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Original Research Article

Comparison of Pritchard and low dose magnesium sulphate regimen in patients with severe preeclampsia and eclampsia

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ABSTRACT

Background: Hypertensive disorders of pregnancy, particularly preeclampsia and eclampsia, remain major contributors to maternal and perinatal morbidity and mortality. Magnesium sulphate ($MgSO_4$) is the drug of choice for seizure prophylaxis and control, but the optimal dosage regimen balancing efficacy and safety remains debated. The aim and objectives of the study were to compare the efficacy, safety, and maternal–fetal outcomes of the standard Pritchard regimen with low-dose $MgSO_4$ regimens (Zuspan and Dhaka) in patients with severe preeclampsia and eclampsia.
Methods: A prospective observational study was conducted in the Department of Obstetrics and Gynaecology, M. L. N. Medical College, Prayagraj, over one year, including 150 women diagnosed with severe preeclampsia or eclampsia. Participants were allocated to three groups receiving Pritchard, Zuspan, or Dhaka regimens. Maternal and perinatal outcomes, adverse effects, and recurrence of convulsions were compared using appropriate statistical tests.
Results: The recurrence of convulsions was comparable among the three groups ($p=0.67$). However, adverse effects such as loss of deep tendon reflexes (36.4% versus 10.4% versus 8.5%), decreased urine output (32.7% versus 6.3% versus 4.3%), and respiratory depression (23.6% versus 4.2% versus 2.1%) were significantly higher in the Pritchard group ($p<0.05$). Maternal and perinatal outcomes, including mortality and neonatal intensive care unit (NICU) admissions, showed no statistically significant differences.
Conclusion: Low-dose $MgSO_4$ regimens (Zuspan and Dhaka) are as effective as the Pritchard regimen in controlling eclamptic seizures but have fewer adverse effects, making them safer, more tolerable, and cost-effective, especially in resource-limited settings.

Keywords: Magnesium sulphate, Pritchard regimen, Low-dose regimen, Severe preeclampsia, Eclampsia, Maternal outcome, Perinatal outcome

INTRODUCTION

Hypertensive disorders of pregnancy remain one of the leading causes of maternal and perinatal morbidity and mortality worldwide, particularly in low- and middle-income countries. Among these, preeclampsia and eclampsia constitute a major public health problem, accounting for approximately 10–15% of maternal deaths globally.[1] Preeclampsia, characterized by new-onset hypertension and proteinuria after 20 weeks of gestation, can progress to eclampsia—a severe condition marked by the occurrence of seizures unrelated to other neurological causes.[2]

Magnesium sulphate ($MgSO_4$) is the anticonvulsant of choice for the prevention and control of eclamptic seizures, as established by several clinical trials and meta-analyses.[3] The Pritchard regimen, traditionally used in many centers, combines intramuscular and intravenous administration of $MgSO_4$ and has demonstrated significant efficacy in reducing recurrent convulsions and improving maternal outcomes.[4] However, the high dosage in this regimen may lead to adverse effects such as respiratory depression, loss of tendon reflexes, and oliguria, particularly in resource-limited settings where continuous monitoring is difficult.[5]

To minimize toxicity while maintaining efficacy, several low-dose regimens—including the Dhaka and Zuspan protocols—have been developed and evaluated in recent years.[6] These regimens aim to provide comparable seizure control with reduced risk of toxicity, shorter hospital stays, and greater cost-effectiveness, making them potentially more suitable for use in developing countries.[7]

Despite these advancements, the optimal $MgSO_4$ regimen remains debated, particularly regarding balancing efficacy, safety, and feasibility in diverse clinical settings. Therefore, this study was conducted to compare the Pritchard regimen with a low-dose $MgSO_4$ regimen in patients with severe preeclampsia and eclampsia, to determine whether the latter offers equivalent therapeutic benefit with reduced side effects.

Aim

The aim was to find out whether the lower-dose regimen provides equivalent or superior control of seizures with reduced risk of toxicity compared to the standard high dose Pritchard regimen, thereby improving maternal and perinatal outcomes.

Objectives

Objectives were to compare the Pritchard and low-dose $MgSO_4$ in severe preeclampsia and eclampsia without compromising its efficacy in feto-maternal outcome and to assess whether the low dose is a better option for hypertensive patients in terms of efficacy, toxicity and cost effectiveness.

METHODS

Research design

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology, Moti Lal Nehru Medical College, Prayagraj, under Atal Bihari Vajpayee Medical University, Lucknow. The study was carried out over a duration of one year (2023–2024) and included a sample size of 150 women diagnosed with severe preeclampsia or eclampsia.

The participants were divided into three groups receiving different magnesium sulphate regimens—Pritchard, Zuspan, and Dhaka. Clinical and biochemical parameters were monitored throughout the study to compare the efficacy and safety of each regimen in improving maternal and perinatal outcomes.

Inclusion criteria

Women diagnosed with severe preeclampsia or eclampsia were included in the study and written or witnessed informed consent obtained from the patient or, in case of unconsciousness, from the spouse or nearest relative.

Exclusion criteria

Patients with known history of epilepsy patients with meningitis, encephalitis, or intracranial tumors and patients who had received $MgSO_4$ or other anticonvulsants prior to admission were excluded from the study.

Procedure for data collection

The data collection procedure for this study involves enrolling pregnant women diagnosed with severe preeclampsia or eclampsia who meet the inclusion criteria and have given informed consent. Eligible participants are randomly assigned to either the high-dose or low-dose $MgSO_4$ treatment group, based on pre-defined treatment protocols. Clinical and demographic data such as age, gestational age, parity, blood pressure, and presenting symptoms are recorded at baseline. Laboratory investigations including complete blood count, liver and renal function tests, are also documented. During treatment, participants are closely monitored for vital signs, urine output, deep tendon reflexes, and any signs of magnesium toxicity. Data regarding the dosage, timing, and route of $MgSO_4$ administration are recorded for each patient. Maternal outcomes including seizure recurrence, adverse effects, need for additional anticonvulsants, 33 durations of hospital stay, and maternal mortality are systematically collected. Fetal and neonatal outcomes such as birth weight, Apgar scores, NICU admissions, and neonatal complications are also documented. All data are entered into a structured case record form and later analyzed using appropriate statistical tools to compare the safety and efficacy of high-dose versus low-dose $MgSO_4$ regimens.

Data analysis

The collected data will be entered and coded into Microsoft Excel and subsequently analyzed using statistical package for the social sciences (SPSS) software version 21. Descriptive statistics such as mean, standard deviation, and percentage will be used for summarizing data. Chi-square test will be applied for categorical variables, while student's t-test and ANOVA will be used for continuous variables to compare means among groups.

A p value of <0.05 will be considered statistically significant for all analyses.

Ethical issues

All participants gave their written consent willingly. The research plan was approved by the Institutional Ethics Committee for Human Studies at MLN Medical College in Prayagraj, Uttar Pradesh.

All study procedures followed the ethical standards of the Declaration of Helsinki and the relevant national guidelines.

RESULTS

The majority of women with severe preeclampsia and eclampsia were unbooked (68%), belonged to lower socioeconomic class (73.3%), and came from rural areas (61.3%). Most were primigravidae (65.3%) and aged 20–24 years (44%), suggesting that lack of antenatal care and low socioeconomic background are major contributors to these conditions (Table 1). There was no significant difference (p=0.78) in the distribution of severe preeclampsia and eclampsia cases among the Pritchard, Zuspan, and Dhaka regimens, indicating that all three groups were comparable in baseline disease severity and patient distribution (Table 2). The Pritchard regimen showed a much higher incidence of magnesium toxicity and complications such as loss of deep tendon reflexes (36.4%), decreased urine output (32.7%), and respiratory depression (23.6%) compared to the low-dose Zuspan and Dhaka regimens, which showed significantly lower rates ($p<0.05$). This indicates that low-dose regimens are safer while maintaining efficacy (Table 3). Neonatal outcomes such as live births, perinatal mortality, Apgar scores, and NICU admissions were comparable across all regimens ($p>0.05$), showing that reducing the maternal magnesium dose does not compromise fetal or neonatal safety or outcomes (Table 4). Although maternal complications like HELLP syndrome (20% in Pritchard versus 8.3% and 6.4%) and AKI (12.7% versus 6.3% and 4.3%) were more frequent in the Pritchard group, the recurrence of convulsions and maternal mortality were similar across all regimens ($p>0.05$). Thus, low-dose regimens provide equal seizure control with fewer complications (Table 5).

Table 1: Sociodemographic and clinical characteristics of patients with severe preeclampsia and eclampsia.

Characteristic	Categories	Severe preeclampsia (n=82) (%)	Eclampsia (n=68) (%)	Total (n=150) (%)
Booking status	Booked	26 (31.7)	22 (32.4)	48 (32.0)
	Unbooked	56 (68.3)	46 (67.6)	102 (68.0)
Age group (years)	<20	4 (4.9)	8 (11.8)	12 (8.0)
	20–24	32 (39.0)	34 (50.0)	66 (44.0)
	25–29	26 (31.7)	14 (20.6)	40 (26.7)
	≥30	20 (24.4)	12 (17.6)	32 (21.3)
Residence background	Rural	48 (58.5)	44 (64.7)	92 (61.3)
	Urban	34 (41.5)	24 (35.3)	58 (38.7)
Socio-economic status	Upper	4 (4.9)	2 (2.9)	6 (4.0)
	Middle	20 (24.4)	14 (20.6)	34 (22.7)
	Lower	58 (70.7)	52 (76.5)	110 (73.3)
Parity distribution	Primigravida	50 (61.0)	48 (70.6)	98 (65.3)
	Multigravida	32 (39.0)	20 (29.4)	52 (34.7)

Table 2: Distribution of severe preeclampsia and eclampsia cases across different magnesium sulphate regimens.

Condition	Pritchard regimen (n=55) (%)	Zuspan regimen (n=48) (%)	Dhaka regimen (n=47) (%)	Total (n=150) (%)	P value
Severe preeclampsia	30 (54.5)	28 (58.3)	24 (51.1)	82 (54.7)	0.78
Eclampsia	25 (45.5)	20 (41.7)	23 (48.9)	68 (45.3)	
Total	55 (100)	48 (100)	47 (100)	150 (100)	

Table 3: Maternal adverse effects and complications observed in different magnesium sulphate regimens.

Characteristic	Pritchard regimen (n=55) (%)	Zuspan regimen (n=48) (%)	Dhaka regimen (n=47) (%)	P value
Loss of deep tendon reflexes	20 (36.4)	5 (10.4)	4 (8.5)	0.004
Decreased urine output (<30 ml/hour)	18 (32.7)	3 (6.3)	2 (4.3)	0.01
Respiratory depression (RR≤16/min)	13 (23.6)	2 (4.2)	1 (2.1)	0.02
Injection site abscess	10 (18.2)	0 (0)	1 (2.1)	0.04
Recurrence of convulsions	2 (3.6)	2 (4.2)	1 (2.1)	0.67
Maternal complications: HELLP syndrome	11 (20.0)	4 (8.3)	3 (6.4)	0.04
Maternal complications: acute kidney injury	7 (12.7)	3 (6.3)	2 (4.3)	0.05

Continued.

Characteristic	Pritchard regimen (n=55) (%)	Zuspan regimen (n=48) (%)	Dhaka regimen (n=47) (%)	P value
Maternal complications: pulmonary edema	5 (9.1)	2 (4.2)	2 (4.3)	0.08
Maternal complications: DIC	3 (5.5)	2 (4.2)	1 (2.1)	0.09
Maternal complications: PPH	2 (3.6)	1 (2.1)	0 (0)	0.21
Maternal mortality	1 (1.8)	0 (0)	0 (0)	0.34

Table 4: Neonatal outcomes among patients treated with different magnesium sulphate regimens.

Condition	Pritchard regimen (n=55) (%)	Zuspan regimen (n=48) (%)	Dhaka regimen (n=47) (%)	P value
Live birth	41 (74.5)	34 (70.8)	37 (78.7)	0.58
Perinatal mortality	14 (25.5)	14 (29.2)	10 (21.3)	0.51
Apgar score <7	23 (41.8)	19 (39.6)	21 (44.7)	0.83
Nicu admission	21 (38.2)	16 (33.3)	19 (40.4)	0.72
Severe birth asphyxia	7 (12.7)	7 (14.6)	6 (12.8)	0.95

Table 5: Comparison of maternal complications across Pritchard, Zuspan, and Dhaka regimens.

Condition	Pritchard regimen (n=55) (%)	Zuspan regimen (n=48) (%)	Dhaka regimen (n=47) (%)	P value
Recurrence of convulsions	2 (3.6)	2 (4.2)	1 (2.1)	0.67
HELLP syndrome	11 (20.0)	4 (8.3)	3 (6.4)	0.04
Acute kidney injury (AKI)	7 (12.7)	3 (6.3)	2 (4.3)	0.05
Pulmonary edema	5 (9.1)	2 (4.2)	2 (4.3)	0.08
Disseminated Intravascular coagulation (DIC)	3 (5.5)	2 (4.2)	1 (2.1)	0.12
Postpartum hemorrhage (PPH)	2 (3.6)	1 (2.1)	0 (0)	0.28
Maternal mortality	1 (1.8)	0 (0)	0 (0)	0.31

DISCUSSION

The present study compared the efficacy, safety, and feto-maternal outcomes of the standard Pritchard regimen with low-dose $MgSO_4$ regimens (Zuspan and Dhaka) in women with severe preeclampsia and eclampsia. The results revealed that while all three regimens were equally effective in preventing seizure recurrence, the low-dose protocols were associated with significantly fewer adverse effects such as loss of deep tendon reflexes, oliguria, and respiratory depression, consistent with findings from several previous studies.

Comparison of efficacy

In the current study, seizure recurrence was comparable among the three regimens (Pritchard 3.6%, Zuspan 4.2%, Dhaka 2.1%), demonstrating that reduction in magnesium dosage did not compromise anticonvulsant efficacy. This aligns with observations by Asnani et al in 2015, Nautiyal et al in 2016, and Bhagat et al in 2019, who reported equivalent seizure control between low-dose and standard regimens.[8-10]

Similarly, Sontakke et al in 2020 found no significant difference in seizure control between groups (96.6% versus 90.8%, p>0.05), confirming the effectiveness of reduced-dose therapy in maintaining adequate therapeutic serum magnesium levels.[11]

These findings collectively indicate that lowering the dose by up to 40% still achieves optimal anticonvulsant action, particularly among women with lower body mass index (BMI) and adequate renal function.

Maternal adverse effects

In the present study, magnesium toxicity—manifested as loss of deep tendon reflexes (36.4%), oliguria (32.7%), and respiratory depression (23.6%)—was considerably higher in the Pritchard group compared to the low-dose groups (p<0.05). Similar trends were documented by Patil et al in 2017 and Vaishnav et al in 2019, who found toxicity rates of 35% and 15.3%, respectively, in patients receiving the Pritchard regimen, whereas the Dhaka and Zuspan groups showed markedly fewer adverse reactions.[12,13]

Bagariya et al in 2020 further supported these results by demonstrating higher toxicity and injection-site complications with intramuscular Pritchard administration compared with intravenous regimens.[14] Collectively, these studies support that high-dose intramuscular magnesium therapy increases local and systemic toxicity without improving efficacy.

Maternal complications and mortality

HELLP syndrome, acute kidney injury, and pulmonary edema were observed more frequently in the Pritchard group, a pattern consistent with findings from Agarwal et al and Rani et al, who reported higher maternal morbidity associated with the Pritchard regimen.[15,16] However, the overall maternal mortality rate was low and comparable across groups, echoing the results of Nayek et al and Kamanchi et al, where mortality ranged between 0–2.5% across treatment arms.[17,18] The reduction in morbidity without compromising survival underscores the safety profile of low-dose regimens, particularly beneficial in low-resource settings where continuous monitoring may be challenging.

Perinatal outcomes

In our study, neonatal outcomes—including Apgar scores, NICU admissions, and perinatal mortality—did not differ significantly among groups. Similar observations were made by Naseha et al, Agarwal et al, and Sahithi et al, confirming that low-dose magnesium therapy does not adversely affect fetal outcomes.[19-21]

Akhtar et al and Kumari et al also concluded that lower-dose intravenous infusions were equally effective in seizure prevention, with comparable neonatal survival and fewer NICU admissions.[22,23] This consistency across studies suggests that therapeutic magnesium levels adequate for seizure prophylaxis can be maintained safely with lower dosing, without compromising fetal well-being.

Clinical implications

The results of this study, in concordance with previous literature, suggest that low-dose $MgSO_4$ regimens (Dhaka and Zuspan) are not only clinically effective but also more tolerable and cost-efficient. Given that Indian and South-Asian women generally have lower body weight and lean mass than Western populations, reduced doses are more physiologically appropriate, preventing magnesium accumulation and toxicity.

Furthermore, low-dose regimens require less intensive monitoring, which is particularly advantageous in primary and secondary healthcare facilities with limited manpower and equipment. Adoption of such protocols may thus improve treatment accessibility and compliance, especially in rural or resource-limited settings.

CONCLUSION

The present study concludes that low-dose magnesium sulphate regimens such as the Zuspan and Dhaka protocols are equally effective as the standard Pritchard regimen in preventing and controlling eclamptic seizures, while significantly reducing the incidence of adverse effects such as loss of deep tendon reflexes, respiratory depression, and injection site complications. Maternal and neonatal outcomes, including recurrence of convulsions, perinatal mortality, and NICU admissions, were comparable across all groups, indicating that lower-dose regimens maintain therapeutic efficacy with improved safety and tolerability. Given their reduced toxicity, easier monitoring requirements, and cost-effectiveness, low-dose $MgSO_4$ regimens represent a safer and more practical alternative, particularly in resource-limited settings, for the management of severe preeclampsia and eclampsia.

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