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ROLE OF MAGNESIUM SULFATE FOR FETAL NEUROPROTECTION IN WOMEN AT RISK OF PRETERM BIRTH.

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ABSTRACT

Introduction: With a decrease in gestational age, the chance of cerebral palsy increases significantly and is primarily ascribed to preterm birth. Currently, infants delivered prior to 34 weeks of gestation account for 25% of all new instances of cerebral palsy. **Objective:** To evaluate the impact of MgSO4 administered to pregnant women at risk for premature delivery for fetal neuroprotection. **Materials and Methods:** From January 2020 to December 2022, this prospective observational research was carried out at obstetrics & gynecology department hayatabad medical complex peshawar. Total 519 preterm pregnant women between 28-36 weeks gestational age were enrolled. Out of 519, 199 premature laboring women received MgSO4 and were placed in group A, while the remaining 320 were placed in group B because they did not receive MgSO4. Women in group A got a 4g bolus dose of MgSO4 over 20–30 minutes, then 1g/hour. All pregnant women, whether carrying a single or multiple pregnencies, who were between 28-36 weeks gestational age. **Results:** Neonatal outcomes of groups include the following: Mechanical ventilation in group A was 45(22.6%) & 85(26.5%) in group B, Respiratory distress 83(41.7%) vs 191(59.7%), neonatal enterocolitis 11(5.5%) vs 9(2.8%), intensive resuscitation 6(3%) vs 12(3.7%), neonatal seizures 7(3.5%) vs 11(3.4%), NICU admission required in group A was 85(42.7%) vs 183(57.1%) in group B, mortality in both groups was 2(1%) vs 4(1.2%). **Conclusion:** The development of cerebral palsy in preterm infants may be prevented by administering MgSO4 with a wide margin of safety. Even though MgSO4 has only moderate benefits, it is a secure, affordable drug, so the risk-benefit ratio favors using it.

Keywords: $MgSO_4$, Magnesium sulfate, Preterm labor, gestational age.

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INTRODUCTION

With a decrease in gestational age, the chance of cerebral palsy increases significantly and is primarily ascribed to preterm birth. Currently, infants delivered prior to 34 weeks of gestation account for 25% of all new instances of cerebral palsy. Multiple births are associated with a greater chance of cerebral palsy, which is partly due to preterm delivery.[1,2] Recent population-based studies show that there are 1.5 to 3.6 cases of cerebral palsy for every 1,000 live newborns. The small rise in cerebral palsy frequency over the past three to four decades is ascribed to an increase in the condition in newborns who had very low birth weights, whose higher survival rates were made possible by advancements in neonatal intensive care units. (NICU).[3] Magnesium sulfate (MgSO4) has been one of the most commonly prescribed drugs in neonatal surgery since it was developed in 1916. Despite debate over its efficacy MgSO4 has been used widely over the past century as an anticonvulsant for handling eclampsia in women with preeclampsia and as a tocolysis[4]. According to recent study, prenatal MgSO4 may also protect the developing fetus' neurons in pregnant women who are at risk for premature delivery. According to numerous studies MgSO4 could, without negatively affecting perinatal mortality, decrease mild to severe cerebral palsy and gross motor dysfunction in surviving infants by about 30–40% relative decrease.[5,6]. To reduce the chance of cerebral palsy, the American College of Obstetricians and Gynecologists (ACOG) published a Committee Opinion in 2010 recommending the delivery of MgSO4 previous to an anticipated early premature birth.[7] Despite the recommendation, low cost and the availability of doctors with experience using it in eclampsia, to the best of our knowledge, no comparison research on the use of magnesium sulfate for neuroprotection in Pakistan in recent years, and it is still not widely used. Therefore, we have decided to establish the use of magnesium sulfate for fetal neuroprotection in patients with expected premature delivery as the norm in our unit at a tertiary care institution.

MATERIALS AND METHODS

From January 2020 to December 2022, this prospective observational research was carried out at obstetrics & gynecology department hayatabad medical complex peshawar. Total 519 preterm pregnant women between 28-36 weeks gestational age were enrolled. Out of 519, 199 premature laboring women received MgSO4 and were placed in group A, while the remaining 320 were placed in group B because they did not receive MgSO4. Women in group A got a 4g bolus dose of MgSO4 over 20–30 minutes, then 1g/hour. All pregnant women, whether carrying a single or multiple pregnencies, who were between 28-36 weeks gestational age and in labor if delivery was planned or expected within 24 hours were included in the study.

Exclusion criteria

- Women who are in the second stage of labor or whose birth is expected to occur in the next two hours.
- Pregnant women who got MgSO4 treatment for other causes.
- If MgSO4 is contraindicated (respiratory rate less than 100 mL over the preceding four hours.
- Women with retroplacental hematoma, low platelet syndrome, increased liver function test results, hemolysis, and growth restriction.
- Serious genetic anomalies or fetal malformations.
- Intra Uterine Fetal death.

Statistical analysis was performed using Microsoft Excel 2013. Tables and graphs were used to show all of the data.

RESULTS

Total 519 pregnant preterm women were enrolled. Age ranged of the studied patient was 25-45 years with a mean age of 35 years. Gestational age of patient ranged between 28-35 weeks with a mean age of 32 weeks in group A

and 29-36 weeks in group B with a mean age of 32.5 weeks. Gestational age was analyzed between both groups as 90(45%) vs 151(47.2%) belongs to 28-31 weeks gestational age, 101(50.7%) vs 147(45.9%) belongs to 31-34 weeks and 8(4%) vs 22(6.8%) belong to 35-36 weeks of gestational age respectively. Birth weight of neonatals in both groups was analyzed as 14(7%) vs 31(9.7%) belongs to <1.5 kg, 131(65.8%) vs 240(62.8%) belong to 1.6 - 2 kg and 54(27.1%) vs 49(15.3%) belongs to 2.1-2.5 kg, which is not insignificant. Neonatal outcomes of groups include the following: Mechanical ventilation in group A was 45(22.6%) & 85(26.5%) in group B, Respiratory distress 83(41.7%) vs 191(59.7%), neonatal enterocolitis 11(5.5%) vs 9(2.8%), intensive resuscitation 6(3%) vs 12(3.7%), neonatal seizures 7(3.5%) vs 11(3.4%), NICU admission required in group A was 85(42.7%) vs 183(57.1%) in group B, mortality in both groups was 2(1%) vs 4(1.2%). Intraventricular hemorrhage was 1(0.5%) vs 2(0.6%), periventricular leukomalacia was found in 0(0%) in group A and 3(0.9%) in group B. Table-3Maternal side effects in both groups includes: Flushing 121(60.8%) vs 15(4.6%), sweating 42(21.1%) vs 21(6.5%), nausea 46(23.1%) vs 16(5%), hypotension 10(5%) vs 7(2.1%), tachycardia 8(4%) vs 3(1%) and postpartum hemorrhage 5(2.5%) vs 9(2.8%) respectively. Table-4

TABLE-1: GESTATIONAL AGE OF WOMEN

Gestational age	Group A	Group B	P value
28-31 weeks	90(45%)	151(47.2%)	0.871
31-34 weeks	101(50.7%)	147(45.9%)	0.705
35-36 weeks	8(4%)	22(6.8%)	0.600

TABLE-2: BIRTH WEIGHT OF NEONATAL

Birth weight (kg)	Group A	Group B	P value
<1.5 kg	14(7%)	31(9.7%)	0.610
1.6–2 kg	131(65.8%)	240(62.8%)	0.705
2.1-2.5kg	54(27.1%)	49(15.3%)	0.608

TABLE-3: NEONATAL OUTCOME

Outcome	Group A	Group B	P value
Mechanical ventilation	45(22.6%)	85(26.5%)	0.510
Respiratory distress	83(41.7%)	191(59.7%)	0.705
Neonatal enterocolitis	11(5.5%)	9(2.8%)	0.840
Intensive resuscitation	6(3%)	12 (3.7%)	0.911
Neonatal seizures	7(3.5%)	11(3.4%)	0.999
NICU admission	85(42.7%)	183(57.1%)	0.615
Mortality	2(1%)	4(1.2%)	0.878
Intraventricular hemorrhage	1(0.5%)	2(0.6%)	0.780
Periventricular leukomalacia	0(0%)	3(0.9%)	0.605

TABLE-4: MATERNAL SIDE EFFECTS

Side effects	Group A	Group B	P value
Flushing	121(60.8%)	15(4.6%)	0.001
Sweating	42(21.1%)	21(6.5%)	0.003
Nausea	46(23.1%)	16(5%)	0.005
Hypotension	10(5%)	7(2.1%)	0.410
Tachycardia	8(4%)	3(1%)	0.101

DISCUSSION

Recent population-based studies show that there are 1.5 to 3.6% cases of cerebral palsy for every 1,000 live newborns. The small rise in cerebral palsy frequency over the past 40 years is ascribed to an increase in the condition in infants delivered with very low birth weights, who have a higher mortality rate thanks to advancements in newborn intensive care units. (NICU).[8-9]Since its introduction in 1916, magnesium sulfate (MgSO4) has been one of the most frequently used medications in fetal surgery.[10] Despite controversy regarding its effectiveness, MgSO4 has been used extensively over the past century as an anti convulsant for managing eclampsia, for avoiding eclampsia in women, and as a tocolysis. Prenatal MgSO4 may also protects the growing fetus's neurons in pregnant women who are at risk for premature delivery, according to new research.[11] According to several studies, MgSO4 may be able to reduce gross motor dysfunction and mild to severe cerebral palsy in surviving newborns by 30–40% relative decline without negatively affecting perinatal mortality.[12-15]. It is still not commonly used, and to the best of our knowledge there haven't been any comparative studies on the use of magnesium sulfate for neuroprotection in Pakistan in the last few years, despite the recommendations, the drug's low cost and clinicians who are knowledgeable about using it in eclampsia. Therefore, in our unit at a tertiary care facility, we chose to make the use of magnesium sulfate for fetal neuroprotection in patients with expected premature delivery.A small sample size and a single organization were two of our study's limitations. It is necessary to conduct additional multicenter studies with larger sample sizes to examine how neonates' serum magnesium concentrations are correlated with their immediate adverse effects when exposed to magnesium. To provide fetal neuroprotection with the fewest neonatal adverse outcomes, additional prospective studies must be conducted to identify the ideal dose of maternal magnesium for various subsets of mothers. In the interim, recommendations for using MgSO4 are required.

CONCLUSION

The development of cerebral palsy in preterm infants may be prevented by administering MgSO4 with a wide margin of safety. Even though MgSO4 has only moderate benefits, it is a safe, affordable drug, so the risk-benefit ratio favors using it.

Ethics Approval: The ERC gave ethical review approval

Consent To Participate: written and verbal consent was taken from subjects and next of kin

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Conflict Of Interest: No competing interest declared.

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