
Magnesium Sulphate for Prevention and Treatment of Preeclampsia and Eclampsia in Pakistan

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Summary

Eclampsia is among the leading causes of maternal mortality which accounts for around 10% of all maternal deaths, according to National Surveys reviewed for this paper. Evaluation of the studies referred to, in this Review article, it became evident that the role of anticonvulsants is crucial for preventing and managing seizures during pregnancy. Some studies were critically evaluated for the choice between different drugs for treatment, much of the controversy over which having subsided, it became irrefutably evident that magnesium Sulphate ($MgSO_4$) has greater efficacy in comparison with other drugs used for this purpose.

The objective for reviewing this topic was to find out as to why $MgSO_4$ usage remains negligible in Pakistan, despite compelling evidence of its superiority. The extraction of information was from various studies including those in print or online or through the net, etc. There were National Surveys and Reports, National and International papers, product briefs, United Nations and WHO reports. The papers searched for the study were Randomised Trials, Systematic Reviews or Chochrane Reviews etc. etc. Some reports were from developed countries, while others were from developing countries world over, with some resource poor countries.

The Results of study showed that the PRIMARY BARRIERS to the use of $MgSO_4$ in this country are, lack of National Priority and National Guidelines, lack of Education and training of concerned Health staff and shortage of supplies. It is concluded that for Pakistan, the challenge is the EVIDENCE BASED integration of use of $MgSO_4$ into current clinical practice and procedures for the prevention and management of the disease.

Keywords: Eclampsia, Pre-eclampsia, Magnesium Sulphate, Pakistan.

Introduction

Pakistan has the third highest number of maternal deaths after India and Nigeria. Maternal health in Pakistan has been in a deplorable state for the indefinite past. At 276 per 100,000 live births, the maternal mortality ratio is well short of the 140 per 100,000 target set for 2015 under the Millennium Development Goals. According to Pakistan Demographic and Health Survey conducted in 2006 – 2007, out of every ten maternal deaths, one is attributed to eclampsia. Importantly, many of the antepartum stillbirths are also associated with PET and eclampsia in Pakistan.¹ Eclampsia cannot be effectively treated at home once it occurs. Symptoms of eclampsia need to be identified during antenatal period and treated by trained medical practitioner and monitored carefully. Effective prevention and treatment of PET and eclampsia, by and large, depend on antenatal care, functioning referral system and deliveries by skilled birth attendants.² For effective treatment, there is now firm evidence supporting the introduction of MgSO₄ for significantly reducing the risk of eclampsia among women with severe PET.³ This article reviews and summarizes available evidence, in the context of Pakistan, on the efficacy, accessibility and acceptability of MgSO₄ as a drug of choice in the prevention and treatment of PET and eclampsia.

Methodology of Search of Literature

For the purpose of this review, published literature was retrieved through a variety of search engines, including PUB MED, POP LINE and Reproductive

Health Archive. Various combinations of search terms were utilized to access relevant literature, primary combinations of search strings contained 'Pakistan,' 'Eclampsia' and 'MgSO₄.' Articles written specifically in the context of Pakistan and those that discussed barriers to the use of MgSO₄ in general were included in the review. Relevant published and unpublished material available online and produced since 1990 was indexed and reviewed for the purpose of this article. The selected literature was further arranged according to its overall relevance to this review, i.e. common elements, innovations and implications in the context of Pakistan.

Magnesium Sulphate as a Drug of Choice

Eclampsia is usually a consequence of PET consisting of central nervous system seizures, which often leave the patient unconscious; if untreated it may lead to death. The onset of eclamptic convulsions can be antepartum, intra-partum, or postpartum, however, in almost all cases (more than 90%) of eclampsia develop at or beyond 28 weeks. The remaining cases occur between 21 and 27 weeks of gestation (7.5%) or at 20 weeks of gestation or earlier (1.5%) table I.⁴

Table I. Time of Onset of Eclampsia in Relation to Delivery [Percentages]

	Douglas and Redmanc ⁵ (N = 383)	Katz et al ⁶ (N = 53)	Mattar and Sibai ⁷ (N = 399)	Chames et al ⁸ (N = 89)
Antepartum	38	53	53	67
Intrapartum	18	36	19	
Postpartum	44	11	28	33
≤48h	39	5	11	7
>48h	5	6	17	26

Pathogenesis of eclampsia is not fully known and therefore its prevention strategies are limited. It is done primarily through prevention of PET or secondary by using pharmacologic agents to prevent convulsions in women with established PET. Prevention can also be tertiary by preventing subsequent convulsions in women with established eclampsia. Currently, there is no preventive therapy for PET. During the past decade, several randomized trials reported on the use of protein or salt-restricting zinc, magnesium, or fish oil supplementation, low-dose aspirin, calcium, and vitamin C and E in women with various risk factors to reduce the rate or severity of PET, results of which have shown minimal or no benefit in reduction of PET.⁹ Current management schemes designed to prevent eclampsia are based on early detection of gestational hypertension or PET and subsequent use of preventive therapy in such women.¹⁰

MgSO₄ is an anticonvulsant drug recommended by the World Health Organization as the most effective, safe, and low-cost treatment available for severe PET and eclampsia. It has been on the World Health Organization's essential medicines list since 1996 and is highly affordable (a typical dosage costs US\$ 0.35 per ampoule). However, MgSO₄ has not achieved widespread usage in developing countries. This is, in general, due to lack of public awareness of the drug, lack of adequate service-provider training, and lack of availability of MgSO₄ in these areas. MgSO₄ is rarely globally manufactured because its low cost leaves little profit-based incentive for pharmaceutical companies to produce it for international market. As of

January 2012, WHO regulatory authorities had not yet prequalified manufacturers of MgSO₄. It was, however, placed on their 2010 Expression of Interest list as a drug for which they will accept requests for prequalification. There are no existing global public-sector price agreements for MgSO₄.¹¹

Efficacy of Magnesium Sulphate

One of the landmark studies to test the evidence supporting MgSO₄ is known as the magnesium sulphate for Prevention of Eclampsia (Magpie) Trial. The study was based on a randomised placebo controlled trial conducted in 33 countries and included over 10,000 eligible women. It effectively found that MgSO₄ halves the risk of eclampsia, and probably reduces the risk of maternal death. In 2003, a systematic review showed that MgSO₄ is substantially more effective than diazepam for eclampsia.¹² A series of studies had already firmly established that MgSO₄ is a better anticonvulsant than other available drugs, i.e. diazepam and phenytoin.¹³ While MgSO₄ has been the drug of choice in the United States, however in Britain, for instance, diazepam and phenytoin were favoured. By mid 1990s, a network of researchers – the collaborative eclampsia trial – reported, from the first large-scale randomised trial, that compared the three drugs which showed firm and compelling support for the use of MgSO₄. The trial reported that women were 52% and 67% less likely to suffer recurrent fits after treatment with MgSO₄ than with, diazepam or phenytoin.¹⁴ A review article published in 1996 collated evidence on the use of MgSO₄ from randomised trials and came to the

conclusion that this drug is superior in preventing the recurrence of seizures in eclampsia and seizure prophylaxis for PET.¹⁵

In Pakistan too there have been several cross-sectional studies conducted, though limited in research rigour, assessing the efficacy of MgSO₄ for the prevention and treatment of PET and eclampsia. A study conducted at the Sobhraj Maternity Hospital, Karachi over a period of two years from 1999 to 2000 found eclampsia to be well-controlled by the use of MgSO₄. In its findings, convulsions were controlled in 94% patients despite lack of monitoring facilities of serum magnesium level.¹⁶ Another study conducted at District Headquarter Hospital, Faisalabad in 2007 found MgSO₄ to be a better anticonvulsant in terms of total morbidity, recurrence of fits, maternal deaths and respiratory depression as well as in terms of total foetal morbidity and perinatal deaths when compared with Diazepam.¹⁷ A study conducted over a period of four years from 2004 to 2008 at the Hayatabad Medical Complex, Peshawar reached at the conclusion that eclampsia, a major cause of maternal mortality and morbidity in Pakistan, can be effectively controlled with the administration of MgSO₄ for prevention of recurrent fits and is safe for both mother and foetus.¹⁸ Similarly, a study conducted at the Sandeman Hospital, Quetta in 2006 with an obstetric population of 3,050 deliveries found MgSO₄ to be a therapeutically effective anticonvulsant agent.¹⁹ A study conducted at the Punjab Medical College and in its affiliated hospitals found that MgSO₄ is an effective drug for prevention of fits in patients of se-

vere PET.²⁰ In addition, there are a number of other small-scale studies, mostly relying on hospital records, conducted in Pakistan showing greater efficacy of MgSO₄ in the treatment of PET and eclampsia and recommending MgSO₄ as a drug of choice for reducing the rate of eclampsia.²¹

In light of the findings of several large and small scale studies and also through randomized controlled trials, including those in Pakistan, there is now wide consensus among health practitioners and public health experts that MgSO₄ is more effective in reducing convulsions and maternal deaths, compared to other anticonvulsants, i.e. Diazepam or Phenytoin.²²

Barriers to the Use of Magnesium Sulphate

In countries like Pakistan as mentioned in the introduction lack of national priority and guidelines, lack of education and training and supply shortages have been consistently identified as the primary barriers to the use of MgSO₄.²³ Among studies that have originated from developing countries and having relevance to the context of Pakistan, Aaserud et al came to a conclusion in their case study on the policy and practice gap on the use of MgSO₄ that despite robust evidence from a landmark trial and systematic review, the drug is still not available, and that licensing, import and production are probably not the most important barriers in most settings to translating this research evidence into practice.²⁴ Duley, in order to promote evidence-based care for the treatment of eclampsia, recommends that key strategies in removing barriers to the use of MgSO₄ are facilitating easy access to the drug, increasing under-

standing of how to evaluate health care interventions and the levels of evidence, and raising awareness of the evidence supporting the use of the drug.²⁵ A study conducted in Zambia found that the major barrier to the availability of MgSO₄ within the public health system was lack of procurement by the Ministry of Health. Other barriers identified by the study included a lack of demand by health professionals at the health centre level and a lack of in-service training in the use of MgSO₄.²⁶ In Nigeria, while national protocol has been developed on the use of MgSO₄, there is need for further training of health workers on how to use this important drug.²⁷ In Zimbabwe, it was found that delays in the availability of MgSO₄ for the treatment of eclampsia were caused by poor communication between central medical stores and obstetricians, as well as by delays in adding MgSO₄ to the WHO list of essential drugs.²⁸

Non availability of the Drug: In the case of Pakistan, the foremost barrier reported in several studies is the nonavailability of the drug. A study conducted at the Hayatabad Medical Complex in Peshawar reaches at the conclusion that non-availability of ideal anticonvulsant i.e. MgSO₄, for the majority of the patients has resulted in higher

mortality as it was found higher at 18.6% in patients given parenteral Diazepam compared with 8.3% among those given MgSO₄.²⁹ Also see table II. The observation is consistent with the findings of other studies.³⁴ The issue of non-unavailability of drugs in health facilities is directly linked to its supply. On the lack of supplies of MgSO₄ in health facilities, a baseline study conducted under Norwegian-Pakistan Partnership Initiative in Sindh in 2009 confirms this finding. This study revealed that only 3% district-headquarter facilities and 20% tehsil-headquarter facilities have the supplies of MgSO₄.³⁵ A study conducted in Multan covering 49 public health facilities that included basic health units, rural health centres, and tehsil and district headquarter hospitals found that no facility had the supplies of MgSO₄.³⁶ Importantly, clear policies concerning what level of facilities, health centres or hospitals, should receive which drugs as vital components for availability of sufficient stocks.

Availability of the Antidote: Since staff members, including physicians, in lower level facilities are not adequately trained in the use of MgSO₄, or because regulations may restrict provision by certain cadres of staff such facilities may simply not receive the drug. This is also the case with the

Table II. Availability of Magnesium Sulphate in Public Health Facilities, Selected Studies

Sources	First Level Care Facilities, i.e. BHU, RHC	Secondary Level Care Facilities, i.e. THQ	Tertiary Level Care Facilities, i.e. DHQ
NPPI Baseline Survey Sindh, 2009	-	20%	3%
Fikree et al ³⁰ , 2006 – Multan	0% (n = 38; n = 8)	0% (n = 2)	0% (n = 1)
Shah and Pervaiz, 2006 – DG Khan ³¹	0% (n = 35; n = 8)	0% (n = 1)	100% (n = 1)
WHO, 2010 – Kohat and Swabi ³²	40% (n = 4; n = 3)	-	50% (n = 2) 5% (n = 21; n = 2; n = 0; n = 2)
NARI, 2009 – Dadu ³³			13% (n = 20; n = 1; n = 1; n = 1)

antidote of $MgSO_4$ i.e. calcium gluconate. Several studies in Pakistan have reported severe lack of supplies of not only $MgSO_4$ but also of its antidote. Together with $MgSO_4$, it is also extremely important that calcium gluconate is always available as an antidote for $MgSO_4$.³⁷ There is no comprehensive study conducted to-date to assess the availability of both the $MgSO_4$ and calcium gluconate at different levels of public and private health facilities.

Capacity of Health Care Providers: Existing evidence shows that only those health practitioners who were either part of donor-funded projects or participated in any randomized control trials had received training and training-aid on the use of $MgSO_4$.³⁸ As for the curriculum of midwives and nurses, Table III provides brief overview of the present status. The curriculum of community midwives, which has been developed not too long ago, mentions $MgSO_4$ as a drug to be taught for the prevention of eclampsia and to be injected only as a loading dose. **While curriculum for nurses, prepared by Pakistan Nursing Council, does not contain any reference to $MgSO_4$ as a drug of choice and only refers to anticonvulsants for the**

treatment of pregnancy-induced hypertension.

Knowledge and Recognition at the Household and Community Levels: At the household and community levels, knowledge and recognition of danger signs of PET and eclampsia are non-existent or otherwise extremely limited. A review of literature conducted on maternal health issues in Pakistan in 1997 suggested that not only married women and their mothers-in-law had no knowledge of PET/eclampsia, extensive training on its danger signs is also needed for traditional birth attendants.⁴³ According to the most recent Pakistan Demographic and Health Survey, one-third of pregnant women in Pakistan receive no prenatal care at all. Of the two-thirds (61%), with at least one prenatal visit, consulting a skilled provider, only quarter learns about the symptoms of complications during pregnancy. Similarly, in qualitative formative research carried out in 2006 by the Pakistan Initiative for Mothers and Newborns, a USAID-funded project, bleeding, prolonged labour, retained placenta and fever were reported as threatening conditions during the entire duration of pregnancy. In ten districts, where baseline study was conducted, no where the

Table III. Health Care Providers as Per Their Curriculum and Knowledge on Management of Eclampsia

Health providers	Curriculum	Knowledge
Community Midwives	Drugs to be taught include magnesium sulphate to be injected only as a loading dose in cases of impending eclampsia. ³⁹	An assessment by Technical Resource Facility on behalf of the Program finds 62% of CMWs do not know how to advise mothers or the management of mild preeclampsia, while 68% also did not know what action to take in the case of severe preeclampsia before referral. ⁴¹ Similar findings are made by a Population Council study in which only 19 CMWs knew how to administer $MgSO_4$ out of a total of 106. ⁴²
Nurses	Unit III includes pregnancy-induced hypertension (eclampsia and preeclampsia) under safe motherhood and its referral, while anticonvulsants are part of unit V. ⁴⁰	No study available

knowledge about three or more danger signs was found to be more than one-third, while in six districts it was even less than 10%.

Health Care Delivery System: Perhaps one of the most relevant study conducted to date is an unpublished work by Hafiz and Rizwan where they have used both qualitative and quantitative approaches to study the barriers to the use of MgSO₄ in Pakistan for the purpose of developing an informed policy. The review of findings from different studies conducted in Pakistan and those at which Hafiz and Rizwan arrived are arranged in table IV connecting levels of health care delivery system.

Addressing barriers to expand access to Magnesium Sulphate

The National Essential Drug List, first prepared by the Ministry of Health in 1994 in partnership with the World Health Organization and most recently revised in 2007, includes MgSO₄ as an essential drug at the primary, secondary and tertiary levels for the treatment of eclampsia and severe PET.⁴⁴ However, the status of the National Essential Drug List remains murky with the passing of the eighteenth amendment to the constitution whereby health is now a devolved subject and a prerogative with provinces. The province of Punjab has adopted the National Essential Drug List as it is

and sets itself the target of its yearly review, according to the needs of the population of Punjab, under the Punjab Health Sector Strategy for 2012 – 2020. One of the targets set under the Strategy for the revision of essential drug list is the inclusion of MgSO₄.⁴⁴ In view of the eighteenth amendment, provinces can start by adopting the national essential drug list or the World Health Organization's model list of essential drugs, both of which includes MgSO₄ and overtime revise it to their specific needs.

A study prepared for the United Nations Commission on Commodities for Women and Children's Health explores the current landscape and available evidence on the use of MgSO₄ identifies eight key areas where there are potential barriers and gaps.⁴⁵ These eight key areas have been summarized in table V. In addition to inclusion of magnesium sulphate in essential medicines lists in all provinces, there is also need for development (and endorsement by the provinces) of standard treatment guidelines, including protocols on administering the drug, according to different levels of health care delivery and health practitioners. Furthermore once the drug is included in the essential medicines, it will require quality control and quality assurance measures for both public and private sectors. This would then be the federal

Table IV. Bottlenecks for MgSO₄ at different levels of health care

Levels	Bottlenecks
Policy, Guidelines	Only one pharmaceutical company in Pakistan – Zafa – is manufacturing the medicine. The he dosage recommended in EmNOC is different from latest recommendations.
Procurement and Distribution	Procurement of MgSO ₄ is mostly dependent upon the demands by the Health Departments and is therefore reflective of policies of respective facilities rather than of a central procurement policy. The Provincial Medical Store Depot manages the acquisition, storage and distribution of medicines.
Cost and Production	MgSO ₄ is low-cost drug; does not have incentives for pharmaceutical companies to manufacture and not used for other purposes and thus has limited demand.
Dosage Regimen and Route	There is variation in dosage quantities and regimens at the facility level. The study found only one facility using internationally recommended regimen and that was because the obstetrician was trained on essential surgical skills and emergency maternal and child health.
Availability	The availability of drug is considerably less in Sindh and Balochistan and if available in other provinces then it is only at the level of teaching hospitals. The drug is usually unavailable in private hospitals but larger pharmacies in major cities do have available stock. Similar problems of availability exist for the antidote and local anaesthesia.
Training	Pharmacists do not have dosage preparation training and the dosage was prepared in obstetric departments. Clinical guidelines are not always followed and in some settings diazepam and magnesium sulphate is administered together making the treatment dangerous. Most of the hospital staff administering MgSO ₄ does not have training and knowledge of recommended protocols and guidelines.
Awareness and Practices of Health Professionals	At the teaching hospital level, while there is awareness of the usefulness of magnesium sulphate, health professionals are mostly using other anticonvulsants in which they have been trained. Knowledge regarding usefulness of the drug during severe preeclampsia is also limited. At the tertiary care level and below patients are being referred without any emergency management. There are no referral guidelines and health professionals.

Table V. Addressing The Barriers And Gaps to Expand Access to Magnesium Sulphate

Barriers / Gaps	Description
Policy	Inclusion of MgSO ₄ in the essential medicines lists of all provinces and regions and similarly development and endorsement, by the provinces, of standard treatment guidelines and protocols on administering MgSO ₄ .
Regulatory	Once registered, MgSO ₄ requires quality control and assurance measures within public and private sectors, such as quality testing and post-marketing surveillance.
Manufacturing	MgSO ₄ is rarely globally manufactured because of its low cost that leaves little profit-based incentive for pharmaceutical companies.
Supply Chain Mgt.	Earmark funds for the procurement of MgSO ₄ .
Demand by Providers	To ensure that health providers are prescribing MgSO ₄ , education and training are the keys here that strongly influence the quality and level of provider care as well as acceptable standards of practice.
Demand by Consumers	The staff trained in the use of MgSO ₄ , to shed any doubt about its utility and safety and to address the concerns that the hospitals might have about their reputation in the event of overdose and maternal deaths.
Information System	Implementation of a management information system (MIS) for logistics and to ascertain availability, accessibility, and appropriate use of the medicine.
Financing	To address health costs, apparent, hidden and financial barriers that may be prohibitive in providing or receiving treatment.

prerogative under the four subjects that remain within the purview of health's 'national roles'—information, regulation, international commitments, and several elements of policy. More specifically it would be the task of the Drug Regulatory Authority, whose bill has just been passed in the national assembly. As for its manufacturing, pharmaceutical companies will respond to demand from health facilities even if profit margins are thin. The manufacturing of drug could be made even more attractive for pharmaceutical companies by ensuring the widespread availability and appropriate utilization of affordable, ready-to-use "eclampsia treatment packs" for the administration of $MgSO_4$. Importantly, demand by health providers for $MgSO_4$ can only be increased if they are given adequate education and training, along with establishing standards of practice, for prescribing and administering $MgSO_4$. Side-by-side there is also a need to engage in a concerted communication with healthcare staff and with the management of health facilities to shed any doubts about drug's utility and safety. Their apprehensions in the event of overdose and maternal deaths need to be addressed.

There are several research studies that have come out with specific policy recommendations on the use of $MgSO_4$ in the context of Pakistan. These include, among others, a study by Siddiqui et al that comes to a conclusion that pharmacist, intervention in the management of pregnancy-induced hypertension is needed to prevent pregnant mothers from PET and eclampsia.⁴⁶ Amongst other studies, Fikree et al, found that with regards to

eclampsia, physical examination by nurses and doctors are mainly 'poor,' however management, especially among doctors, depicts a better trend reflecting the need to build the capacity of health care provider on the prognosis of the disease. Bhutta et al, made a recommendation on the basis that there is strong evidence of the benefits of $MgSO_4$ for the prevention and management of eclampsia, it should be included in the repertoire of management strategies in first-level health facilities.⁴⁷ Spurrett and Cook, while reviewing the management practices in the Asia-Oceania region, recommend that the use of traditional birth attendant is a resource that needs to be utilised.⁴⁸ In Pakistan, where two-thirds of the births are still administered in non-medical setting, role of traditional birth attendant cannot be ignored for improving maternal health in general and reducing maternal mortality in particular.

Areas for Further Research

While there seems to be a general consensus in the scientific community on its efficacy, existing evidence is inconclusive about the optimal regimen for the administration of $MgSO_4$ for the prevention and treatment of PET and eclampsia. A Cochrane review came to the conclusion that trials comparing alternative treatment regimens are too small for reliable conclusions.⁴⁹ Though, there is evidence that loading dose of $MgSO_4$ is a good alternative for standard Pritchard regimen as it avoids multiple painful injections of $MgSO_4$.⁵⁰ Although use of $MgSO_4$ is preferred to be through intravenous route, an alternative intramuscular

regimen has also shown effectiveness. Accordingly, this regimen advocates a loading dose of combined intravenous and intramuscular administration followed by four hourly intramuscular maintenance therapy.⁵¹ A study in Bangladesh has also shown that administration of a loading dose of MgSO₄ at the community level before referral to the hospital improved the maternal and perinatal outcomes of patients with eclampsia and PET at the hospital.⁵² A study conducted in India comparing the efficacy of low dose MgSO₄ (Dhaka) regime with the widely used Pritchard Regime in eclampsia found both to be equally effective. However, this study found that maternal and perinatal outcomes were better in low dose MgSO₄ (Dhaka) regime as compared to Pritchard regime.⁵³ In the context of Pakistan, any study that intends to look into preferable regimen for administering MgSO₄ will also have to explore acceptability and adaptability factors from the perspective of health practitioners.

Further research is needed to determine the effect of MgSO₄ on stillbirths when administered in pregnancies with hypertensive disorders. A study by Jabeen et al. arrived at a conclusion that antihypertensive and MgSO₄ supplementation for hypertensive disorders in pregnancy reduce morbidity and mortality associated with these disorders, however their role in reducing stillbirths is not clear for which further research is needed.⁵⁴ Administering prophylaxis for mild PET is controversial. American Congress of Obstetricians and Gynaecologists recommends MgSO₄ in severe PET only.⁵⁵ Anthony et al. came to a general conclusion

that though MgSO₄ is now the drug of choice for treating eclamptic patients, further studies are required to establish its role as a prophylactic agent in the prevention of eclampsia.⁵⁶ This has strong implications for Pakistan, especially when standardized, health practitioners' and referral guidelines are yet to be developed. Also, effects of MgSO₄ on maternal morbidity, or perinatal morbidity and mortality are still not clear.⁵⁷ Further research is needed for establishing the effectiveness of the drug not just for the expectant mothers but their newborns as well.

Conclusion and Policy Recommendations

Prevention of eclampsia in Pakistan remains a challenge. [The review has highlighted the need for preparation of standard national treatment guidelines that include Pakistan-specific standard of care and protocols needed for administering MgSO₄.](#) Guidelines developed by the World Health Organization and recommended through several best practices could be adapted. There is also a need for a shift to incorporate medical association, public health alliances, national programmes, civil society organisations, provincial and district governments, pharmaceutical companies and teaching hospitals in policy development and implementation. This will help make the drug a norm for the treatment and prevention of PET/eclampsia. In addition there is dire need to ensure uninterrupted supply of the drug together with its antidote. More suppliers should be encouraged to manufacture and supply the drug lo-

cally in ready-to-use injections with usage instructions in local language. A prefilled dosage available with pharmacists could also help in increasing the acceptability of the use of the drug by health practitioners. At the facility level, simplified protocols, referral guidelines, regular training and refresher courses of health staff will increase the use as well as efficacy of the drug. Training and material needs should be specific for different levels of healthcare delivery and the roles of the practitioners. Finally, simplified protocols that recommend standard dosage regimen and are available in one treatment box, will help health staff in non-teaching facilities to use MgSO₄. For Pakistan the commitment, to reduce high rate of maternal mortality, will be assessed by the extent low cost practice i.e. the use of MgSO₄, is integrated into existing clinical practice and procedures.⁵⁸

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She may reach a facility,
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