Section: Obstetrics and Gynecology

Original Research Article

ROLE OF ANTENATAL MAGNESIUM SULPHATE ADMINISTRATION AT 30-34 WEEKS AND FETAL BRAIN MATURITY IN ANDHRA PRADESH POPULATION

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Abstract

Background: Preterm birth is a major cause of death and a significant cause of long term disability. Mgso4 administration in preterm gestational delivery plays an important role in neuroprotection to prevent cerebral palsy and neurobehavioral developmental disorder in preterm delivery. **Materials and Methods:** Out of 300 pre-term delivery women, 150 women are not given Mgso4 and 150 are given Mgso4 at a 7.4 mg I.V. loading dose in 100 ml of normal saline over 30 minutes, probably 4 hours prior to pre-term birth, as per the standard of care. Mothers and pre-term infants were followed up postnatally, 1 month after discharge from the hospital, and outcomes were compared between preterm-administered and non-administered infants. **Result:** LSCS had more preterm infants observed in the non-Mgso4 group (120) and In PTVD delivery, a higher number of preterm infants were observed in the MgSO4 group (60). In the study of the efficacy of antenatal Mgso4 for less than 4 hours, 30 preterm infants in LSCS and 42 in PTVD total 72. In more than 4 hours, there were 48 preterm infants in LSCS and 30 in PTVD, for a total 78. ELBS were 45, VLBS were 69, and LBW was 36 in the MgSO4 group. **Conclusion:** In the present pragmatic study, It is concluded that Mgso4 is a safe drug to use in antenatal women at risk for impending preterm birth. Mgso4 is neuroprotective for preterm infants.

INTRODUCTION

Preterm brain injury remains a crucial and unresolved issue among neonatologists. The ensuing cerebral lesions (encephalopathy of prematurity, including white matter injury, peri-ventricular leukomalacia, and intra ventricular intraparenchyma hemorrhage) are strongly associated with cerebral palsy and neurobehavioral developmental disorders.[1] No single neuroprotective intervention is known to prevent preterm brain injury. Magnesium sulfate (MgSO4) is one of the most commonly used medications in obstetrics practice today since its first reported use in 1916. Over the past century, MgSO4 has been widely used as an anticonvulsant for treating eclampsia and preventing eclampsia in women with pre-eclampsia. Many studies revealed that, Mgso4 usage reduces moderate to severe cerebral palsy and gross mother dysfunction in adversely surviving infants without adverse perinatal outcomes.[2] The American College of Obstetricians and Gynecologists also encouraged the use of MgSO4 before anticipated early preterm birth (less than 32 weeks of gestation) to reduce the risk of cerebral palsy.[3]

Some studies have raised controversy regarding the administration of MgSO4. Mgso4 causes necrotizing enteric colitis (NES) and spontaneous intestinal perforation. Hence, the role of antenatal Mgso4 in association with gastrointestinal complications is not yet established.[4]

Hence attempt is made to study the advantages of administration of Mgso4 in preterm delivery (30–34 weeks of gestation) and compare them with preterm delivery infants to whom Mgso4 is not administered.

MATERIALS AND METHODS

300 pregnant women aged between 30-41 years who gave preterm birth between 32-34 weeks either due to spontaneous preterm labor and/or planned preterm birth at Nimra Institute of Medical Science Hospital Jupidi Ibrahimpatnam Vijayawada, Andhra Pradesh-521456 were studied.

Method: Out of 300 delivery women, 150 were given MgSO4 and 150 were not given MgSO4. The 150

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infants were born to mothers who were not given Mgso4 injection (group I), and the 150 infants were born to mothers in impending preterm delivery who were given injection Mgso4 (group II) at a 4 mg intravenous loading dose in 100 ml of normal saline over 30 minutes, probably 4 hours prior to preterm birth, as per the standard of care. No maintenance dose was given. If delivery was imminent, it was still given, irrespective of the 4 hour window period for women who delivered before they could get the benefit of two doses of steroids for lung maturity.

Pregnant women and neonates were cared for according to standard clinical practice. The outcomes of those preterm infants and their mothers were analyzed through information collected from patient records until postnatal 1 month or hospital discharge, whichever was later, and used for comparison.

The duration of the study was from January 2022 to January 2024.

Statistical Analysis: mode of delivery, efficacy of antenatal MgSO4, and birth weight of infants in both groups I and II were compared. The statistical analysis was carried out using SPSS software.

RESULTS

[Table 1] Study of Mode of Delivery: in LSLC <30 weeks, there were 21 in the non-Mgso4 group and 6 in the Mgso4 group, and the total was 27. In 30.1-32 weeks, 45 in the non-MgSO4 group, 39 in the MgSO4 group, and total 84

- 32-34 weeks 54 in non-Mgso4 group, and 45 in Mgso4 group and total 99
- In PTVD group <30, 6 in Non-Mgso4 group, 24 in Mgso4 group, and total 30.
- 30-1-32 weeks of gestation for non-Mgso4, 21 in the Mgso4 group, >32-34 weeks, 15 in the non-Mgso4 group, and 15 in the Mgso4 group

Table 2: Efficacy of Antenatal Magnesium Sulfate Duration between Mgso4 and Delivery: less than four hours (30 in LSCS), 42 PTVD, and 72 more than four hours (48 in the LSCS group, 30 PTVD total 78).

Table 3: Study of Birth Weight among Non-Mgso4 and Mgso4 Groups

- ELBW: 30 in the non-Mgso4 group, 45 in the Mgso4 group,
- VLBW: 78 in the non-MgSO4 group, 69 in the MgSO4 group,
- LBW 42 in non-MgSO4, 39 in MgSO4, 36 in MgSO4.

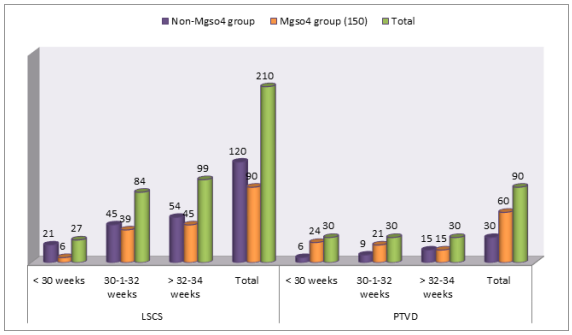

Figure 1: Mode of delivery among Mgso4 and Mgso4 group

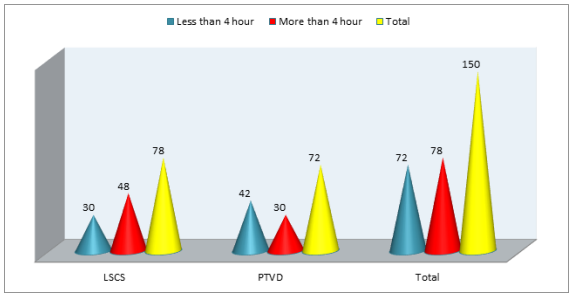

Figure 2: Efficacy of Antenatal Magnesium sulfate

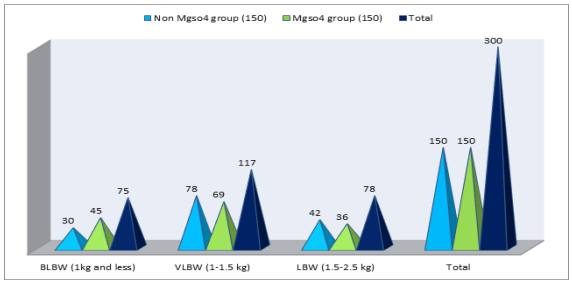

Figure 3: Comparative of Birth weight among Mgso4 and Non-Mgso4 group

Table 1: Mode of delivery among Mgso4 and Mgso4 group.

Mode of Delivery	Week of gestation	Non-Mgso4 group (150)	Mgso4 group (150)	Total
LSCS	< 30 weeks	21	6	27
	30-1-32 weeks	45	39	84
	> 32-34 weeks	54	45	99
	Total	120	90	210
PTVD	< 30 weeks	6	24	30
	30-1-32 weeks	9	21	30
	> 32-34 weeks	15	15	30
	Total	30	60	90

Table 2: Efficacy of Antenatal Magnesium sulfate

Duration between Mgso4 and delivery	LSCS	PTVD	Total
Less than 4 hour	30	42	72
More than 4 hour	48	30	78
Total	78	72	150

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Table 3: Comparative of Birth weight among Mgso4 and Non-Mgso4 group

Birth weight	Non Mgso4 group (150)	Mgso4 group (150)	Total
BLBW (1kg and less)	30	45	75
VLBW (1-1.5 kg)	78	69	117
LBW (1.5-2.5 kg)	42	36	78
Total	150	150	300

ELBW = extremely low birth weight VLBW = very low birth weight
LBW = Low birth weight

DISCUSSION

The role of antenatal administration of MgSO4 at 30-34 weeks of gestation and fetal brain maturity in the Andhra Pradesh population. In the comparison of Mgso4 and non-Mgso4 groups in different modes of delivery, the highest number (120) at different weeks of gestation was observed in non-Mgso4 group LSLC delivery; on the other hand, the highest number of deliveries (60) were observed in PTVD delivery in the Mgso4 group [Table 1]. In the study of efficacy of Antenatal Mgso4 less of efficacy of Antenatal Mgso4 less than 4 hours 36 LSCS and 42 PTVD delivery (Total 72). Moreover, 4 hours, 48 LSCS, and 30 PTVD deliveries (total of 78) were observed [Table 2]. In the comparative study of birth weight among Mgso4 and non-Mgso4 groups, in ELBS 30 Non-Nagso4, 45 mgso4 group (total 75). In VLBW: 78 preterm infants in Non-Mgso4, 69 in the Mgso4 group LBW 42 in the Non-Mgso4 group, and 36 in the Mgso4 group [Table 3]. These findings are more or less in agreement with previous studies.[5-7]

The mechanisms that lead to cerebral palsy and neurobehavioral developmental disorders are numerous and may include inflammation or an ischemic insult. The risk factors may present before, during, and after birth (e.g., intra- and extrauterine growth restriction, systemic inflammation, or perinatal hypoxia ischemia).

Magnesium is the fourth most prevalent in the body and contributes to several physiological processes, including storage, metabolism, and energy utilization. In the brain, magnesium is predominantly bound to chelators such as adenosine triphosphate (ATP) and is a co-factor in more than 300 enzymatic reactions.[8] Magnesium ions are essential for DNA, RNA, and protein synthesis. It contributes to glycolysis and ATP production and functions as a cell membrane stabilizer. In the central nervous system, blockers of the N-methyl – D aspirate (NMDA) glomulate receptor modulate calcium influx.

Sixty percent of magnesium is stored in bone, 20% in muscle, and 20% in soft tissue. The normal adult plasma concentration of magnesium is 0.75 mm 01/L. In newborns, magnesium levels increase during the first week after birth (0.91 mm.01/L).[9]

Mgso4 affects several pathways potentially involved in preterm brain injury. As a noncompetitive NMDA (N-methyl-D-asperate) receptor antagonist, Mgso4 prevents excitoxic calcium induced injury. Mgso4 decreases extracellular glutamate under ischemic conditions, possibly reducing excitotoxicity. Mgso4 limits calcium influx through voltage gated channels, which may reduce the activation of apoptosis.[10]

It was experimented on in lower animals that Mgso4 reduced the effect of hypoxia, and post-traumatic injection of Mgso4 decreased neurological disorders and reduced excitotoxic brain lesions in the mice. Mgso4 also protected oligodendrocyte lineage cells in vitro in a model of hypoxic ischemic injury.[11]

Mgso4 has been used for decades as a tocolytic agent and for the prevention or treatment of seizures in women with preeclampsia or eclampsia, but Mgso4 is ineffective in delaying preterm birth.[12]

CONCLUSION

Preterm birth is a major cause of death and a significant cause of long term disability worldwide. MgSO4 is a safe and effective molecule that plays a key role in protecting immature brains. It is a cost-effective, feasible, efficient, and safe intervention that contributes to the improvement of neurological outcomes. The present study demands that such clinical trials be conducted on a large number of patients in hi-tech research centers to confirm the present significant findings because the exact pharmacological action of MgSO4 in the preterm uterus is still unclear.

Limitation of study: Owing to the tertiary location of the research center, small numbers of patients, and a lack of the latest techniques, we have limited research results.

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