



# A Comparative Study of Magnesium Sulphate Versus Phenytoin Sodium in Prophylaxis & Control of Eclamptic Seizures

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## Abstract

To evaluate the efficacy of Magnesium sulphate and Phenytoin sodium regime in the prevention & control of eclamptic fits. This retrospective study was conducted for one year. 197 eclamptic cases were reported of which 147 cases were managed with magnesium sulphate and 47 were managed with Phenytoin sodium regime. There were 197 cases of eclampsia among 12,170 deliveries, incidence being 1.61%. In magnesium sulphate regime, seizures were controlled within 4hrs of therapy in 97.94% patients while it was 80.86% in Phenytoin sodium group. Recurrent convulsions with Magnesium sulphate (4.76%) were less as compared to phenytoin sodium (34.04%)  $p < 0.01$ . 91.8% of patients in Magnesium sulphate regained their consciousness within 12 hrs of therapy while it was only 70-72% in Phenytoin sodium regime  $p < 0.01$ . It is therefore inferred that Magnesium Sulphate therapy has proved superior to Phenytoin sodium regime because of minimal CNS depressant action, minimal fits recurrence and better level of consciousness. All the above factors collectively help in reducing maternal mortality and morbidity & improving foetal salvage.

## Key Words

Eclampsia, Magnesium Sulphate, Phenytoin Sodium

## Introduction

Eclampsia is life threatening condition that can develop in pregnant women. It is the advent or association of convulsions in a patient of pre-eclampsia or protineuric hypertension. In a developing country like India, eclampsia form one of the major cause of maternal mortality. The fact that eclampsia is largely a preventable disease is established by the negligible incidence of eclampsia with proper antenatal care & prompt treatment of pre-eclampsia as seen in developed countries (1).

Prompt control of convulsions & blood pressure along with step to initiate delivery form the foundation stone of treatment of eclampsia. Over the years various anticonvulsants have been in use. The efficacy and safety of magnesium sulphate in the treatment of pre-eclampsia & eclampsia have been well documented during the past 60 years. Recently phenytoin has been recommended as

an alternative for magnesium sulphate however comprehensive data regarding its safety & efficacy are lacking. The evidence in the literature indicates that magnesium sulphate is the ideal anticonvulsant in pre-eclampsia & eclampsia (2).

Magnesium sulphate vasodilates the small diameter intracranial vessel distal to the middle cerebral artery and may exert its main effect in the prophylaxis & treatment of eclampsia by relieving cerebral ischaemia (3). Phenytoin sodium causes dose dependent blockage of sodium channels thus reducing neuronal sodium concentration leading to a reduction in post-tetanic potentiation (PTP) & increase potassium concentration. Reduction in PTP stop the spread of seizure discharge (4). Magnesium sulphate appears to be subsequently more effective than phenytoin for treatment of eclampsia (5).

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Magnesium sulphate is superior to phenytoin for the prevention of eclampsia in hypertensive pregnant women (6). Phenytoin is a well tolerated alternative to Magnesium sulphate for seizure prophylaxis in patients with mild PIH (7). Our study evaluate the efficacy of Magnesium sulphate in reducing convulsions, duration of coma and blood pressure in eclampsia and compares the results concerned with use of Phenytoin sodium in similar women.

### Aims and Objectives

1. Comparative study of efficacy of Magnesium sulphate & Phenytoin sodium regime in prevention and treatment of eclamptic convulsions.

2. To study which is a better drug -Magnesium sulphate or Phenytoin sodium.

### Material & Methods

This retrospective study was carried out on all cases of eclampsia admitted in Ummaid Hospital Dept of Obstetrics & Gynecology, Dr SN Medical College, Jodhpur for one year in ICU. After taking a detailed obstetric family and personal history, performing clinical examination, sending routine and special investigations, 147 women were treated on the basis of Magnesium sulphate (Pritchard regime) & 47 cases were treated on Phenytoin regime. Three women were admitted in moribound condition, died within half an hour of admission could not receive any regime.

#### Magnesium Sulphate Regimen

Loading dose of Magnesium sulphate 4gm as 20% soln at a rate not to exceed 1gm/min given intravenously. Follow promptly with 10gm of 50% Magnesium sulphate, one half injected deeply in the upper outer quadrant of both buttocks. Every 4 hours thereafter give 5gm of 50% solution of Magnesium sulphate injected deeply in the upper quadrant of alternate buttocks, but only after assuring that

- Patellar reflex is present
- Respiration is not depressed
- Urine output in the previous 4hrs exceed 100 ml.

Magnesium sulphate is discontinued 24 hrs after delivery.

#### Phenytoin Sodium Regimen

Loading dose of 500mg of Phenytoin sodium diluted in 200ml of normal saline over 20 minutes at an infusion rate of <math>50\text{mg}/\text{min}</math>. This was followed immediately by 500mg diluted in 200ml normal saline administered over

next 4hrs. A final dose of 500mg administered over 4hrs was given 12 hrs after initiating therapy. A maintenance

**Table . 1 Characteristics of Women in Magnesium Sulphate & Phenytoin Sodium Regimen**

Characteristics	Mgso <sub>4</sub> regime		Phenytoin sodium regime	
	n(147)	%	n(47)	%
1. No of patients				
2. Age (years)				
<20	26	17.68	8	17.02
20-25	99	67.34	31	65.95
26-30	16	10.88	5	10.63
>30	6	4.08	3	6.38
3. Parity				
0	124	84.35	33	70.21
1-3	18	12.24	12	25.53
>3	5	3.40	2	4.25
4. Gestational age(weeks)				
<34	46	42.59	9	36.00
34-36	18	16.66	3	11.11
>37	44	41.12	13	52.00
5. Mean Arterial Pressure(mmHg)				
(a) Average	126		128	
(b) SD	16		15	
6. Proteinuria				
Trace	3	2.04	4	8.51
1+	20	13.60	10	21.27
2+	28	19.04	8	17.02
3+>	96	65.30	25	53.19
7. Unbooked	137	93.19	44	93.61
8. Rural	105	71.42	35	74.46
9. Type of Eclampsia				
Antepartum	54	36.73	17	36.17
Intrapartum	52	35.37	8	17.02
Postpartum	39	26.58	22	46.80
Intercurrent	2	1.36	-	-
10. Average Birth Wt (gm)	2060		2070	
11. Average Hospital stay(days)	8		10	

dose of 200mg/8hrs was given intravenously during the intrapartum period & orally in the postpartum period for 24hrs & was then discontinued.

### Results

There were 197 cases of eclampsia among 12,170 deliveries, the incidence being 1.61%. 147 cases were managed with Magnesium sulphate (Pritchard regime) & 47 cases with Phenytoin sodium regime. There was no comparable difference in characteristics between the women given Magnesium sulphate regime and Phenytoin sodium regime. The result of the study shown in table (1-5)

Out of 147 cases in Mgso<sub>4</sub> group, one case was of intercurrent eclampsia having no fits at time of admission. Seizures were controlled within 4 hrs in 97.94% patients given magnesium sulphate regime as compared to 80.85% in Phenytoin sodium regime. Thus magnesium sulphate

**Table. 2 Control of Fits in Magnesium Sulphate & Phenytoin Sodium Regime**

Hours of therapy	Mg So <sub>4</sub> (N)=146				Phenytoin Sodium(N)=47			
	Controlled		Not Controlled		Controlled		Not controlled	
	Case(n)	%	Case(n)	%	Case(n)	%	Case(n)	%
0-4	143	97.94	3	2.05	38	80.85	9	19.14
4-8	-	-	3	2.05	6	12.76	3	6.38
8-12	2	1.36	1	0.68	2	4.25	1	2.12
12-24	1	0.68	-	-	1	2.12	-	-
>24	-	-	-	-	-	-	-	-

**Table No. 3 Number of Fits Before & After therapy with Magnesium Sulphate and Phenytoin Sodium Regime**

No. of fits	Mgso <sub>4</sub> (N=146)						Phenytoin sodium (N=47)					
	Before			After			Before			After		
	1-5	6-10	10-12	0	1-2	3-4	1-5	6-10	10-12	0	1-2	3-4
APE	40	13	2	-	2	-	13	3	1	-	4	-
IPE	38	11	3	-	1	-	5	3	0	-	2	3
PPE	32	6	1	-	4	-	18	2	2	-	7	-
Total	110	30	6	-	7	-	36	8	3	-	13	3

Chi-square Test  $p < 0.01$

**Table. 4 Recurrent Convulsions with other Authors**

S. No	Author	Year	Mgso <sub>4</sub> regime	Phenytoin sodium
1	J. Dommissé <sup>8</sup>	1990	0%(0/11)	36.36%(4/11)
2	Eclampsia Trial Collaborative group <sup>9</sup>	1995	5.7%(22/388)	17.1%(66/387)
3	Sawhney H et al <sup>10</sup>	1999	8%(2/25)	40%(10/25)
4	U.S.Hangarga, S.Pragya <sup>11</sup>	2001	8.8%(3/24)	6.25%(2/32)
5	<b>Present study</b>	2001	4.76%(7/146)	34.04%(16/47)
6	Ritu Sharma, Shahida Mir et al <sup>12</sup>	2008	0% (0/25)	24%(6/25)

**Table . 5 Regain of Consciousness in Magnesium Sulphate & Phenytoin Sodium Regime**

Time (Hrs of therapy)	Magnesium Sulphate(110)		Phenytoin sodium(41)	
	n	%	n	%
0-6	77	70.0	15	36.58
6-12	24	21.8	14	34.14
12-24	5	4.54	4	9.75
>24	3	2.72	4	9.75
Comatose	1	0.90*	4	9.75*

Chi-square Test  $p < 0.01$ ; \* expired

is superior to phenytoin sodium in controlling the fits immediately.

### Discussion

Magnesium sulphate act as a cerebral vasodilator by improving the cerebral circulation in these areas. It is possible that this vasodilator effect reverses critical cerebral ischaemia leading to improved perfusion and

prevention of cell damage, cerebral edema and convulsions. Calcium antagonist action of magnesium sulphate in vascular smooth muscle of cerebral circulation is responsible for vasodilation (3)

The above table indicates that out of 147 cases in Mgso<sub>4</sub> group one was a case of intercurrent eclampsia having no fits at the time of admission. 7/146 i.e. 4.76%



have convulsions after treatment with Mgso<sub>4</sub> in comparison to Phenytoin sodium where 16/47 i.e. 34.04% have recurrent convulsions. In our study recurrent convulsions with Mgso<sub>4</sub> were less as compared to Phenytoin sodium which correlates with most of the above mentioned studies. Poor performance of Phenytoin as an anticonvulsant in severe eclampsia may relate to inadequate distribution of drug to brain as a result of cerebral edema and poor cerebral perfusion(13).

Above table indicates that 70% of the patients given Mgso<sub>4</sub> regime completely regained their consciousness within 6 hrs of therapy in comparison to 36.58% given Phenytoin sodium regime. Typically after Mgso<sub>4</sub> therapy women soon become aroused & oriented without evidence of profound CNS depression ( 14).

Early regain of consciousness in women given Mgso<sub>4</sub> regime is due to the fact that 4gm intravenous loading dose causes immediate elevation of CSF Mg<sup>++</sup> ion levels without exerting a depressant action on central nervous system. It has wide safety margin relieves cerebral ischaemia and oedema faster than Phenytoin. Its renal clearance is very similar to the glomerular filtration rate. Normally 90% of the loading dose is promptly excreted in urine.

The most important step in the management of pre-eclampsia and eclampsia is preventing the occurrence of first convulsion(i.e.progression of pre-eclampsia to eclampsia and preventing the recurrence of convulsions in eclampsia).A variety of anticonvulsants are available but the most commonly used ones today are magnesium sulphate and phenytoin. The Magnesium sulphate regimen was standardized at Parkland Hospital by Pritchard et al and is widely used in America. Phenytoin regimen is popular in Britain but is now being replaced by magnesium sulphate. Various studies were conducted to compare the seizure prevention and control in the patients of pre-eclampsia eclampsia managed with magnesium sulphate and phenytoin (12).

Magnesium sulphate has proved superior to phenytoin sodium therapy because of minimal CNS depressant action, minimal fits recurrence, better level of consciousness & improving uterine blood flow. All the above factors collectively help in reducing maternal mortality, morbidity & improving foetal salvage (Collaborative Eclampsia Trial) (9).

## Conclusion

Thus the results of present study suggest that Magnesium sulphate is a better anticonvulsant than phenytoin and our study corroborates with the evidence.

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