

Low-dose Magnesium Sulfate Regime for Eclampsia in India

¹Ruchika Garg, ²Neha Agrawal, ³S Shantha Kumari, ⁴Prabhat Agrawal

ABSTRACT

Introduction: Eclampsia is one of the leading causes of maternal mortality. Magnesium sulfate (MgSO₄) can be a drug for its management.

Objectives: To study the safety and efficacy of low-dose MgSO₄ for control of convulsions in case of eclampsia and to compare it with Pritchard regimen in terms of its effects and perinatal outcome.

Materials and methods: This study was conducted in Department of Obstetrics and Gynecology. It was a prospective study and included 78 cases of eclampsia. Thirty-nine cases were given low-dose regime and remaining 39 were given Pritchard regimen. Low-dose regime for eclampsia: Loading dose 4 gm MgSO₄ IV diluted in 20 cc of 5% dextrose, slowly over 5 to 8 minutes. Maintenance dose 2 gm IV similarly diluted was given 3 hourly till 24 hours after delivery or after convulsion which ever was later. If recurrence of convulsions occurs, then additional dose 2 gm IV was given and previous dose schedule continued as such.

Results: Eclamptic convulsions were controlled in 94.87% of cases with low-dose regime, and in the remaining cases were controlled with additional 2 gm IV dose MgSO₄ compared to 37.14% with Pritchard regimen.

Conclusion: Low-dose magnesium regime is highly suitable for women in our setup, and it is as effective as Pritchard regimen for controlling convulsions in eclampsia along with better perinatal outcome and with less MgSO₄ toxicity.

Keywords: Eclampsia, Low-dose regimen, Pre-eclampsia, Pritchard regimen.

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INTRODUCTION

Pregnancy and motherhood is gift of nature and the most beautiful event which occur in a women's life. But sometimes this gift is wrapped with some complications also which can endanger her life. Eclampsia is one of the most dreaded complications of toxemia of pregnancy, which puts the life of both mother and fetus at stake. Over a period of time, though much has been understood about this condition, profound mysteries of this condition still need to be unraveled for which we have to go right up to molecular level to look for hidden ions. In the light of such a maze, the current endeavor is focused at giving better treatment for such patients so as to improve both maternal and perinatal outcome. Most patients of eclampsia are unbooked and belong to rural areas with very limited access to health services. Therefore, we should have a regime which can be given safely without much monitoring in these patients at such a center.

Until recently, major efforts by all obstetricians were to reduce maternal mortality in eclampsia. This has decreased from 25 to 37% in 1930s to less than 5% in India. Attention has now shifted to the fetus also. Many regimes have been tried so far, but magnesium sulfate (MgSO₄) stood the first of all. But this drug too is not free of complications. It is well known that MgSO₄ is the drug of choice to control seizures in women of eclampsia, but what is its lowest effective dose is a matter of debate.

The following discussion emphasizes role of low-dose MgSO₄ regime in patients of eclampsia to improve maternal and perinatal outcome.

MATERIALS AND METHODS

The present study was a prospective study conducted in the Department of Obstetrics and Gynecology, Mahatma Gandhi Medical College and Maharaja Yeshwantrao Hospital, Indore. Total 78 cases of eclampsia were included in the study. These cases were emergency cases in labor room irrespective of age and parity. Thirty-nine cases of eclampsia were given low-dose regimen and remaining 39 were given high-dose regimen (Pritchard regimen). Patients with renal hypertension, coincidental seizures in pregnancy like epilepsy or any space occupying lesion or trauma to brain or hyperpyrexia, renal failure, and pulmonary edema were excluded.

¹Assistant Professor, ²Consultant, ³Consultant, ⁴Associate Professor

^{1,2}Department of Obstetrics and Gynecology, Sarojini Naidu Medical College, Agra, Uttar Pradesh, India

³Department of Obstetrics and Gynecology, Yashoda Hospitals Hyderabad, Andhra Pradesh, India

⁴Department of Medicine, Sarojini Naidu Medical College, Agra Uttar Pradesh, India

Corresponding Author: Ruchika Garg, Assistant Professor Department of Obstetrics and Gynecology, Sarojini Naidu Medical College, Agra, Uttar Pradesh, India, e-mail: ruchikagargagra@gmail.com

Detailed history regarding age, parity, duration of pregnancy, history of pre-eclampsia, time of onset of first convulsion (to calculate number of convulsions), admission to delivery interval was taken. Magnesium sulfate was given for seizure control in eclampsia.

Protocol for Low-dose Regime in Eclampsia

Loading Dose

A dose of 4 gm MgSO₄ given IV diluted in 20 cc D5 given slowly up to 5 to 8 minutes.

Maintenance Dose

A dose of 2 gm MgSO₄ IV similarly diluted. Start 3 hours after loading dose given 3 hourly for 24 hours after delivery or last seizures, whichever is later.

In Case of Recurrence of Convulsions

A dose of 2 gm IV is given, and previous regime is continued.

Pritchard Protocol for Eclampsia

Loading Dose

A dose of 4 gm MgSO₄ given IV, diluted in 20 cc D5 given slowly up to 5 to 8 minutes + 10 gm IM MgSO₄.

Maintenance Dose

A dose of 5 gm MgSO₄ IM every 4 hourly. Start 4 hours after loading dose for 24 hours after delivery or last seizures, whichever is later.

All patients were monitored on clinical criteria. Before giving each dose of MgSO₄ toxicity was assessed in form of deep tendon reflexes, urine output, and respiratory rate; dose was deferred if urine output <100 mL in 4 hours, loss of knee jerk, RR < 16/minute. Antihypertensive was given if BP > 160/110. Termination of pregnancy was done in all cases of eclampsia. Delivery was expedited through induction/augmentation of labor with prostaglandin E2 and oxytocin with artificial rupture of membranes. Cesarean section was done in cases when convulsions were not controlled or in whom induction failed or if decision taken for obstetric indication.

RESULTS AND DISCUSSION

We included 79 cases of eclampsia with average weight profile 45 + 5.3 kg. Out of these, 48 (61.53%) were primigravida and 30 (38.47%) were multigravida. Seventy (89.74%) were antenatal eclampsia and eight (10.26%) were postnatal.

In their study, Biswas et al² found that most of the cases were primigravida. Sardesai³ found that 73.67%

of patients of eclampsia were primigravida and 26.33% eclampsia were multigravida.

In our study, we found that in women with low-dose regimen 37 (94.87%) women had control of convulsions and only 2 (5.13%) had recurrence of convulsions which were well controlled with 2 gm IV additional dose (Table 1).

Sardesai³ found that low-dose MgSO₄ had efficiently controlled convulsions in 92% of patients. Shilva and saha⁴ found that 96% women had control of convulsion with low-dose MgSO₄ regimen. Patients receiving low-dose MgSO₄ regimen had serum magnesium level of 4.58 + 1.807 µq/dL (p < 0.001) in high-dose regimen (Table 2).

Thus, serum magnesium level was in the therapeutic range (3.5–8.4 µq/dL) in both the groups, but there was a significant difference in serum magnesium level in both the groups, but there was no statistical difference in control of convulsions in both groups. Thus, if similar results were obtained with low dose then extra high doses should be given, which only increase side effects and hence are not advantageous.

Average duration of labor in low-dose group was 7.742 hours as compared to 10.41 hours in the high-dose group (Table 3). Magnesium sulfate inhibits uterine contraction, i.e., why it has a role in management of preterm labor.⁵

Bhalla⁶ found mean duration of labor with Pritchard regimen to be 11.4 hours, thus our results are comparable with the authors.

With this observation, it is clear that complication like loss of knee jerk (2.56%) and oliguria (1.28%) were less in low-dose group. Recurrence of seizures was seen in two cases (5.13%), number of doses deferred in two cases (5.13%), and no woman required calcium gluconate

Table 1: Number of recurrence of convulsions after treatment in eclampsia

No. of convulsions	Low dose		High dose	
	no.	%	no.	%
0	37	94.87	38	94.87
1	2	5.13	2	5.13
2	0	0	0	0
Total	39	100	39	100

Table 2: Average serum magnesium level in cases of eclampsia (measured 3 hours after loading dose)

	Low dose	High dose
Average serum magnesium (µq/dL)	4.52 + 1.282	6.897 + 1.807
p < 0.001, highly significant		

Table 3: Average duration of labor

Mode of delivery	Low dose	High dose
Average duration of labor (hours)	7.742	10.41

Table 4: Complications in mother due to magnesium sulfate

Complications	Low dose		High dose	
	no.	%	no.	%
Loss of knee jerk	1	2.56	5	12.82
Oliguria	1	2.56	6	16.38
Recurrence of seizures	2	5.13	2	5.13
Total number of deferred doses	2	5.13	8	20.51
Requirement of calcium gluconate	0	0	2	5.13

for MgSO₄ toxicity. In low-dose regimen, recurrence of seizures was controlled well with additional 2 mg IV MgSO₄ dose. These complications were more in the high-dose group, and eight (20.51%) cases deferred the dose and two (5.13%) required calcium gluconate as antidote for MgSO₄ toxicity in this group (Table 4).

Begum et al⁷ (low-dose Dhaka regimen) found in their study that 9% patients had loss of knee jerk.

Shilva and Saha⁴ found loss of jerk in 8% patients with low-dose Dhaka compared to 32% in Pritchard regimen. They also found 4% patients with oliguria in low-dose group as compared to 20% in high-dose group.

Thus, the side effects of MgSO₄ can be very well decreased by giving low-dose without compromising its efficacy to control seizures.

In this study, we found that perinatal mortality was significantly less in low-dose group, i.e., 7 (20%), compared to high-dose group, i.e., 13 (37.14%). There were four stillbirths (11.43%), early neonatal death (ENND) three (8.57%), respiratory depression (Apgar at 5 minutes) three (8.57%), less hypotonia 4 (11.43%) in neonates of patients receiving low-dose regimen compared to other group (Table 5). Also, no baby of the patients receiving low-dose MgSO₄ regimen required calcium gluconate in neonatal intensive care unit, while three babies of the patients receiving Pritchard regimen required calcium gluconate to combat magnesium overdose which occurred due to MgSO₄ given to their mothers. Concentration of

Table 5: Perinatal outcome in antenatal eclampsia

Perinatal outcome in eclampsia	Low dose		High dose	
	no.	%	no.	%
Live birth	31	88.57	27	77.14
Stillbirth	4	11.43	8	22.86
Early neonatal death (ENND)	3	8.57	5	14.28
Hypotonia	4	11.43	9	25.71
Respiratory distress at birth				
Apgar <7 at 1 minute	5	14.28	9	25.71
Apgar <7 at 5 minutes	3	8.57	6	17.14
Calcium gluconate requirement in neonate	0	0	3	8.57
Perinatal mortality				
Total antenatal cases	20	37.14		
Total postnatal cases	35	35		
	4	4		

magnesium in fetus and neonate are similar to maternal levels. This translates clinically into decreased fetal heart variability during labor and central nervous system depression in neonate. Infants of mothers treated with MgSO₄ shortly before delivery are frequently hypotonic at birth and require respiratory support, until the magnesium is eliminated.

Long-term use may cause fetal hypocalcemia. Recent investigations have suggested existence of an association between use of MgSO₄ in women of preterm labor and incidence of intraventricular hemorrhage, neonatal depression, neonatal hypocalcemia, and neonatal hypotonia. These disadvantages are less in the patients receiving low-dose MgSO₄ regimen compared to patients receiving conventional Pritchard regimen. So, the women receiving low-dose MgSO₄ regimen have significantly better perinatal outcome.

Desai⁸ has reported perinatal mortality as 33.83% by Pritchard regimen.

Sardesai,³ in their study, found perinatal mortality rate to be 25.87% in patients receiving low-dose MgSO₄ regimen.

Shilva and Saha⁴ found 4% babies with hypotonia at birth in the women receiving low-dose Dhaka regimen compared to 28% in women who were given Pritchard regimen. Four percent babies had respiratory depression at birth in low-dose group compared to 12% in high-dose group. Eight percent neonates in their study required calcium gluconate in low-dose group, compared to 32% in high dose group.

Menon et al⁹ found fetal mortality rate of 40% in cases of eclampsia by giving Pritchard regimen. Thus, we see that low MgSO₄ has proved to have better perinatal results in various studies also, just like ours.

Pritchard et al¹⁰ suggested that dose of MgSO₄ should be limited in women who are known to be or appear to be small or low weight. Administering Pritchard regimen to them might prove to be hazardous with a possibility of respiratory failure. Patients of our setup are usually from low socioeconomic status with poor weight gain in pregnancy. Actually, even if we give Pritchard regimen, the excess of magnesium is excreted by the kidney. The question is then, why give extra salt when it is wasted? This is a strong justification for giving low-dose regimen.

CONCLUSION

Eclampsia most often affects primigravida and unbooked women.

- Control of convulsion by low-dose MgSO₄ regimen was nearly equal (94.87%) to the patients who were given Pritchard regimen (97.43%).
- Serum magnesium level was significantly less in patients receiving low dose compared to others. Thus,

less monitoring of serum magnesium level is required in patients who were given low-dose MgSO₄ regimen.

- Average duration of labor in women of eclampsia was less in women who were given low-dose regimen compared to patients receiving Pritchard regimen.
- Toxicity of MgSO₄ (like oliguria, loss of knee jerk), was significantly less in women receiving low-dose regimen compared to patients receiving Pritchard regimen.
- Perinatal outcome is definitely better in women receiving low-dose MgSO₄ compared to the conventional Pritchard regimen.

So, it is highly effective in reducing maternal and perinatal morbidity and mortality. In our study, we found that this low-dose MgSO₄ regimen is effective, as Pritchard regimen does not require monitoring and is associated with less side effects in mother and baby and with definitely better perinatal outcome. So, it should be given in all women of eclampsia so as to improve maternal and perinatal outcome in our patients.

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