CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.2672846

Available online at: http://www.iajps.com *Research Article*

ANALYSIS OF ROLE OF MAGNESIUM SULPHATE IN ECLAMPSIA AND PRE-ECLAMPSIA

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Article Received: March 2019 **Accepted:** April 2019 **Published:** May 2019

Abstract:

Introduction: *Magnesium sulfate ($MgSC_4$) is the agent most commonly used for treatment of eclampsia and prophylaxis of eclampsia in patients with severe pre-eclampsia.*

Aims and objectives: *The basic aim of the study is to analyze the role of magnesium sulphate in eclampsia and pre-eclampsia women in Pakistan.*

Material and methods: *This descriptive study was conducted in King Edward Medical University, Lahore during March 2018 to November 2018. This study was done with the permission of ethical committee of hospital. The data was collected from 100 female patients. Data was collected through a systematically designed questionnaire. The survey included facility characteristics, $MgSO_4$ availability and potential barriers to its access, availability and distribution of clinical protocols for $MgSO_4$ use, $MgSO_4$ dosing regimens for the treatment of pre-eclampsia and eclampsia, institutional capacity to manage $MgSO_4$ toxicity, and preferences for different options of simplified $MgSO_4$ regimens.*

Results: *The data were collected from 100 female patients. Respondents reported that 24.3% of all facilities used $MgSO_4$ for treatment of mild pre-eclampsia (35.1% in Latin America, 22.7% in Asia and 18.6% in Africa). Over 90% of health facilities in all three regions used $MgSO_4$ for treatment of severe pre-eclampsia and eclampsia. With respect to the diagnosis and management of $MgSO_4$ toxicity, 27.8% of all facilities reported having the capacity to routinely measure serum magnesium concentration.*

Conclusion: *It is concluded that here was no association between adverse outcomes and maternal serum magnesium concentrations and no maternal mortality occurred. Magnesium sulphate was effective in preventing recurrence of eclamptic fits and safe for both mother and fetus.*

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Please cite this article in press Sidra Ishaq et al., ***Analysis of Role of Magnesium Sulphate in Eclampsia and Pre-Eclampsia.,*** *Indo Am. J. P. Sci, 2019; 06(05).*

INTRODUCTION:

Magnesium sulfate ($MgSC_4$) is the agent most commonly used for treatment of eclampsia and prophylaxis of eclampsia in patients with severe pre-eclampsia. It is usually given by either the intramuscular or intravenous routes. The intramuscular regimen is most commonly a 4g intravenous loading dose, immediately followed by 10g intramuscularly and then by 5g intramuscularly every 4 hours in alternating buttocks [1].

agnesium sulfate (MgSO4) has been used throughout the 20th century for prevention of eclamptic seizures, and it continues to be used extensively. Empirical evidence supports the effectiveness of MgSO4 in preventing and treating eclamptic seizures, in addition to recent controlled clinical trials. For eclamptic seizure prophylaxis in preeclamptic women, MgSO4 is superior to phenytoin, nimodipine, diazepam, and placebo [2]. In the multinational Collaborative Eclampsia Trial, MgSO4 reduced the risk of recurrent seizures in eclamptic women by 52% when compared to diazepam and by 67% when compared to phenytoin. The publication of these clinical trials significantly increased the use of MgSO4 versus other anticonvulsants in the United Kingdom and Ireland [3], where the reported use in preeclampsia increased from 2% to 40%.16 In addition, 60% of providers surveyed indicated they would use magnesium as an anticonvulsant for eclampsia in 1998, up from only 2% of eclamptic women who received MgSO4 in 1992 [4]. Magnesium is a unique calcium antagonist as it can act on most types of calcium channels in vascular smooth muscle and as such would be expected to decrease intracellular calcium [5].

Aims and objectives:

The basic aim of the study is to analyze the role of magnesium sulphate in eclampsia and pre-eclampsia women in Pakistan.

MATERIAL AND METHODS:

This descriptive study was conducted in King Edward Medical University, Lahore during March 2018 to November 2018. This study was done with the permission of ethical committee of hospital. The data was collected from 100 female patients. Data was collected through a systematically designed questionnaire. The survey included facility characteristics, $MgSO_4$ availability and potential barriers to its access, availability and distribution of clinical protocols for $MgSO_4$ use, $MgSO_4$ dosing regimens for the treatment of pre-eclampsia and eclampsia, institutional capacity to manage $MgSO_4$ toxicity, and preferences for different options of simplified $MgSO_4$ regimens.

Statistical analysis:

Data analyses were mainly descriptive. Cross-tabulation was used to describe health facility characteristics, availability and use of $MgSO_4$ by geographical regions.

RESULTS:

The data were collected from 100 female patients. Respondents reported that 24.3% of all facilities used $MgSO_4$ for treatment of mild pre-eclampsia (35.1% in Latin America, 22.7% in Asia and 18.6% in Africa). Over 90% of health facilities in all three regions used $MgSO_4$ for treatment of severe pre-eclampsia and eclampsia. With respect to the diagnosis and management of $MgSO_4$ toxicity, 27.8% of all facilities reported having the capacity to routinely measure serum magnesium concentration. In more than half of all facilities, $MgSO_4$ was administered as a loading dose followed by continuous intravenous maintenance dose, and in one-quarter of facilities the loading dose was followed by intramuscular maintenance dose.

Vascular Effects of Magnesium Sulfate.

Cellular Target	Mode of Action	Possible Mechanism(s)
Smooth Muscle Uterine +++ Mesenteric +++ Aorta +++ Cerebral +	Relaxation ↓ Vasodilation ↓ Decreased Vascular Resistance	Calcium Antagonism Decreased Voltage-operated Calcium Channel (VOCC) Activity Decreased $[Ca^{+2}]_i$ Release From Sarcoplasmic Reticulum
Endothelium	Decreased Platelet Aggregation	Increased Prostaglandin I_2 (PGI_2)
	Vasodilation	Increased Nitric Oxide (NO, Gestation Dependent)

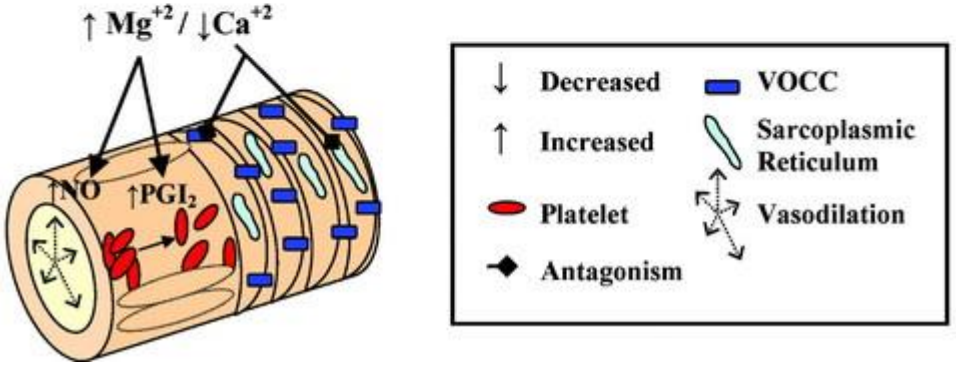

Figure 01: Magnesium is a potent vasodilator of uterine and mesenteric arteries, and aorta, but has minimal effect on cerebral arteries. In vascular smooth muscle, magnesium competes with calcium for binding sites, in this case for voltage-operated calcium channels (VOCC).

Table 01: Analysis of level of $MgSO_4$ in normal, pre-eclampsia and eclampsia patients

Initial (baseline) serum magnesium levels, mg/dl	Group A No. (%)	Group B No.(%)	Group C No.(%)
0-0.5	0(0)	1 (2.85)	1 (2.85)
0.5-1.0	5(14.28)	3 (8.75)	3 (8.75)
1.0-1.5	7(20)	11(31.42)	12 (34.28)
1.5-2.0	16 (45.71)	17(48.57)	17 (48.57)
≥ 2	7 (20)	3(8.75)	2 (5.71)
Total	35 (100)	35(100)	35 (100)
Mean±SD	1.81±0.58	1.55±0.41	1.49±0.41

DISCUSSION:

Magnesium sulphate therapy in pre-eclampsia has not been associated with improved neonatal outcome in the short-term. There are many confounding factors that contribute to adverse neonatal outcome, and therefore make the evaluation of the neonatal outcome after magnesium sulphate therapy difficult, such as primigravidity (52%), preterm delivery in 56 and 53% of preeclamptic and eclamptic women, respectively, and intrauterine growth restriction among 30.2% of the women in the present study [6]. In the Magpie study, more than 53% of the babies were born underweight (less than 2.5 kg). One should, however, take into account that most cases of perinatal morbidity in pre-eclampsia usually occur very remote in time from the exposure to MgSO [7]. Riaz et al. evaluated the effects of maternal magnesium sulphate treatment on newborn infants delivered at 6 weeks of gestation whose mothers received a minimum of 12 h of intravenous $MgSO_4$, and beyond the immediate postdelivery period, there were no additional complications in this cohort attributable to prenatal $MgSO_4$ exposure [8]. This has recently been confirmed by the follow-up of 4,483 children of the Magpie Trial at 18 months after exposure of their mothers to $MgSO_9$ [9] . There was no increased risk of death or disability. Like the present study, two studies at the Rotunda Hospital in Dublin and the Yorkshire region of the UK involving 16 maternity units using a common guideline of $MgSO_4$ therapy for pre-eclampsia for a 5-year prospective study confirmed the outcome [10].

CONCLUSION:

It is concluded that here was no association between adverse outcomes and maternal serum magnesium concentrations and no maternal mortality occurred. Magnesium sulphate was effective in preventing recurrence of eclamptic fits and safe for both mother and fetus.

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