

# To Study the Average Possible Low Dose of Magnesium Sulfate to Control the Convulsions in Eclampsia in a Tertiary Care Hospital

Varsha Narayana Bhat<sup>1</sup>, Shamrao Ramji Wakode<sup>2</sup>, Kiran Ambatwar<sup>3</sup>

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## ABSTRACT

**Objective:** The aim of this study is to evaluate the efficacy of minimal effective dose of magnesium sulfate (MgSO<sub>4</sub>) for control of convulsions in eclampsia and also at reducing the MgSO<sub>4</sub>-related toxicity thus by reducing the dose of MgSO<sub>4</sub> and also to analyze the maternal and perinatal outcomes among these patients.

**Design:** The prospective observational study was carried out between January 2019 and January 2022 at Dr. Shankarrao Chavan Govt Medical College and Hospital, Nanded, Maharashtra.

**Setting:** Tertiary care hospital, Nanded, Maharashtra.

**Materials and methods:** Injection of MgSO<sub>4</sub> 14 gm loading dose was given at the admission in eclampsia cases, and further doses of MgSO<sub>4</sub> were given with close monitoring of patients and a reduction in the number of doses of MgSO<sub>4</sub> doses was done as per the patient's condition. If the patient gets the next episode of convulsion, immediately 2 gm IV MgSO<sub>4</sub> drip was given.

**Results:** In our study, out of 200 patients, 2.5% of them had received only a loading dose of MgSO<sub>4</sub>, whereas maximum (61.5%) of them had received 20–24 gm of MgSO<sub>4</sub>. During the observation period of 5–7 days post delivery, none of the patients had any complications like repeat convulsions, loss of consciousness, or intracranial hemorrhage, even after reducing the possible doses of MgSO<sub>4</sub>. The recurrence rate of convulsions is 7%. Total MgSO<sub>4</sub> doses were administered (in grams) with a mean of 24.83 gm among the study population. There was no significant correlation between doses of MgSO<sub>4</sub> received, and the number of convulsions reoccurred with *p*-value > 0.05.

**Conclusion:** It appears that treatment of eclampsia cases should be individualized by considering the level of consciousness, laboratory parameters, induction delivery interval, convulsion to delivery interval, number of convulsions, and hence deciding further maintenance doses to be given or omitted. Due to the low toxicity profile, reduced monitoring, cost-effectiveness, and equally effective in comparison with the Pritchard regimen, the present regimen is recommended.

**Keywords:** Birth weight, Cesarean, Comorbidities, Eclampsia, Maternal and fetal outcome, Preeclampsia.

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## INTRODUCTION

Eclampsia remains an important cause of maternal morbidity and mortality in India and Worldwide. In India, reports reveal that incidence ranges from 0.179 to 5%, averaging 1.5%.<sup>1</sup> Eclampsia is an acute and life-threatening complication of pregnancy characterized by the appearance of tonic-clonic seizures (convulsions), usually in a woman who has developed preeclampsia. Various drugs and regimens have been advocated for the management of eclampsia, but of all anticonvulsant drugs used in the last 70 years, magnesium sulfate (MgSO<sub>4</sub>) has retained its popularity. Major concern in day-to-day practice is dose-related toxicity of MgSO<sub>4</sub> and limited facility available for monitoring these patients according to their body weight and plasma levels. Principally, two main regimens are used for administering MgSO<sub>4</sub>: the Pritchard<sup>2</sup> regimen and the Zuspan regimen. However, these regimens are based mostly on Western women. The average body weight of Indian women is much lesser than their Western counterparts and hence the Pritchard regimen may be hazardous among Indian women.<sup>3</sup>

Various regimens with different dosages have been used over the past years, but still the question of "minimal effective dose of MgSO<sub>4</sub> to control convulsion" remains unsolved and if the women appear to be small to limit the dose is being questionable. And also due to inadequate antenatal care, lack of awareness, and poor

<sup>1</sup>Department of Obstetrics and Gynecology, JJ Group of Hospital, Mumbai, Maharashtra, India

<sup>2</sup>Department of Obstetrics and Gynecology, Dr. Shankarrao Chavan Government Medical College & Hospital, Nanded, Maharashtra, India

<sup>3</sup>Department of Obstetrics and Gynecology, Government Medical College, Parbhani, Maharashtra, India

**Corresponding Author:** Varsha Narayana Bhat, Department of Obstetrics and Gynecology, JJ Group of Hospital, Mumbai, Maharashtra, India, Phone: +91 9740673416, e-mail: chvarshanbhat@gmail.com

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socioeconomic status, it is difficult to monitor MgSO<sub>4</sub> dose. The aim of the present study is to evaluate the efficacy of minimal effective dose of MgSO<sub>4</sub> for the control of convulsions. It also aims at reducing the MgSO<sub>4</sub>-related toxicity thus by reducing the dose of MgSO<sub>4</sub> and also to analyze the maternal and perinatal outcomes among these

patients. The major challenge with the study is reducing MgSO<sub>4</sub> toxicity without compromising its efficacy in controlling seizures and thus lowering morbidity and mortality rates.

### AIM

To formulate the average lowest possible dosage of MgSO<sub>4</sub> to control convulsions in eclampsia in Indian population.

### OBJECTIVES

- Incidence of eclampsia
- Maternal and fetal outcome in eclampsia
- Real requirement of MgSO<sub>4</sub> dose in controlling convulsions in eclampsia cases
- Effect of induction and delivery interval on the requirement of further doses of MgSO<sub>4</sub>
- Complications in eclampsia.

### MATERIALS AND METHODS

This is a prospective observational study conducted at Dr Shankarrao Chavan Government Hospital, it is a tertiary care hospital and a referral center for both public and private health sectors. The study included cases admitted between January 2019 and January 2021. In this study duration, 200 cases were reported at our institution and were included in the study. After obtaining permission from the Institutional Ethics Committee, all patients with eclampsia who were admitted to inpatient department and those fulfilling inclusion or exclusion criteria were included in the study. All the relevant information was recorded in the pretested case form. Injection of MgSO<sub>4</sub> 14 gm loading dose was given at the admission and further doses of MgSO<sub>4</sub> were given with close monitoring of patients, and a reduction in the number of doses of MgSO<sub>4</sub> was done as per the patient's condition. If the patient gets the next episode of convulsion, immediately 2 gm IV MgSO<sub>4</sub> drip was given.

The considered parameters were followed while reducing MgSO<sub>4</sub> dose in eclampsia cases:

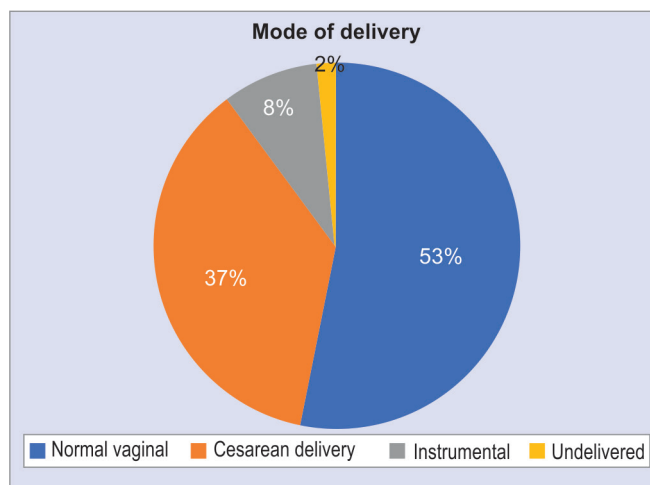
- *Number of convulsions:* If the patient had one to three episodes of convulsions and faster recovery of level of consciousness without cerebrovascular accident (CVA) post delivery, further doses of MgSO<sub>4</sub> were reduced.
- *Efforts to reduce induction:* Delivery interval by selecting and monitoring better oxytocic while managing termination of pregnancy.
- Resuscitation of the patient on admission in terms of hydration and oxygenation.
- Early treatment of disseminated intravascular coagulation (DIC) and hemolysis, elevated liver enzymes, low platelet count (HELLP) syndrome.
- Normal ophthalmic examination (fundus) and normal coagulation profile with normal liver and kidney function tests among the study population group can be considered for a possible reduction in the further doses of MgSO<sub>4</sub>.

### RESULTS

The overall incidence of eclampsia during the study period was 3.07%. The majority (49.5%) of the patients were in the age group between 21 and 25 years, followed by 41.5% in the age group of less than 20 years. About 58.5% of the patients were not booked

**Table 1:** Distribution of delivered study subjects as per gestational age

Gestational age (weeks)	Delivery		Total
	Caesarean (n)	Vaginal (n)	
28–32	10 (16.4%)	51 (83.61%)	61
33–36	36 (37.5%)	60 (60%)	96
37–40	25 (67.6%)	12 (32.43%)	37
41 and above	3 (100%)	0 (0%)	3
Total	74	123	197



**Fig. 1:** Distribution of study subjects as per mode of delivery

and 89% of the study population belonged to rural places. In total, 84.5% of the patients were primigravida, followed by 9% of them were multigravida. About 53.5% of patients had headache as premonitory symptoms followed by nausea or vomiting (29%) and epigastric pain (6%). Systolic blood pressure ≥160 mm Hg was present in 63.5% of patients, and diastolic blood pressure ≥110 mm Hg was present in 46.5% of patients. Anemia was the major (54%) risk factor followed by preeclampsia (41.5%) and twin gestation (1%). On laboratory investigation, anemia (Hb <10%) was highest and seen among 74% of the study population followed by significant proteinuria of greater than +2 among 58.5% of the study population. Deranged coagulation profile was the least common finding noted only among 3.5% of the study population. Most (48%) of the patients had one to three episodes of convulsion at the time of admission and 42% of them had three to six episodes of convulsion and 7 of them had status eclampticus. About 67% were drowsy and irritable, 19% were unconscious, 10% were conscious, and 2.5% were in coma (Table 1).

Three patients were undelivered. Two of them were in the gestational age group between 33 and 36 weeks and one was in the 28–32 weeks group (Fig. 1).

About 61.5% of the patients had a vaginal delivery (including 8% of instrumental deliveries), while the remaining 37% of the patients had a cesarean delivery with failure of induction being the most common indication (44.6%) and 3 (1.5%) of them were undelivered and mortality had occurred.

Approximately 64.5% of them had received MgSO<sub>4</sub> within 5–8 hours of the first episode of convulsion followed by 29% of them within 0–4 hours post convulsion, and all of them had received MgSO<sub>4</sub> within 12 hours from the first episode of convulsion. Most

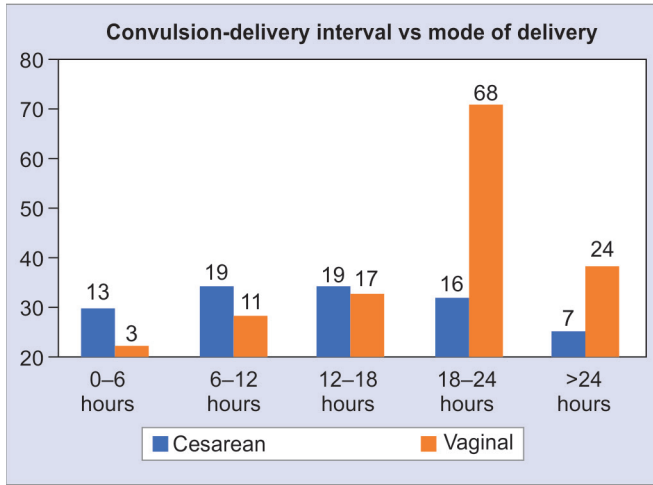


Fig. 2: Distribution of cases showing convulsion to delivery interval (in hours)

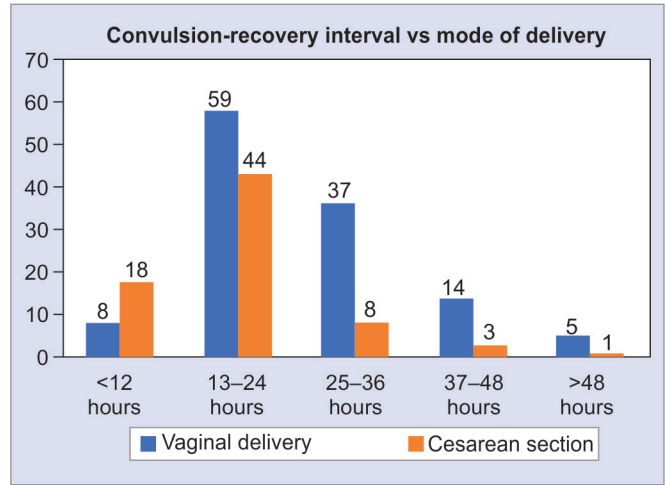


Fig. 3: Distribution of cases according to mode of delivery and convulsion to recovery interval

Table 2: Distribution according to recurrence of convulsion to total MgSO<sub>4</sub> received

Doses of MgSO <sub>4</sub> (gm)	Convulsion present	Convulsion absent	Total	p-value
Loading dose of 14	1	4	5	0.051
14-19	3	18	21	
20-24	4	108	112	
25-29	3	38	41	
30-34	2	17	19	
35-39	1	1	2	
Total	14	186	200	

of the patients from the cesarean group (65.4%) had bishop score between 0 and 3, while 27 (34.6%) patients were from the vaginal delivery group (Fig. 2).

The most patients (81%) from the vaginal delivery group had convulsion to delivery interval of 18-24 hours, which was present in 19% of patients from the cesarean group. The association between convulsion delivery interval and mode of delivery was statistically significant with a *p*-value of < 0.001 (< 0.005). The Chi-square test was conducted (Table 2).

In our study, out of 200 patients, 2.5% had received only a loading dose of MgSO<sub>4</sub>, maximum (61.5%) of them had received 20-24 gm of MgSO<sub>4</sub>, and 1% received 35-39 gm of MgSO<sub>4</sub>. Total MgSO<sub>4</sub> mean and standard deviation are 24.83 gm and 4.31 gm, respectively. There is no significant correlation between doses of MgSO<sub>4</sub> received and the number of convulsions reoccurred with *p*-value of > 0.05 (Fig. 3).

In most patients (*n* = 103), the interval between the first convulsion and the convulsion-recovery interval was 13-24 hours. There is a significant association between the mode of delivery and convulsion recovery interval with a *p*-value of < 0.001.

The major maternal complication was posterior reversible encephalopathy syndrome (PRESS) (8%), followed by DIC (4.5%), abruption (4%), and HELLP (2%). Maternal mortality was seen in eight patients and causes were DIC (1.5%) followed by intracranial hemorrhage (ICH) (1%) and aspiration pneumonitis (1%) followed by

HELLP syndrome (0.5%). The association between maternal mortality and mode of delivery was statistically not significant (*p* > 0.05).

Prematurity (31.5%) was the major fetal complication, followed by respiratory distress syndrome (27.5%), intrauterine fetal demise (21%), and intrauterine growth restriction (18.5%). About 79% had live birth, 15.7% were neonatal death, and 5.6% were stillbirth.

## DISCUSSION

During the study period, the total number of deliveries was 15,776. Of these, 483 cases were of eclampsia, accounting for an incidence of 3.06%. Deepita Pannu et al.<sup>4</sup> reported the incidence of eclampsia being 3.2% and 0.76%, respectively. Higher incidence in our study might accredited to the fact of being a tertiary care center that acts as a referral hospital covering a large population draining from rural areas where poverty, anemia, illiteracy, lack of adequate antenatal care checkups, and poor peripheral health services are common.

As per the literature, eclampsia is common in primigravida, in accordance with the studies by Gaddi and Somegowda<sup>5</sup> and Shikha et al.<sup>6</sup> Our study also shown that primigravidas were the common cases.

The commonest gestation age found in our study was between 28 and 36 weeks, in accordance with a study by Shikha et al.<sup>6</sup> the mean gestational age was 34.1 ± 3.4. The patients who develop eclampsia at early gestation might respond poorly to oxytocics. Hence, a balanced decision regarding the selection of the oxytocic agent and its appropriate dosing and cutoff line can be made regarding the change of mode of delivery to avoid prolonged induction, as it is observed that the lesser the induction delivery interval, the faster the recovery among eclamptic patients.

In our study, anemia was the major (54%) risk factor, followed by preeclampsia (41.5%) and twin gestation (1%) in par with Bilano et al.'s<sup>7</sup> study to confirm the association between severe anemia and preeclampsia or eclampsia. About 53% of the deliveries were vaginal, 37% were cesarean section, and 8.5% were with the use of instruments in our present study were comparable with a study by Singh and Shrivastava.<sup>8</sup> There was an increasing trend of cesarean section in eclamptic women similar to other studies.<sup>9-11</sup>

In our study, out of 200 patients, 2.5% of them had received only a loading dose of MgSO<sub>4</sub>, whereas a maximum (61.5%) of them had received 20–24 gm of MgSO<sub>4</sub>. During the observation period of 5–7 days post delivery, none of the patients had any complications like repeat convulsions, loss of consciousness, or ICH, even after reducing the possible doses of MgSO<sub>4</sub>. This indicates that with proper selection of eclampsia cases, it should not be a routine regimen like Pritchard of giving an average of 32 gm of MgSO<sub>4</sub> till 24 hours post delivery or post convulsion, whichever is the last but individualize the case and decide the possible reduction in MgSO<sub>4</sub> keeping patient under observation. Even after postnatal follow-up up to 6 weeks, none of these cases had shown any adverse outcome.

In the present study, 14 cases out of 200 showed a recurrence of convulsion, and the recurrence rate of convulsion is 7%, which was comparable with the studies by Pritchard et al.<sup>2</sup> and Sibai,<sup>12</sup> both had reported a recurrence rate of 10–20%.

In this study, maternal mortality was 4% which was comparable with a study by Suman et al.<sup>13</sup> in her low dose regime was 2.63%. Hence, these can be attributable to critical conditions at arrival, delayed referral, poor transport facilities, and inadequate diagnosis and treatment at peripheral centers, as most of them did not receive any antenatal care. Three of the 200 eclampsia cases had died in the antepartum period within 4–6 hours of admission, 2 (1%) of them had aspiration pneumonitis, and 1 (0.5%) had CVA confirmed by autopsy. All attributed causes of death were clinically determined and are not attributable to possible reduction in doses of MgSO<sub>4</sub>.

The benefits of reducing the possible doses of MgSO<sub>4</sub> may help to prevent repeated intramuscular injections in the buttock, which can be painful and embarrassing for the patient and might also avoid the complication of injection abscess and dose-related toxicity. Hence, early recovery and a reduction of the burden on hospital resources can be expected.<sup>14</sup>

## CONCLUSION

It seems that the treatment of eclampsia cases should be individualized by considering the level of consciousness, laboratory parameters, induction delivery interval, convulsion to delivery interval, and number of convulsions, and hence deciding further maintenance doses to be given or omitted.

Owing to the low toxicity profile, reduced monitoring, cost-effectiveness, and equally effective in comparison with the Pritchard regimen, the present regimen is recommended. In developing countries where maternal morbidity and mortality due to preeclampsia are relatively higher, resorting to such shorter low-dose courses of MgSO<sub>4</sub> therapy with minimal monitoring would welcome a change in peripheral health centers with limited resources and high patient turnover.

## LIMITATIONS

Being an observational study with a small sample size, the findings need to be confirmed in an adequately powered, well-designed,

large-scale-randomized trial before changing from standard Pritchard's regimen tailored to the Indian women with lower body mass index.

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