Magnesium sulphate: A Life Saving Drug

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ABSTRACT

A retrospective study of 68 eclamptic women who received Magnesium sulphate at Koshi Zonal Hospital were analyzed during a one year period (2006-2007 AD). Maternal conditions at admission, associated complications in mothers and babies, delivery outcomes and cause of death were also studied in each case.

There were 5240 deliveries during the period of analysis. Of which 4976 were live births, pregnancy induced hypertension was 0.89% (47), 0.74% (39) presented with pre-eclampsia, 0.30 (16) cases with severe pre-eclampsia and 0.43 (23) cases with mild pre-eclampsia. During this period 1.3% (68) of eclampsia presented to the hospital. Of which 67.7% presented with ante-partum eclampsia, 22.1% with intrapartum eclampsia and 10.3% with post partum eclampsia. Majority of women (63.2%) were between 20-25 years of age, while teenage pregnancy contributed 30.88% of eclamptic cases. The diastolic blood pressure was >110 mm of Hg in 45.6% of cases, 90-110 mmHg in 50% of cases and in 4.4% the it was <90 mmHg. 94.1% presented to the hospital in an unconscious state, 79.4% of eclamptic women received the full dose of magnesium sulphate (initial loading plus maintenance dose), while rest failed to receive the full dose. Nine women with severe pre-eclampsia received magnesium sulphate as a prophylactic measure. 17.7% women had home delivery, one patient left against medical advice and one was referred to a tertiary care center. Caesarian Section (Lower Segment) was performed in 35.2% of cases, 30.8% had normal vaginal deliveries and 5.8% had pre term delivery. About 69.6% babies were born alive, 8.7% were still births, 11.6% were neonatal deaths and 4.4% of babies had to be admitted to the neonatal intensive care. Eclamptic women stayed less than one week in the hospital in majority of cases (64.7%), between 1-2 weeks in 32.4% and more than two weeks in 2.9%. Maternal complications included decreased urinary output, pulmonary edema in three cases; chest and wound infection two cases each; post partum psychosis, vulval haematoma, severe headache one case each. There were seven maternal deaths during this period and eclampsia contributed to one of the deaths.

Eclampsia is a major cause of maternal and perinatal morbidity and mortality in our setup. Magnesium sulphate is an excellent drug of choice in management of eclampsia and pre-eclampsia. Wider coverage of pre-natal care, timely referral and optimal management of cases of eclampsia with magnesium sulphate in hospitals are key issues to prevent mortality/morbidity associated with it.

Key words: *eclampsia, pre-eclampsia, magnesium sulphate, maternal morbidity, moratlity*

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INTRODUCTION

Maternal health is a crucial part of the health care delivery system of any nation, with special focus on reducing the morbidity as well as mortality of the complications related to pregnancy. Prenatal care that a woman receives during pregnancy, labor and in the postpartum period is vital for the survival of both the mother as well as the baby. Currently, lots of women in Nepal die during pregnancy, labor and in the postpartum period due to preventable causes such as eclampsia, hemorrhage and abortion related complication. Eclamptic and non-eclamptic hypertensive disorders of pregnancy are responsible for a high number of maternal and perinatal morbidity and mortality in Nepal. Majority of these cases could have been detected during the pre natal period and timely intervention can save millions of lives. However there is a wide disparity between urban women seeking prenatal care and rural women seeking prenatal care 52% vs 26% of women. The real challenge is to tap this rural population much earlier in order to improve maternal as well as neonatal health.

Magnesium sulfate ($MgSO_4$) is the agent most commonly used for treatment of eclampsia and prophylaxis of eclampsia in patients with severe pre-eclampsia.[1] Koshi Zonal Hospital has been training service provider in basic emergency obstetrical care, midwifery refresher training since 2002 AD. Till date 173 health care workers have been trained at the hospital. Refocused antenatal care, use of magnesium sulphate ($MgSo_4$) have been instrumental in improving the lives of women in the region. This study analyzes the outcome of using magnesium sulphate for eclampsia over a year's period.

MATERIAL AND METHODS

This is a retrospective study conducted in the Koshi Zonal Hospital during July 17, 2006 to July 16, 2007. After the institutional approval data were collected in which sixty eight women with ecalmapsia, who received magnesium sulphate were included in this study. Maternal conditions at admission, diastolic blood pressure (BP), mode of delivery and fetal outcomes, complications in both mother and neonate, duration of admission and causes of maternal deaths were analyzed.

Statistical analysis were done by using statistical package for social science (SPSS) version 13 for windows.

RESULTS

There were 5240 deliveries at Koshi Zonal Hospital during one year study period. Of which 4976 were live births. During this one year period 1.3%, (68) women presented with eclampsia (1.3%), 0.74% (39) with pre-eclampsia, 0.30 % (16) with severe pre-eclmapsia, 0.43% (23) with mild pre eclampsia and 0.89% (47) with pregnancy induced hypertension. Majority of women presented to the emergency in an unconscious state (94.1%). Ante partum eclampsia was seen in 67.7% of cases, intra partum in 22.1 % and post partum eclampsia in 10%. In 45.6% of the cases the BP on admission was >110 mmHg, 50% had BP ranging from 90-110 mmHg and in 4.4% the BP was below 90 mmHg. Urine albumin was tested on admission for all eclamptic women, 20.6% did not have the presence of albumin on admission.

Majority of the women were between the ages of 20-25 years age group 63.24%, adolescent mothers comprised 30.88% (Table 1). As far as the parity was concerned most of them were primi gravidas, seen in 85.29% of cases. However maximum number of women had eclampsia at term with 67.65% of cases and only 8.82% had post dated pregnancy.

Table 1. **Age wise distribution**

Age	Number	Percentage
≤ 19	21	30.88
20-25	43	63.24
26-30	2	2.94
31-35	2	2.94
>35	0	0.00

Table 2. **Parity of the patients**

Parity	Number	Percentage
Primi	58	85.29
Multi	10	14.71

Table 3. **Period of Gestation**

Period of Gestation	Number	Percentage
Term	46	67.65
Preterm	16	23.53
Post term	6	8.82

Significant number of eclampsia patients presented to the emergency in an unconscious state (94.1%). Ante partum eclampsia was seen in 67.7% of cases, intra partum in 22.1 % and post partum eclampsia in 10%. In 45.6% of the cases the BP on admission was >110 mmHg, 50% had BP ranging from 90-110 mmHg and in 4.4% the BP was below 90 mmHg. Urine albumin was tested on admission for all eclamptic women, 20.6% did not have the presence of albumin on admission.

All women received Pitchart's regime of magnesium sulphate, 79.4% received full dose (loading dose

intravenous) and maintenance dose till 24 hours after delivery. In the rest of the eclampsia patients, magnesium sulphate had to be discontinue due to variety of reasons, (Table 4), decreased urinary output being the main reason. There were no cases of magnesium sulphate toxicity. In one patient immediately after giving the loading dose of magnesium sulphate, she developed eclamptic fits. Magnesium sulphate was given in nine cases as a prophylactic measure. 17.7 % of women had a home delivery.

Table 4. Dose of Magnesium Sulphate

Dose of MgSo4	No.	%	Reason for discontinuation
Full dose	54	79.41	
Loading Dose only	3	4.41	Decreased urinary output
Loading +1 Maintainance	2	2.94	Decreased urinary output
Loading +2 Maintainance	4	5.88	Decreased urinary output
Loading +3 Maintainance	1	1.47	Decreased urinary output
Loading +4 Maintainance	4	5.88	Decreased urinary output + Loss of P reflex

*Only one women developed fit after starting MgSO4. This was immediately after the intravenous (IV) loading dose.

Table 5. Dose of MgSO4 in Severe Pre-eclampsia

Dose	No.	%	Reason for discontinuation
Full	7	77.78	
Loading +1 Maintainance	1	11.11	Decreased urinary output
Loading +4 Maintainance	1	11.11	Refused to take further dose

Eclampsia case who presented in early stage of labor had an emergency Lower Segment Caesarian Section (LSCS) in 35.29% of cases, followed by vaginal delivery in 30.88 cases (Table 6). The instrumental delivery rate was negligible 2.94%. One case of antepartum eclampsia left against medical advice despite the couselling of consequences. Another case was referred to tertiary care center for better neonatal intensive care facilities on patient's demand.

Table 6. Mode of Delivery

Mode of Delivery	Number	Percentage
LSCS	24	35.29
Forceps	2	2.94
Normal delivery	21	30.88
PVD	4	5.88
Vaginal delivery SB	3	4.41
Home delivery	12	17.65
Referred to BPKIHS	1	1.47
LAMA	1	1.47

There were several maternal complications that occurred while in the hospital, post partum psychosis, severe headache and vulval hematoma one case each. Chest and wound infection was seen in two cases, and pulmonary edema in three cases which was timely recognized and treated appropriately. There were seven maternal deaths during the study period. The mortality was due to post partum hemorrhage in two cases, anemia, septic abortion, ruptured uterus, puerperal sepsis and eclampsia were responsible one case each for maternal mortality.

There was one maternal death due to eclampsia during the study period, despite all emergency measures. The case was a 21 year primi admitted with a history of multiple fits at home. She was unconscious with a blood pressure of 150/110 mmHg, urinary albumin absent but there was evidence of pulmonary edema. She was immediately given diuretics and broad spectrum antibiotics. The urinary output was adequate. Bed side clotting test was normal. Loading dose of MgSO4 was given. Despite all these measures, she collapses one later of her presentation.

Birth weight is a good indicator for the survival of the baby. The majority of women delivered babies more than 2.5 kg in 40.48% cases, low birth weight was seen in 41.9% of cases. Several neonatal deaths occurred mainly due to asphyxia in 11.59% of cases while neonatal death was seen in 4.35 %.

DISCUSSION

Maternal mortality ratio in Nepal has dramatically declined to 280 per 100,000 live births, despite the political instability and decade long insurgency. Some of the factors that have contributed to this decline are increased awareness, expansion of health facilities, immunization and antenatal care. Contraceptive prevalence rate also has increased from 39% to 48% in the last five years. The average family size has declined from 4.6 children in 1996, to 4.1 in 2001 and 3.1 in 2006.[2] Abortion also has been legalized since 2004. Since less women are pregnant, there are less maternal

Table 7. **Cost of Medicines for Eclampsia Patients**

Drugs	Quantity	Unit cost	Total
IV Cannula	1	Rs. 65.00	Rs. 65.00
IV Set	1	Rs.50.00	Rs. 50.00
Inj Ringer Lactate	2	Rs.37.00	Rs.74.00
Foleys Catheter	1	Rs.75.00	Rs.75.00
Urobag	1	Rs.50.00	Rs.50.00
Inj MgSO4	40 ampules	Rs.7.00	Rs.280.00
Inj Calcium Gluconate 10%	1 ampule	Rs.20.00	Rs 20.00
Inj. 2% Lignocaine	1 vial	Rs.35.00	Rs. 35.00
Disposable syringe 20 cc	2	Rs.14.00	Rs.50.00
Disposable Syringe 10cc	8	Rs.15.00	Rs. 120.00
Disposable Syringe 5cc	1	Rs 3.00	Rs.3.00
Water for injection	3 ampules	Rs 1.00	Rs.3.00
Cap Nefidipine	10 capsule	Rs 1.15	Rs.11.50
TOTAL			Rs 836.00($13)

Table 8. **Fetal Outcome**

Weight	No.	%
>2.5 kg	28	40.58
1.5-2.5	24	34.78
<1.5	5	7.25
Weight (Wt) not known(Home Delivery, LAMA, Mother Expired, In utero transfer)	12	17.39

Table 9. **Baby Outcome**

Baby Outcome	No.	%
Live born	48	69.56
SB	6	8.69
NND	8	11.59
NICU	3	4.35
Refered/LAMA/Mother expired	3	4.35

deaths are noted. But at a closer look at the department of health services (DHS) data, there is a wide disparity between urban and rural population. About 85% of women in urban areas receive antenatal checkup (ANC) from a skilled birth attendant, while only 38% of rural population. Data regarding delivery in a health facility is also alarming, 38% of children in urban areas are born at a health facility, compared to only 14% of the rural population.[2] In our study 17.65% women delivered at home and presented to the emergency department of Koshi Zonal Hospital with post partum eclampsia. If we see national figure also less than one fifth of births take place with the assistance of skilled birth attendant. The challenge lies in meeting the health demands of the rural population and increasing the awareness for delivery by a skilled birth attendant. Earlier studies have shown eclampsia as one of the leading causes of death, in the eastern region of the country.[3]

The incidence of eclampsia is high in countries of South East Asia and Africa have a higher incidence as compared to the incidence in the West.[4-9]

The incidence of eclampsia at Koshi Zonal Hospital was 1.3% similar to the incidence seen in Nigeria. However the population here are maximum in the age group of 20-25 in 83.3% cases and adolescent group was 30.88% unlike the 16.5% of eclampsia patients in Ethiopian study. Majority of our women were primi gravidas 83.3%, other studies in India, Turkey, Ethiopia also have quoted a similar age/parity profile.

The mortality here was very low (only one death) in contrast to the high number of maternal deaths due to eclampsia seen in Ethiopia or India in which 28% and 24% women died due to eclampsia. Another factor responsible for this could be that many women who had eclampsia never made it to the hospital, thus we may not have statistics to highlight the magnitude of the problem. Though there are not statistics of previous years of maternal mortality ratio figures from the hospital, it is not difficult to conclude that magnesium sulphate has been instrumental in improving patients of eclampsia. We can however conclude that since not a single case of magnesium toxicity occurred during the study period, all eclampsia patients were treated well. Previously diazepam and phenytoin were also used. Retrospective studies in Thailand and Tureky have also demonstrated magnesium sulphate as an excellent drug for the management of eclampsia/pre-eclampsia

and reduction of maternal mortality. The data from this region has shown that there is a significant decline of maternal deaths with the use of magnesium sulphate, from 16% to 8% at Dhaka Medical College. Similar results have also been seen at postgraduate institute Chandigarh, Turkey, Cambodia, as well as in Bangkok, Thailand.[10-18]

Lancet in 2001 published a international multi-center randomized trial comparing standard anticonvulsant regimes were compared, which involved 1687women with eclampsia. The risk of recurrent convulsions were less in magnesium sulphate group as compared to phenytoin or diazepam and there is now compelling evidence in favor of magnesium sulphate, than other drugs for the treatment of eclampsia except for one case who had repeated convulsions soon after the loading dose of magnesium sulphate. Here in this study there are not see many cases of postpartum eclampsia at our hospital, unlike the Ethopian study, 10% vs 15.7%.[9]

Several studies have concluded that high perinatal mortality/morbidity is associated with babies born to eclampsic mothers. In our study also we had 11.6% neonatal deaths. Unlike the Cambodian study of 20% still birth our still birth rate was much lower 8.7%. The neonatal admission rate was 4.4%. Studies in Thailand and India have quoted a high cesarean section rate, associated with better peri-natal outcome. Even though our operative rate was not that high 35.29% compared to 57% in Thailand, or 79% in Nova Scotia, the perinatal outcomes are not as bad in comparison to the two.[12]

The limitation of this study was the study was based on the data available in the medical record section. To prove the efficacy and safety of $MgSO_4$ we need to have a more larger population study.

CONCLUSION

It has been well established that eclampsia is a major cause for both maternal and perinatal mobidity and mortality. Till there are emergency obstetrical care services available throughout the country, advocacy for institutional delivery, early recognition/ referral of hypertensive disorders of pregnancy, timely management of pre-eclampsia/eclampsia, use of magnesium sulphate are key strategies to help improve the maternal mortality/morbidity of mothers and babies in Nepal.

REFERENCES

1. Lu JF, Nightingale CH. Magnesium sulfate in eclampsia and pre-eclampsia: pharmacokinetic principles. Clin Pharmacokinet 2000 Apr;38(4):305-14.
2. Ministry of Health and Population (MOHP) [Nepal], New ERA,and Marcro International Inc. 2007.
3. Goswami A, Kasliwal M R, Lekraj H G, Urala M S. Maternal mortality in a Tertiary care centre in Nepal. Trop J Obstet Gynaecol 2004; 21:168-171.
4. Begum R, Begum A, Bullough CH, Johanson RB. Reducing maternal mortality from eclampsia, using magnesium sulphate. Eur J Obstet Gynecol Reprod Biol 2000 Oct;92(2):223-4.
5. Sawhney H, Aggarwal N, Biswas R, Vasishta K, Gopalan S. Maternal mortality associated with eclampsia and severe preeclampsia of pregnancy. J Obstet Gynaecol Res 2000 Oct;26(5):351-6.
6. Which anticonvulsant for women with eclampsia? Evidence from the Collaborative Eclampsia Trial. Lancet. 2001 Jan 27;357(9252):312.
7. Witlin AG, Sibai BM Magnesium sulfate therapy in preeclampsia and eclampsia. Obstet Gynecol 1998 Nov;92(5):883-9.
8. Azria E, Tsatsaris V, Goffinet F, Kayem G, Mignon A, Cabrol D. Magnesium sulfate in obstetrics: current data. J Gynecol Obstet Biol Reprod (Paris) 2004 Oct;33(6 Pt 1):510-7.
9. Gessessew A. Maternal complications--in a zonal hospital. Ethiop Med J 2007 Jan;45(1):47-54.
10. Chhabra S, Kakani A Maternal mortality due to eclamptic and non-eclamptic hypertensive disorders: a challenge. J Obstet Gynaecol 2007 Jan;27(1):25-9.
11. Onuh SO, Aisien AO Maternal and fetal outcome in eclamptic patients in Benin City, Nigeria. J Obstet Gynaecol 2004 Oct;24(7):765-8.
12. Lee W, O'Connell CM, Baskett TF. Maternal and perinatal outcomes of eclampsia: Nova Scotia, 1981-2000. J Obstet Gynaecol Can 2004 Feb;26(2):119-23.
13. Chinayon P. Clinical management and outcome of eclampsia at Rajavithi Hospital. J Med Assoc Thai 1998 Aug;81(8):579-85.
14. Swain S, Ojha KN, Prakash A, Bhatia BD. Maternal and perinatal mortality due to eclampsia. Indian Pediatr 1993 Jun;30(6):771-3.
15. Abate M, Lakew Z. Eclampsia a 5 years retrospective review of 216 cases managed in two teaching hospitals in Addis Ababa. Ethiop Med J 2006 Jan;44(1):27-31.
16. Taner CE, Hakverdi AU, Aban M, Erden AC, Ozelbaykal U Prevalence, management and outcome in eclampsia. Int J Gynaecol Obstet 1996 Apr;53(1):11-5.
17. Koum K, Hy S, Tiv S, Sieng T, Obara H, Matsui M, Fujita N. Characteristics of antepartum and intrapartum eclampsia in the National Maternal and Child Health Center in Cambodia. J Obstet Gynaecol Res 2004 Apr;30(2):74-9.
18. Obed SA, Wilson JB, Elkins TE. Eclampsia: 134 consecutive cases. Int J Gynaecol Obstet 1994 May;45(2):97-103.