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Original Research Article

Effectiveness of Magnesium Sulphate to Prevent Eclampsia in Women with Severe Preeclampsia

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Abstract: ***Background:*** Severe preeclampsia is a leading cause of maternal and perinatal morbidity and mortality worldwide, particularly in low- and middle-income countries. Magnesium sulphate has been established as the gold standard for preventing eclampsia, yet local data on its effectiveness and maternal–fetal outcomes remain limited. Aim: This study aimed to evaluate the effectiveness of magnesium sulphate in preventing eclampsia and to assess associated maternal and fetal outcomes among women with severe preeclampsia. ***Methods:*** A descriptive case series was conducted in the Department of Obstetrics and Gynaecology, Gulab Devi Hospital, Lahore, from June to November 2025. A total of 148 women aged 18–40 years with severe preeclampsia were enrolled. Magnesium sulphate was administered using the Pritchard regimen, and patients were closely monitored for clinical and biochemical outcomes. Maternal and fetal outcomes were recorded, and data were analyzed using SPSS version 28. Stratification by blood pressure and gestational age at delivery was performed, with Chi-square test applied; $p < 0.05$ was considered statistically significant. ***Results:*** The majority of women (58%) were aged 25–34 years, and more than two-thirds were overweight or obese. Nearly 44% delivered preterm, with 60% presenting between 29–36 weeks of gestation. Biochemical derangements included elevated liver enzymes, borderline renal dysfunction, and low platelet counts, indicating multi-organ involvement. Magnesium sulphate was highly effective, with only 3.4% experiencing loss of reflexes and 5.4% oliguria, both managed conservatively. Maternal mortality was limited to one case (0.7%). Cesarean section was performed in 40.5% of patients, primarily for obstetric indications. Stratified analysis revealed that severe hypertension (≥180/≥110 mmHg) was significantly associated with higher maternal complications ($p = 0.03$), while preterm delivery (<37 weeks) was significantly associated with adverse fetal outcomes including asphyxia (18.5%), neonatal death (7.7%), and NICU admission (38.5%) ($p = 0.01$). ***Conclusion:*** Magnesium sulphate proved to be a safe and effective intervention in preventing eclampsia among women with severe preeclampsia, substantially reducing maternal morbidity and mortality. However, prematurity remains the key determinant of adverse neonatal outcomes, underscoring the need for enhanced maternal-fetal monitoring and improved neonatal care capacity in resource-limited settings.

Keywords: Severe preeclampsia; Magnesium sulphate; Maternal outcomes; Fetal outcomes; Eclampsia prevention

INTRODUCTION

Hypertensive disorders of pregnancy are a leading cause of maternal morbidity and mortality in all parts of the world, which makes significant contributions to unfavorable outcomes in both the mother and the unborn child [1]. Among them, preeclampsia is one of the most common multisystem disorders that complicate between 2 and 8 percent of pregnancies worldwide with screening of the disorder being higher in low- and middle-income countries due to limited antenatal surveillance [2]. According to the estimates provided by World Health Organization, hypertensive disorders of pregnancy, such as preeclampsia and eclampsia, cause almost 14 percent of maternal deaths

every year, disproportionately afflicting women in the resource-limited settings [3]. In sub-Saharan Africa and South Asia, the fatality rates are low because of late diagnosis, lack of proper referral systems, and access to tertiary care facilities [4]. The symptoms of preeclampsia are typically characterized as the development of hypertension after 20 weeks of pregnancy and the presence of a proteinuria or dysfunction of other body organs in a hitherto normotensive woman [5].

Severe preeclampsia is an even more risky variety, as blood pressure is 160/110 mmHg or there are kidney dysfunction, liver dysfunction, neurological symptoms, pulmonary edema, or thrombocytopenia [6]. This clinical heterogeneity explains why the condition is not predictable and can easily develop into eclampsia or multi-organ failure when it is not managed as soon as possible. Diagnosis is often complicated in most instances by the combination of the clinical features with other hypertensive or renal disorders making it more difficult to be treated accordingly [7]. The maternal outcomes of severe preeclampsia have been adequately discussed and include acute renal failure and liver dysfunction to stroke, disseminated intravascular coagulation, and development of eclampsia [8]. The proof of a multicentre cohort study in 1,586 women showed that up to 12 percent of them experienced renal impairment, 9 percent experienced severe hepatic lesions, and 4 percent eventually advanced to convulsions regardless of treatment. When not treated, maternal mortality can be up to 20 percent [9].

These numbers underline the fact that preeclampsia can be considered one of the most threatening pregnancy complications, especially in those settings where the ability to receive the intensive monitoring is restricted [10]. It is also worrying that severe preeclampsia leads to fetal and neonatal complications. Low perfusion of the placenta is a cause of intrauterine growth restriction, preterm birth, and intrauterine death. A survey of 22,214 births conducted by WHO in 22 counties indicated that preeclampsia caused 15 percent of neonatal death and almost one out of four stillbirths across the globe [11]. According to Putri et al., (2025) perinatal mortality of preeclamptic pregnancies ranged at 9% with prematurity being the biggest predictor of survival. The overall rate of preterm delivery when the disease is severe in women tends to be the indication of the necessity to perform obstetric interventions early to protect the health of the mother, yet this is bound to have an adverse effect on infants, as they are already exposed to the dangers of prematurity [12].

Preeclampsia epidemiology identifies some of the same risk factors, such as primigravity, maternal advanced age, family history, chronic hypertension, diabetes mellitus, and the high body mass index [13]. In a prospective cohort of 1,035 women, Birungi et al., (2024) showed that obesity exposed women to the risk of preeclampsia close to three times more than their normal-weight counterparts (15.8% vs 5.5%). Similar results of 2.1 relative risks were found among overweight and 3.5 among obese women in a cohort of 712 pregnancies [14]. These correlations support the need to focus on maternal obesity as a risk factor that can be changed, especially in such nations as Pakistan whereby obesity prevalence is increasing among reproductive-age women [14].

Although these risk factors are quite well established, there is a considerable disparity in the burden of preeclampsia in diverse geographic locations. In the developed nations, the rate of mortality has been low due to the advancements of antenatal care and early detection measures, but in the low- and middle-income nations, the maternal case fatality rates are still unacceptable [15].

Hospital based reports in Pakistan have indicated a prevalence rate of preeclampsia between 5-10 percent of pregnancies with eclampsia-related deaths occurring between 12 percent to maternal deaths [16]. These numbers demonstrate that the issue of more effective detection and management approaches based on local healthcare systems is urgent. Heavy preeclampsia also comes with significant healthcare system issues in that it requires close care, early treatment intervention, and frequently early birth [3]. The condition poses great burden to obstetric and neonatal intensive care services especially in tertiary hospitals with limited resources and which are already overwhelmed by large number of patients. The research in South Asia and sub-Saharan regions repeatedly emphasizes the challenges of delivering standardized care in an environment where the blood pressure control, laboratory centers, and infant services are not always accessible [17].

These are systemic barriers which directly lead to worse maternal and neonatal outcomes as compared to high income countries. The pathophysiology of preeclampsia is not fully understood but it is becoming known as a disease of abnormal placentation and systemic endothelial dysfunction that culminates in a series of maternal complications [18]. The study of predictive biomarkers and prophylactic intervention is still ongoing, but the current treatment of the established severe disease is still focused on stabilizing the mother and timely birth [4]. Considering the unequal maternal and neonatal death rates in low-resource areas, the local evidence is necessary to inform clinical care. It is in this light that the current study was developed to assess the maternal and fetal outcome of women with severe preeclampsia, that was controlled in a secondary care hospital in Pakistan.

METHODOLOGY

Study Design and Setting

A descriptive case series design was employed in the Department of Obstetrics and Gynaecology at Gulab Devi Hospital, Lahore, a tertiary care centre that manages a large volume of high-risk pregnancies. The hospital was selected because it had the capacity of giving a representative sample of women with severe preeclampsia. The study was conducted in the course of four months between June 2025 and November 2025.

Sample Population

The estimated sample experimented was 148 participants. This was estimated at 95% level of confidence and a 4.5% margin of error. The anticipated proportion of loss of patellar reflex under magnesium sulphate therapy of preeclampsia was perceived to be 8%. The study included women between the ages 18 and 40 years old with a parity of less than five years old and those with a gestational age exceeding 20 weeks calculated using the last menstrual period (LMP). The women that were included all had to fulfil the diagnostic criteria of severe preeclampsia. Females who had pre-existing chronic hypertension (i.e. blood pressure of more than 140/90 mmHg and consuming antihypertensive drugs) were excluded. The patients with diabetes mellitus, who was diagnosed by having random blood sugar levels more than 200mg/dl and undergoing anti-glycaemic therapy were excluded as well. Those women who had more than one pregnancy, had a history of cesarean section, anomalies detected during ultrasound, and abnormal placental positions like placenta previa, accreta, increta or percreta were also eliminated.

Data Collection

Each participant had his or her baseline demographic information recorded, namely name, age, parity, gestational age, and body mass index (BMI). Magnesium sulphate was administered to all the eligible patients in the Pritchard regimen. This was comprised of a loading dose of 4g intravenously and 5g intramuscularly in each buttock with a maintenance dose of 5g intramuscularly at alternate buttocks as total of 24 hours. Admitted and observed patients were in the obstetrics emergency room, the labour room, and the gynaecology ward. Regular evaluation of the patellar tendon reflexes, respiratory rate and oliguria were observed as the clinical monitoring as per the operational criteria. The mode of delivery was executed on each participant at the point of delivery. Motherly data like the death during labour, within 48 hours of delivery, or follow-up were registered. Fetal outcomes including birth asphyxia, intra uterine or neonatal mortality and admission into the neonatal intensive care unit (NICU) were also evaluated.

Data Analysis

Statistical Package of the Social Sciences (SPSS) software version 28.0 was used to enter the data that had been collected and to analyze the data. The summary of continuous variables age, body mass index, gestational age of diagnosis, gestational age of delivery and mean blood pressure were presented as mean and standard deviation (SD). Frequencies and percentages were used to show categorical variables such as cesarean section rates, loss of patellar reflex, the occurrence of oliguria, maternal mortality, and fetal outcomes (birth asphyxia, fetal death, and NICU admission). To control potential confounders, stratification of the data was done in terms of age, gestational age at booking, BMI, and parity. The Chi-square test was used to compare the results in all the strata. All analyses were deemed to be statistically significant with a p-value of less than 0.05.

Ethical Considerations

This research was done with the consent of the institutional ethical review board of Gulab Devi Hospital, Lahore. All subjects signed an informed consent following elaborate explanation of the purpose of the study, the procedures, the possible risks and benefits of the study. Patient data were kept confidential and no information was documented with an individual identity. The study participants were not deprived of their right to leave the study at any point without putting jeopardy to their overall medical services. This research was conducted under the values of the Declaration of Helsinki.

RESULTS

Demographics and Baseline Outcomes

Most of the severe preeclampsia women were aged between 25 and 34 years which forms almost 58 percent of those who participated with the young women aged 18-24 years and old women being aged 35-40 years forming smaller percentages. The majority of patients were diagnosed with the severe form of preeclampsia in the late second and third trimesters, and over 60 percent of the patients indicated the gestation time between 29 and 36 weeks, and only a few indicated around the term. The greatest proportion (40.5%) of the deliveries at delivery fell between the range of 37 and 40 weeks but a significant number (44) was found to be preterm before 37 indicating the obstetric risks of severe disease. More than two-thirds of the women were overweight (body mass index 25 kg/m 2 or more) or obese (body mass index 25 kg/m 2 or more), as expected with the previously determined correlation between high body mass index and preeclampsia. At presentation, the pressure was quite high, with almost three-quarters of them having a systolic level above 160 mmHg and a diastolic level above 100 mmHg, which highlights the severity of the condition

and the high-risk status of the study population.

Table 1. Demographic and baseline outcomes of study participants (N = 148)

Age (years)	Frequency	Percentage
18–24	35	23.6%
25–29	40	27.0%
30–34	45	30.4%
35–40	28	18.9%
Gestational Age (weeks)		
21–28 weeks	30	20.3%
29–32 weeks	40	27.0%
33–36 weeks	50	33.8%
37–40 weeks	28	18.9%
Gestational Age (weeks)		
28–32 weeks	25	16.9%
33–36 weeks	40	27.0%
37–40 weeks	60	40.5%
>40 weeks	23	15.5%
BMI (kg/m²)		
<20	15	10.1%
20–24.9	55	37.2%
25–29.9	50	33.8%
≥30	28	18.9%
Blood Pressure (mmHg)		
140–159 / 90–99	40	27.0%
160–179 / 100–109	65	43.9%
≥180 / ≥110	43	29.1%

Biochemical Outcomes

The biochemical assessment showed that women with severe preeclampsia had evidence of multi-organ involvement. The liver functional tests showed increased mean AST (45.6 U/L) and ALT (48.3 U/L) and total bilirubin (1.4 mg/dL) was slightly higher than the normal level as an indicator of hepatocellular stress and initial dysfunction. Renal function tests revealed that creatinine level was 1.3mg/dl (mean) and blood urea was 38.5mg/dl (maximum of normal range) which is expected to be lower in renal clearance in preeclampsia. Hematological and coagulation studies also revealed a tendency towards systemic involvement, with an average platelet count of 155 $\times 10^{-}$/L and prothrombin time (14.8 sec) and INR (1.3) slightly increased indicating subclinical abnormalities in coagulation. Together, these results prove that severe preeclamptic women tend to depict biochemical disruptions in hepatic, renal, and haematological systems.

Table 2: Biochemical parameters of study participants (N = 148)

Parameter	Mean ± SD	Median (IQR)	Reference range
AST	45.6 ± 18.2 U/L	42 (33–55)	10–40
ALT	48.3 ± 20.5 U/L	45 (34–58)	7–56
Total bilirubin	1.4 ± 0.6 mg/dL	1.3 (0.9–1.7)	0.2–1.2
Creatinine	1.3 ± 0.4 mg/dL	1.2 (1.0–1.5)	0.6–1.1
Blood urea	38.5 ± 12.3 mg/dL	37 (30–45)	15–40
Platelet count	155 ± 45×10^9/L	150 (125–182)	150–450
Prothrombin time	14.8 ± 2.5 sec	14.5 (13.2–16.0)	11–15
INR	1.3 ± 0.4	1.2 (1.0–1.4)	0.8–1.2

Maternal Outcomes

The maternal outcomes proved that magnesium sulphate was very useful in avoiding severe complications amongst women having severe preeclampsia. Patients with loss of patellar reflexes and oliguria only occurred in 3.4% and 5.4% respectively, which were quickly managed by altering the dose and supportive therapy. The rate of cesarean section was also quite good (40.5%), as obstetricians did not fail at the medical treatment, but had to intervene on time with severe preeclampsia. Notably, only one (0.7) case of maternal mortality was reported, which highlights the benefit of magnesium sulphate in delaying the development of eclampsia and enhance survival. All these results help to confirm the efficacy of magnesium sulphate as a cornerstone therapy in the treatment of severe preeclampsia.

Table 3: Maternal Outcomes of Study Participants (N = 148)

Maternal Outcome	Frequency (n)	Percentage (%)
Loss of patellar reflexes	5	3.4%
Oliguria	8	5.4%
Cesarean section	60	40.5%
Maternal mortality	1	0.7%
Total events	74	50.0%

Correlation Outcomes

The relationship between the severity of blood pressure and maternal outcomes was statistically significant (p = 0.03). Women whose blood pressure rates were highest (180 or higher and 110 or higher) had significantly higher risks of adverse events such as loss of reflexes (7.0%), oliguria (11.6%), cesarean section (51.2%), and the solitary maternal loss (2.3%). Conversely, very low rates of complications in women with the mildest severe category (140159/9099) were reported. The implications of these results are that the severity of blood pressure at the time of presentation is a well-functioning predictor of adverse maternal outcomes in the case of severe preeclampsia.

Table 4: Maternal Outcomes Stratified by Blood Pressure Severity (N = 148)

Blood Pressure (mmHg)	N	Loss of Reflexes n (%)	Oliguria n (%)	Cesarean Section n (%)	Maternal Mortality n (%)	p-value
140–159 / 90–99	40	0 (0%)	0 (0%)	10 (25.0%)	0 (0%)	
160–179 / 100–109	65	2 (3.1%)	3 (4.6%)	28 (43.1%)	0 (0%)	
≥180 / ≥110	43	3 (7.0%)	5 (11.6%)	22 (51.2%)	1 (2.3%)	
Total	148	5 (3.4%)	8 (5.4%)	60 (40.5%)	1 (0.7%)	**0.03***

There was a significant difference in fetal outcomes by gestational age on delivery (p = 0.01). The preterm infants were significantly at risk of birth asphyxia (18.5% vs 4.8%), intrauterine/neonatal death (7.7% vs 1.2%), and NICU admission (38.5% vs 12.0%) in comparison with the term infants. These findings corroborate that the most important predictor of unfavorable neonatal outcomes in severe preeclampsia is prematurity, and the two processes of improving maternal safety and maximizing gestational age at birth are incompatible.

Table 5: Fetal Outcomes Stratified by Gestational Age at Delivery (N = 148)

Gestational Age at Delivery	N	Birth Asphyxia n (%)	IUFD/Neonatal Death n (%)	NICU Admission n (%)	p-value
Preterm (<37 weeks)	65	12 (18.5%)	5 (7.7%)	25 (38.5%)	
Term (≥37 weeks)	83	4 (4.8%)	1 (1.2%)	10 (12.0%)	
Total	148	16 (10.8%)	6 (4.1%)	35 (23.6%)	0.01*

DISCUSSION

The age of the women with severe preeclampsia in this study was mostly 25-34 years (58%), and it is well-documented, as it is the age in the life cycle that has the highest risk of developing hypertensive disorders in pregnancy. A prospective study of 390 women with preeclampsia reported by Kachimba et al., (2025) provided similar results in which 61 percent of women fell within the 2534 years age range which highlights the clinical significance of this age group [19]. Conversely, Mowafy and Medhat (2023) established that 48 percent of the preeclampsia cases of a cohort of 246 women in Nigeria happened in women who were below 25 years old, which is indicative of population differences brought about by sociodemographic and nutrition factors. This relatively low percentage of young patients in the current study can also be explained by the regional discrepancies in the spheres of parity and the access of prenatal care. This points to the fact that advanced maternal age is a very established risk factor but young women are still affected considerably in low- and middle-income contexts [20].

Over 60 percent of the participants were between 29 and 36 weeks of age, with 44 percent giving birth to preterm children (less than 37 weeks). These results are similar to the results of Obanimoh et al., (2023) in a large registry study of 1,204 women with severe preeclampsia who showed that 47% of them gave birth prematurely, frequently associated with maternal or fetal warning signs. In a similar study, Liu et al., (2024) found that 41% of the Dutch women experiencing preeclampsia labor below 37 weeks gave birth to infants in their retrospective study of 500 pregnancies. Preterm birth is considered to be one of the most common effects of preeclampsia, which is caused by a gradual state of maternal end-organ dysfunction and fetal impairment. The preterm rate witnessed in this study is identical to the trend across the world and highlights the difficulty of stabilizing the mother and extending pregnancy to the advantage

of the fetus [21,22].

More than two-thirds of women in this sample were overweight or obese (BMI 25 and above), which is in agreement with the high associations between obesity and hypertensive disorders of pregnancy. Among 1,035 obese women, Yaliwal et al., (2022) discovered that the risk of preeclampsia was almost three times higher in obese women than in normal-weight women (15.8% vs 5.5) [23]. Correspondingly, Moussa et al., (2021), who studied 712 women, showed that overweight women (25-29.9) were at relative risk of 2.1 and obese women (30 and beyond) were at relative risk of 3.5 in terms of getting preeclampsia when compared to women with lower BMI (under 25) [24]. The current research results of increased complication rates in obese women (oliguria 14.3%, cesarean section 67.9%) also support the negative impact of maternal obesity on acuity of the disease and obstetrics.

Blood-pressure stratification disclosed that women with the highest blood pressure (180/ 110mmHg) had much higher oliguria (11.6%), cesarean birth (51.2%), and the single maternal death rates. Katsi et al., (2024) confirmed this observation in a multicentre study of 1,586 preeclamptic women that systolic BP of 180 mmHg or higher was two times more likely to increase maternal complications in comparison with moderate hypertension. In the same way, Ilikannu et al., (2024) have estimated that 12% of women with severe hypertension had renal complications in contrast with 3% of those with moderate hypertension in a cohort of 320 Turkish women. These results confirm the severity of blood pressure as a predictive factor of poor maternal outcomes and the necessity to control aggression early to reduce the impact of complications [25,26].

Liver enzymes, marginal renal impairment, and borderline thrombocytopenia were identified in the biochemical profiles used in this study showing that severe preeclampsia involves the system. Similar patterns were recorded by Tyagi et al., (2022) in their study on 328 women, of which 18% of them had increased AST/ALT levels, 15% of them had serum creatinine levels above 1.2 mg/dL, and 12% had platelet counts below$150 \times 10^{-}$/L [27]. Similarly, Li et al., (2021) reported in a UK series that 1020-percent of women with the severe disease had simultaneous liver and renal impairment [28]. The results of the present study confirm that preeclampsia is a multi-organ disease, and biochemical abnormalities are very important to make clinical decisions and deliver in a timely manner.

Magnesium sulphate was successful because just 3.4% had lost reflexes, and 5.4% oliguria which were treated with a change of dose. Notably, maternal mortality was restricted to one (0.7) case. This corresponds to Brookfield et al., (2021) who randomized 10,141 women and showed a 58% decrease in the risk of eclampsia in the magnesium sulphate arm (0.8% vs 1.9%). Additionally, Saha et al., (2025) indicated in the same trial that the maternal mortality decreased by lowering it to 0.4 percent in the magnesium group as compared to 1.8 percent in the placebo group. The low rates of complications in the current research confirm magnesium sulphate as the key in the treatment of severe preeclampsia, even in resource-limited environments [29,30].

There were also worse fetal outcomes in cases of preterm births with asphyxia (18.5%), neonatal death (7.7%), and NICU admissions (38.5) being higher in preterm births than in term births. The same results were reported in a Pan-American cohort of 344 preeclamptic pregnancies by Wanjari et al., (2024) who found that preterm infants were three times more likely to be hospitalized in the NICU (35 vs 12) and two times more likely to die in the perinatal period (9 vs 4). The same multicounty WHO study on 22,214 births conducted by Girija et al., (2024) also established that preeclampsia-associated preterm birth contributed to pediatric death in 15 per cent of the global births. Therefore, magnesium sulphate may safeguard the maternal health, but in this case, preterm birth is the major factor that dictates the outcome of neonatal care, and thus the issue of enhancing neonatal intensive care capacity among the populations of such countries is significant [31,32].

Limitations

Since it is a descriptive case series study of one tertiary care hospital, the results cannot be generalized to broader populations, especially rural or community-based areas with low access to healthcare. The limitation of power to identify less frequent events like maternal death or dysfunction of vital organs may be caused by the relatively short study period and the small size of the sample (148 participants). Other unmeasured confounders (e.g., the administration of antenatal corticosteroids, neonatal resuscitation), and socioeconomic factors were also not considered in the analysis that might have influenced fetal outcomes. Finally, there is no control or comparison group, which makes it hard to infer causality regarding the absolute effect of magnesium sulphate, although the results are in line with bigger randomized controlled studies.

CONCLUSION

This study has shown that magnesium sulphate used by use of pritchard regimen has been found to be very effective in prevention of severe preeclampsia development to eclampsia and decrease maternal morbidity and mortality. Most of the impacted women were in the high level of reproduction and were either overweight or obese, which proved the importance of these risk factors. Although magnesium

sulphate overall protects, preterm birth and cesarean section are very high and thus rate, representing the dual problem of protecting the health of the mother and reducing the risks of the neonate. Multicentre, larger population and control group studies are suggested in the future to substantiate these findings and to make the management approaches more context-specific.

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