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THE ROLE OF MAGNESIUM SULPHATE (MgSO4) IN FETAL NEUROPROTECTION

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ABSTRACT

BACKGROUND: Preterm birth is the major cause of perinatal mortality both in developed and developing countries[2].The prevalence of preterm birth is increasing every year and it is nearly more than 15 million preterm births worldwide according to WHO, approximately one million may die and many more may suffer from neurodevelopmental impairment.[1,2] Antenatal MgSO4 can prevent neonatal seizures and neonatal deaths in preterms.

Aims and Objective of the study:

To evaluate the use of antenatal Mgso4 for neuroprotection of preterm infants.

MATERIAL AND METHODS-

This study was conducted in Department of Obstetrics and Gynecology in Sree Mookambika Institute Of Medical Sciences. A total of 20 pregnant women between 28-32 weeks gestation presenting to the emergency department with abdominal pain associated with cervical dilatation (cervical dilatation > 4cm) at risk of imminent preterm delivery(delivery definitely planned within 24 hours) were given Mgso4 4gm iv for about 20-30 min followed by maintenance dose of 1gm/hr for a period of 24 hrs before delivery or upto delivery and

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all the preterm neonates born to the 20 women were followed up for 2 years for neonatal seizures, deaths and gross motor dysfunction.

RESULTS:

Antenatal MGSO4 has better role when given at 28-32 weeks of gestation as only 2 neonates (10% of total preterms) born at 32-34 weeks gestation developed neonatal seizures.

CONCLUSION:

When antenatal MgSO4 administered at an appropriate dose with proper monitoring, there is no evidence of harm to the fetus, neonate or mother and it helps in neuroprotection of the preterms.

Keywords: Preterm,MgSO4, Neuroprotection.

INTRODUCTION:

Preterm birth is the major cause of perinatal mortality both in developed and developing countries[2]. The prevalence of preterm birth is increasing every year and it is nearly more than 15 million preterm births worldwide according to WHO, approximately one million may die and many more may suffer from neurodevelopmental impairment.[1,2] Antenatal MgSO4 can prevent neonatal seizures and neonatal deaths in preterms.

ACTOMgSO4, MagNET, PREMAG, BEAM were the large studies of MgSO4 for neuroprotection in prematurity previously.

AIM AND OBJECTIVE :

To evaluate the use of antenatal MgSO4 for fetal neuroprotection of preterm infants.

METHODOLOGY:

STUDY AREA: Department of Obstetrics and gynecology in Sree Mookambika Institute of Medical Sciences.

STUDY DESIGN: Observational study

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SAMPLE SIZE: 20 women attending to emergency department at our institute

who met inclusion criteria.

INCLUSION CRITERIA:

Patients with 28-32 weeks gestation presenting to the emergency department with abdominal pain associated with cervical dilatation (cervical dilatation > 4cm) at risk of imminent preterm delivery(delivery definitely planned within 24 hours) during a period of 2 years were included.

EXCLUSION CRITERIA :

All the pregnant women who were less than 28 weeks of gestation and who were greater than 32weeks of gestation were excluded.

DOSAGE OF ANTENATAL MgSO4:

A total 20 pregnant women between 28-32 weeks gestation presenting to the emergency department with abdominal pain associated with cervical dilatation (cervical dilatation > 4cm) at risk of imminent preterm delivery(delivery definitely planned within 24 hours) were given Mgso4 4gm iv for about 20-30 min followed by maintenance dose of 1gm/hr for a period of 24 hrs before delivery or upto delivery and all the preterm neonates born to the 20 women were followed up for 2 years for neonatal seizures, deaths and gross motor dysfunction.

RESULTS:

Antenatal MgSO4 given at gestational age	Perinatal outcome showing neonatal seizures
28-30 weeks	0/20 neonates
30-32 weeks	0/20 neonates

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32-34 weeks	2/20 neonates (10%)

At the end of our study antenatal MgSO4 has better role when given at 28 - 32 weeks of gestation as only 2 neonates (10% of total preterms) born at 32-34 weeks of gestation developed neonatal seizures.

Antenatal MgSO4 given at gestational age	Perinatal outcome showing neonatal death
28-30 weeks	2/20 neonates (10%)
30-32 weeks	0/20 neonates
32-34 weeks	0/20 neonates

According to our study neonatal deaths are comparatively more at the gestational age of 28 - 30 weeks as 2 neonatal deaths(10% of preterms) were seen. fetal lung maturity might be an aiding factor for the neonatal deaths.

Antenatal MgSO4 given at gestational age	Perinatal outcome showing Gross Motor dysfunction
28-30 weeks	0/20
30-32 weeks	0/20
32-34 weeks	1/20 (5%)

Gross Motor dysfunction developed in 1 case (5% of cases) in our study

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At our study among the preterm neonates 15 cases (75%) shows better outcome, 2 cases(10%) of neonatal seizures, 2 cases (10%) shows neonatal deaths, and 1 case(5%) of Gross Motor dysfunction noticed.

DISCUSSION:

Definitive mechanism of action of antenatal MgSO4 in fetal neuroprotection remains unclear.

MgSO4 freely crosses placenta and takes part in many intracellular processes.[1]

- cerebral vasodilatation, inhibition of calcium influx into cells.

- preventing early abnormal neuronal cells apoptosis.[2]

- preventing inflammatory and cytotoxic agents release.

-decreasing neuroinflammation and increasing seizures threshold.

- decreasing cerebellar hemorrhage

- MgSO4 also improves vascular tone and maintain good oxygen perfusion to organs which helps the CVS to counter balance when faced with hypoxia for providing cell life protection.[2]

Antenatal MgSO4 causes the promotion of neurogenesis in premature brain cells by stimulating neurotrophic factors like Brain Derived Neurotrophic Factor(BDNF).

BDNF is protective against neonatal hypoxic ischemic brain injury invivo.

BDNF production correlates with fetal brain maturity, more mature the brain more BDNF production.[2]

Antenatal MgSO4 increases BDNF secretion in premature fetal brain to equal levels seen in

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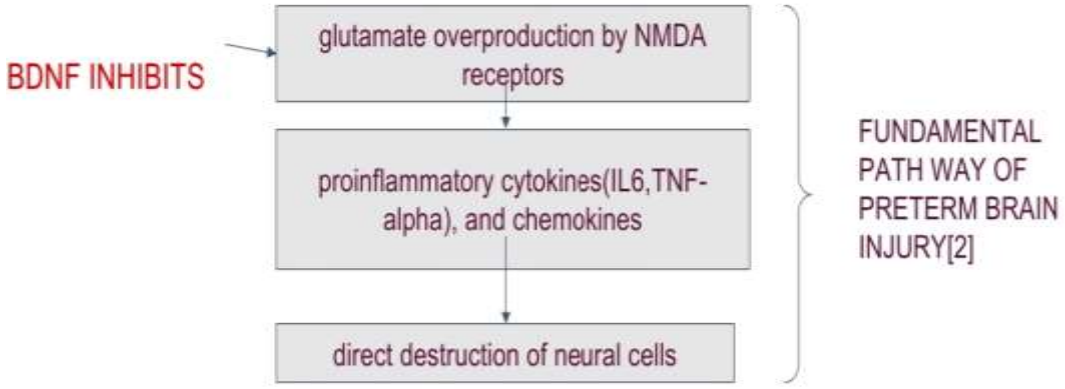
term pregnancy thus decreasing destructive processes in fetal brain.[2]

BDNF block N-Methyl D-Aspartate (NMDA) receptors to prevent glutamate.



Damage to the fetal brain first occurs in periventricular region called PeriVentricular Leukomalacia(PVL) which may lead to cerebral palsy.

Side effects like nausea, vomiting, respiratory depression,hyporeflexia, oliguria, pulmonary edema and cardiac arrest are strictly monitored in the mother during MgSO4 infusion.

Calcium gluconate is an antidote if MgSO4 toxicity suspected.

Injection BETAMETHASONE 12 grams 2 IntraMuscular doses 24 hours apart, also given to mothers for fetal lung maturity.

In our study 75% of neonates has good perinatal outcome.

Previous studies like PREMAG and ACTOMgSO4. has good perinatal outcome with better neuroprotection involving lower neurological disability, less number of neonatal seizures, deaths, Gross Motor dysfunction.

CONCLUSION:

When antenatal MgSO4 administered at an appropriate dose with proper monitoring, there is no evidence of harm to the fetus, neonate or mother and it helps in neuroprotection of the preterms by preventing neonatal seizures, neonatal deaths, Gross Motor dysfunction in

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preterms.

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