

Association of Glasgow Coma Scale with Severe Maternal Morbidity and Mortality in Eclampsia Patient-One Year Audit of Tertiary Care Hospital

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Abstract

Objective: To determine an association between Glasgow coma score and maternal morbidity and mortality in patients presenting with eclampsia in high dependency unit of Maternal and child health centre PIMS.

Methodology: The cross-sectional analysis of the collected data over a one-year period at Maternal and Child Health Centre Unit II, PIMS Hospital Islamabad. Records of admitted patients with eclampsia at the high dependency unit of maternal and child health from 1-1-2016 to 31-12-2016 were prospectively maintained and entered in pre-designed study Performa. The GCS was recorded at the time of admission and after treatment. The data was analyzed with respect to association of GCS with maternal mortality and morbidity in terms of ventilatory support, complications, transfer to surgical/medical ICU, surgical intervention. Chi-square test was used for categorical data, t-test for numerical data.

Results: During the study period, 37 patients presented with eclampsia. The overall complication rate was 6(16.22%). The mortality was significantly higher in GCS < 9(p=0.047). Similarly, a significantly higher no of patients with GCS < 9 required ventilator support (p=0.000). Regarding morbidity, higher incidence of complications was found in terms of renal failure, respiratory failure, neurological failure, and multi organ failure was found in GCS < 9. However, the difference was not statistically significant (p=0.478). The data was analysed using SPSS statistics version 21.0 for Windows.

Conclusion: Significant association between GCS and outcome of eclampsia reflects the importance of the scale in eclamptic patient. The tool can be utilized for assessing the need for ventilator support and other interventions besides having high prognostic value in terms of survivors versus non survivors.

Keywords: Eclampsia, Glasgow Coma Scale, CS, Maternal mortality, maternal morbidity

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Introduction

Eclampsia is a medical condition that affects pregnant women and is characterized by the presence of convulsions and coma states, which are the symptoms that differentiate eclampsia from preeclampsia.^{1,2} The eclampsia is motivated by hypertension (a booking

diastolic pressure of ≥ 90 mm Hg) during pregnancy and severe phase of preeclampsia.^{3,4} Currently, it is unusual to reach this stage of the disease, because the prenatal controls that are performed on most pregnant women can detect it in its infancy. The rate of

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eclampsia is approximately 1 in 2,000 to 3,000 pregnancies, and therefore it is difficult to predict which women in those with severe preeclampsia with high blood pressure, headaches, vision changes, or abnormal blood tests will suffer convulsions and loss of consciousness.⁵ Generally, it appears in the last trimester of pregnancy, during the first 24 hours from the beginning of the birth or during the development of the same.⁶ Although only 5% of uncontrolled preeclampsia cases progress to eclampsia, it is a significant cause of maternal death.

Chames et al. (2005) also agrees with the fact that eclampsia remains a cause of severe maternal morbidity and mortality in both developed and developing countries.⁶ The study also reveals the fact that the incidence is significantly higher in developing countries due to delayed interventions in severe pre-eclampsia. Similarly, mortality is significantly higher in developing countries due to delayed referrals in convulsing patients. The reported maternal death rate due to eclampsia in these countries is 31%.⁷

According to data taken from research papers, hypertensive disorders account for 15% of maternal deaths in patients admitted to tertiary care hospitals.^{8,9} Another local study attributes 34% of maternal deaths due to eclampsia.¹⁰ The predictive outcome of eclamptic patients is a challenge for tertiary care hospital. In this regard, it is important to evaluate this disease with great care and appropriate analysis where required in order to propose the best solution to handle it. In order to manage such patients, various scoring systems have been utilized, including GCS and APACHE II, the organ system failure score, SOFA and SAPS II.

Although the APACHE score is more commonly used in patient admitted in intensive care unit, the GCS has been found more predictive of outcome in eclampsia.¹¹ However, there is scarcity of data to establish an association between GCS and outcome of eclampsia. The study aimed at determining an association between GCS and outcome of eclampsia in terms of need for ventilator support, eclampsia related complications and no of survivors versus non survivors.¹² Glasgow Coma Scale (GCS) is a neurological scale which helps in assessing the conscious state of person initially as well as subsequently; although GCS was initially used for level of assessment after Traumatic Brain Injury (TBI) but is now used for first responder, its use has been up

scaled for assessment of acute medical illness and monitoring of chronic patient in intensive care unit. For the present research, modified Glasgow coma scale was used which is 15-point scale and takes into account, abnormal flexion a parameter omitted in origin 14-point scale. Though some centers use the older scale but majority use the new modified scale.¹³ A high score means a high level of awareness. A low score means a low level of awareness.¹⁴

Methodology

Considering the research aim, the study was conducted in the maternal and child health center, PIMS, Islamabad. Thirty-seven patients were selected and the duration of the study was one year. Records of admitted patients with eclampsia at high dependency unit from 1-1-2016 to 31-12-2016 were prospectively maintained and entered in pre-designed maternal morbidity and mortality Performa. After the informed consent, the patients were fully evaluated in terms of GCS, associated risk factors and state of pregnancy. The below mentioned Glasgow Coma Scale was used.¹⁵

Table I: Glasgow Coma Scale

Behavior	Response	Score
Eye Opening Response	Eyes open spontaneously	4
	Eyes open to verbal command or speech	3
	Eyes open to pain	2
	No eye opening	1
Verbal Response	Oriented	5
	Confused conversation, but able to answer questions	4
	Inappropriate responses	3
	Incomprehensible sounds or speech	2
	No verbal response	1
Motor Response	Obeys commands for movement	6
	Purposeful movement to painful stimulus	5
	Withdraws from pain	4
	Abnormal flexion	3
	Abnormal extension	2
	No response	1
Total Score	Best response	15
	Comatose client	8 or less
	Totally unresponsive	3

Mgso4 and antihypertensive therapy was started. Multi-disciplinary approach was used; the departments such as anesthesia, neurology department, cardiology, pulmonology, general medicine department were involved. The Performa was filled consisting of demographic characteristics, date of admission, home

address, and place of referrals, all sign & symptoms of eclampsia and GCS scoring.

Maternal characteristic included age, parity, gestational age, co-existing co-morbidities. The outcome variables included ventilator support, complications, survivors and non survivors. After collecting the data, data analysis was done using a static test SPSS version 21.0 to evaluate p value and was analyzed to assess the association of GCS score with different outcomes in terms of surgical intervention, ICU requirement, patient expiry status, requirement of ventilator support and complications. As the data source was prospectively maintained hospital records and based on cross-sectional analysis therefore ethics review board approval was not required.

Results

As mentioned earlier, in this study a total of 37 patients were selected in a period of one year. The mean gestational age of the patients was 34.84 ± 3.997 weeks. Majority 19 (51.35%) of the patients were primigravida followed by the patients who had 2-4 gravida. The distribution of parity showed that main bulk 21(56.76%) of the patients had a parity of zero, followed by group having parity of 1-2 in 9 (24.32%) patients. Medical history of 21 (56.76%) patients was normal only 15 (40.54%) patients had a history of HTN.

Most of the patients i.e. 30 (80.08%) were presented with serious illness before treatment. Most common mode of delivery in study sample was LSCS which was noted in 21 (56.76%) of the patients followed by SVD which was observed in 13 (35.14%) of the patients as elaborated in table II.

Almost half of the patients 18 (48.65%) in the study were presented with GCS of < 9 and 6 (16.22%) with GCS of 9-12 and 13 (35.14%) were presented with a GCS of 13-15. The improvement in GCS shows that after treatment only 6 (16.22%) patients had GCS of < 9, and majority 30 (81.08%) of the patients had normal GCS in the range of 13-15, after treatment. The rate of complications was very low and 31 (83.78%) patients had no complication. Only in 6 (16.22 %) patient got any complication as given in table III.

The data was analyzed to assess the association of GCS score with different outcomes in terms of surgical intervention, ICU requirement, patient expiry status, requirement of ventilator support and complications and it was noted that GCS before treatment had a significant (p-value < 0.05) association with expiry

status and requirement of ventilator support. It was observed that the patients expired; all had GCS < 9 before treatment. The ventilator support was required in 18 (48.65%) patients and all these had a GCS score of < 9 as elaborated in table IV.

Table II: Demographic Characteristics of the Patients

Characteristics	Frequency	Percentage
Gestational age		
Mean \pm SD	34.84 \pm 3.997	
Gravida		
PG	19	51.35%
2-4	14	37.84%
> 4	4	10.81%
Parity		
0	21	56.76%
1-2	9	24.32%
3-4	7	18.92%
Medical History		
Non	21	56.76%
HTN	15	40.54%
Diabetes	1	2.70%
Serious Illness		
Before Treatment	30	81.08%
During Treatment	1	2.70%
After Treatment	2	5.40%
Before and during treatment	1	2.70%
Before and after treatment	2	5.40%
During and after treatment	1	2.70%
Mode of Delivery		
SVD	13	35.14%
LSCS	21	56.76%
Instrumental	3	8.11%

Table III: Distribution of GCS and Complications of the Patients

Characteristics	Frequency	Percentage
GCS before Treatment		
< 9	18	48.65%
9-12	6	16.22%
13-15	13	35.14%
GCS after Treatment		
< 9	6	16.22%
9-12	1	2.70%
13-15	30	81.08%
Complications		
Non	31	83.78%
Renal Failure	2	5.41%
Resp fail	1	2.70%
Neurological damage	2	5.41%
MOF	1	2.70%

Table IV: Association of GCS and Surgical intervention, ICU, Expired status, Ventilator Support and

Complications of the Patients				
	GCS before Treatment			P-Value
	< 9	9-12	13-15	
Surgical Intervention				
LSCS	11	4	6	0.671
Hysterectomy	1	0	0	
Non	6	2	7	
Transferred to ICU				
Yes	1	0	0	0.581
No	17	6	13	
Expired Status				
Alive	13	6	13	0.047
Expired	5	0	0	
Ventilator Support				
Yes	18	0	0	0.000
No	0	6	13	
Complications				
Non	12	6	13	0.478
Renal Failure	2	0	0	
Resp fail	1	0	0	
Neurological damage	2	0	0	
MOF	1	0	0	

Discussion

The World Health Organization (WHO) reveals the fact that 1,500 women die every day due to complications of pregnancy and childbirth.¹⁶ It is estimated that in 2005, there were 536,000 maternal deaths worldwide. The majority corresponded to the developing countries and most of them could have been avoided. The four main causes are severe hemorrhages (usually puerperal), infections (septicemia in most cases), hypertensive disorders of pregnancy (usually eclampsia) and obstructed labor. Eclampsia contributes 12% as the cause of such deaths, as revealed in a study conducted in Pakistan.¹⁷ According to a study conducted by Hossain et al. (2015), late presentation of eclampsia patient exposes them to high risk of complications resulting in death and severe morbidity. The incidence of which is reported 34%.¹⁸ For this reason, various scales have been used to examine the association with eclampsia, as the results of this study proved the fact that there is an association between GCS and eclampsia, but on the other hand, limited research was done before in the same domain, in relation to maternal mortality and morbidity. This is a first study conducted at local level and carries its value in determining the state of the eclampsia patients at the time of admission and thus deciding the place of

referral. GCS score also helps in predicting complications and the chance of survivors.

According to the current study results, the number of maternal death resulting from eclampsia in the study was 6 (16.22%). Eighteen patients (48.65%) required ventilator support. Being resource restricted country; the ICU facility is limited to only few tertiary care hospitals, while ventilator support also is available in only a few hospitals. Markedly high number of eclamptic patient requiring ventilator support reflects the need for transfer of large no of patients to tertiary care hospitals with facilities of ventilator support and intensive care.² Significant association of GCS with need for ventilation helps in triage of such patients; patient with low GCS should be transfer to tertiary care hospital with ventilator support while patients with moderate and minor GCS can be manage in other referrals level hospital short of ICU facilities. This will reduce the burden of tertiary care hospitals. Patients with severely low GCS (less than 9) should be transfer to an appropriate hospital.

The accepted outcome of patients GCS was found useful in assessing the condition of patients with eclampsia on admission and need for intervention in terms of ventilatory support and expected complications. These findings are aligned, similarly women with low GCS were found to have high mortality.⁴ Patients with critically low GCS scores are more likely to develop complications such as maternal death and severe morbidities such as respiratory failure, assisted ventilation, acute renal failure, obstetric embolism, and multi-organ failure.¹⁷ The present study provides an update regarding GCS score in patient before and after treatment, complications, and their survival. The study documented that 6(16.22%) patients with severely low GCS went into complications which are respiratory failure, renal failure, neurological failure, and multi organ failure.

Although the GCS is most widely used scale it is limited by the fact that tracheal intubation and facial/eye swelling as seen in eclampsia patient or damage make it impossible to test the verbal and eye response. In such situation it has been suggested that modifier may be attached with respective score for example E1c, where c = closed, or V1t where t = tube. Often the 1 is left out, so the scale reads Ec or Vt. A composite might be GCS 5tc⁷ This would mean, for example, eyes closed because of swelling = 1, intubated = 1, leaving a motor score of 3 for abnormal flexion.

Study Limitation:

The study carries great significance with the fact that this was the first study conducted at local level to examine the association between GCS and eclampsia; in the meanwhile, sample size and the duration of the study were interlinked limitations that should be focused in the future research. The study was limited to one scale; for further research different scales should be used in order to do compare their efficiency when evaluating the relationship between eclampsia in relation to maternal morbidity and mortality.

Conclusion

Conclusively, there is a significant association between Glasgow Coma Score and eclampsia. Hence, it is stated that GCS tool can be utilized for assessing the need for ventilator support and other interventions besides having high prognostic value in terms of survivors versus non survivors.

References

1. Moe HK, Follestad T, Andelic N, Håberg, AK, Flusund AM. H., Kvistad, K. A & Moen, K. G. Traumatic axonal injury on clinical MRI: association with the Glasgow Coma Scale score at scene of injury or at admission and prolonged posttraumatic amnesia. *Journal of Neurosurgery*.2020; 135(2): 562-573.
2. Fathi M, Moghaddam NM, Jame SZB, Darvish, M & Mortazavi, M. The association of Glasgow Coma Scale score with characteristics of patients admitted to the intensive care unit. *Informatics in Medicine Unlocked*.2022; 100904.
3. Dai D, Sun Y Liu, C, Xing H, Wang B, Qin, X & Li, A. Association of glasgow coma scale with total homocysteine levels in patients with hemorrhagic stroke. *Annals of Nutrition and Metabolism*.2019; 75(1): 9-15.
4. Yumoto, T., Naito, H., Yorifuji, T., Aokage, T., Fujisaki, N., & Nakao, A.. Association of Japan Coma Scale score on hospital arrival with in-hospital mortality among trauma patients. *BMC emergency medicine*.2019; 19(1), 1-7.
5. Shennan AH, Redman C, Cooper C, Milne F. Are most maternal deaths from pre-eclampsia avoidable?. *The Lancet*. 2012 May 5; 379(9827):1686-7.
6. Liu S, Joseph KS, Liston RM, Bartholomew S, Walker M, León JA, Kirby RS, et al, Maternal Health Study Group of Canadian Perinatal Surveillance System (Public Health Agency of Canada. Incidence, Risk Factors, and Associated Complications of Eclampsia. *Obstetric Anesthesia Digest*. 2012 ;32(4):214-5.
7. Teasdale G, Maas A, Lecky F, Manley G, Stocchetti N, Murray G. The Glasgow Coma Scale at 40 years: standing the test of time. *The Lancet Neurology*. 2014 ; 13(8):844-54.
8. Glasgow Coma Scale [Internet]. Glasgowcomascale.org. 2017 [cited 2 November 2017]. Available from: <http://www.glasgowcomascale.org/>
9. Alden KR, Lowdermilk DL, Cashion MC, Perry SE. *Maternity and Women's Health Care-E-Book*. Elsevier Health Sciences; 2013 Dec 27.
10. Khowaja AR, Qureshi RN, Sheikh S, Zaidi S, Salam R, Sawchuck D, Vidler M, et al. Community's perceptions of pre-eclampsia and eclampsia in Sindh Pakistan: a qualitative study. *Reproductive health*. 2016 Jun 8;13(1):36.
11. Hossain N, Khan N, Panhwar N, Noreen S. Clinical spectrum of Posterior Reversible Encephalopathy Syndrome (PRES) in patients with eclampsia. *Pakistan journal of medical sciences*. 2015 Sep;31(5):1121.
12. Hifumi T, Kuroda Y, Kawakita K, Sawano H, Tahara Y, Hase M, Nishioka K, et al. Effect of admission Glasgow Coma Scale motor score on neurological outcome in out-of-hospital cardiac arrest patients receiving therapeutic hypothermia. *Circulation Journal*. 2015:CJ-15.
13. Singh B, Chong MC, Zakaria MI, Cheng ST, Tang LY, Azahar NH. Assessing nurses knowledge of glasgow coma scale in emergency and outpatient department. *Nursing research and practice*. 2016 Jan 1;2016.
14. Soysal E, Horvat CM, Simon DW, Wolf MS, Tyler-Kabara E, Gaines BA & Bayir, H. Clinical Deterioration and Neurocritical Care Utilization in Pediatric Patients With Glasgow Coma Scale Score of 9–13 After Traumatic Brain Injury: Associations With Patient and Injury Characteristics. *Pediatric Critical Care Medicine*.2021 22(11), 960-968.
15. Johnson, M. A., Nishijima, D. K., & Kuppermann, N. The Association of Glasgow coma scale score with clinically important traumatic brain injuries in children. *Pediatric emergency care*.2020; 36(11): e610-e613.
16. Borqialli DA, Mahajan P, Hoyle Jr, JD, Powell EC, Nadel FM, Tunik, M. G & Lillis K. Performance of the pediatric Glasgow coma scale score in the evaluation of children with blunt head trauma. *Academic emergency medicine*.2016; 23(8), 878-884.
17. Kochar A, Borland ML, Phillips N, Dalton S, Cheek JA, Furyk J & Babl, FE. Association of clinically important traumatic brain injury and Glasgow Coma Scale scores in children with head injury. *Emergency medicine journal*.2020; 37(3), 127-134.
18. Santos, W. C., Vancini-Campanharo, C. R., Lopes, M. C. B. T., Okuno MFP, & Batista, R. E. A. Assessment of nurse's knowledge about Glasgow coma scale at a university hospital. *Einstein (São Paulo)*.2016; 14, 213-218.