severely injured patients admitted to a major trauma center during ten years were studied retrospectively for early prediction of survival by the Innsbruck Coma Scale (ICS). All 79 patients scoring 0 or 1 died within 21 days. The findings of this study indicate that the ICS allows a highly accurate prediction of non-survival in patients with scores of 0 or 1 even at the time of first examination after trauma.

In our study, in the Glasgow Coma Scale (GCS) score of 3-8, complete agreement was observed in 12 % and in 6% of cases there was complete disagreement. In the GCS score of 9-12, complete agreement was observed in 46 % and in 5% of cases there was complete disagreement In the GCS score of 13-15, complete agreement was observed in 26 % and in 5% of cases there was complete disagreement. In the Innsbruck Coma Scale (ICS) score of 1-7, complete agreement was observed in 2 % and in 2% of cases there was complete disagreement. In the ICS score of 8-14, complete agreement was observed in 15 % and in 19% of cases there was complete disagreement In the ICS score of 16-23, complete agreement was observed in 34 % and in 28% of cases there was complete disagreement. GCS showed complete inter observer agreement in 84 %and complete disagreement in 16% of cases and ICS showed complete inter observer agreement in 51 %and complete disagreement in 49 % of cases, proving that GCS is a better practical method for bedside assessment of impairment of conscious level, the clinical hallmark of acute brain injury.

V. Conclusion

Our study concludes that Glasgow Coma Scale (GCS) is better than Innsbruck Coma Scale (ICS) considering the interobserver agreement.Combining clinical scales with other demographic, physiological, functional, and radiographic data will be needed to achieve useful predictions of functional outcome.Adherence to the principle and enhancement of the reliable practical use of the scale through continuing education of health professionals, standardisation across different settings, and consensus on methods to address confounders will maintain its role in clinical practice and research in the future.

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