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CLINICAL ARTICLE

Use of magnesium sulfate for treatment of pre-eclampsia and eclampsia in Mexico

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ABSTRACT

Objective: To establish a baseline of magnesium sulfate utilization prior to publication of the updated 2006 technical guidelines on pre-eclampsia and eclampsia in Mexico, and to examine barriers to treating pregnant women with magnesium sulfate as perceived by maternal health experts. *Methods:* In collaboration with the Federal Ministry of Health, medical charts were reviewed for 87 maternal deaths due to hypertensive disorders that occurred in Mexico in 2005. Evidence was gathered on whether magnesium sulfate had been indicated or administered. In-depth interviews with experts were conducted to identify barriers to treatment utilization. *Results:* Magnesium sulfate had been used in 37.5% of severe pre-eclampsia and 47.7% of eclampsia cases. Thematic analysis of expert interview data revealed 4 primary barriers to the implementation of evidence-based guidelines and use of magnesium sulfate: lack of knowledge of magnesium sulfate, lack of acceptance, drug-related barriers, and insufficient monitoring or supervision. It was found that magnesium sulfate was not the treatment used for Mexican women who died of pregnancy-related hypertensive disorders in public facilities, and there was suboptimal implementation of evidence-based practices and official guidelines. *Conclusion:* The results highlight barriers to magnesium sulfate use, which constitutes a significant gap in treating women with eclampsia in Mexico.
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1. Introduction

Although significant progress has been made in reproductive and maternal health research in recent years, the translation of results into policy and practice has been slow-moving in many regions of the world [1]. Implementing evidence-based care is vital to advancing quality healthcare, and delays or barriers to implementation can result in severe health outcomes including maternal complications and/or death [1].

Although Mexico is an upper middle-income country [2], its maternal mortality ratio (MMR) is unacceptably high. In 2005, Mexico had a total of 2 010 250 births and the MMR was 61.8 per 100 000 live births [3]. In 2010, this number had dropped to 51.5 per 100 000 live births [4]. To achieve Millennium Development Goal 5 (MDG 5), aimed at reducing the MMR in low-resource countries by three-quarters between 1990 and 2015, Mexico must reduce maternal mortality further to 22 deaths per 100 000 live births [5].

In Mexico, the obstetric emergencies leading to the greatest proportion of deaths (25%) are hypertensive disorders including pre-eclampsia, eclampsia, and HELLP (hemolysis elevated liver enzymes and low platelets) syndrome [4]. The exact pathogenesis of pre-eclampsia is largely unknown, but clinical hallmarks include sustained elevated blood pressure (in previously normotensive women) and excess urine protein after 20 weeks of gestation [6]. Eclampsia, along with seizures associated with pre-eclampsia, can permanently damage vital organs and, if untreated, can result in coma, brain damage, or maternal and/or newborn death [7]. Pre-eclampsia and eclampsia can also develop during the postpartum period, up to 4 weeks after delivery [8].

Large randomized controlled trials, including the 2002 "Magpie trial," demonstrated that seizures due to pre-eclampsia or eclampsia can be significantly reduced with adequate administration of magnesium sulfate [9–14]. The WHO recommends magnesium sulfate as the most effective, safe, and low-cost anticonvulsant treatment for severe pre-eclampsia or eclampsia [15]. In 2006, the Mexican Ministry of Health (MOH) updated its technical guidelines on the Prevention, Diagnosis and Treatment of Pre-eclampsia/Eclampsia. These guidelines list magnesium sulfate as the primary drug of choice for prevention of (recurrent) seizures, and the use of phenytoin or phenobarbital is recommended only when magnesium sulfate is unavailable [16]. Magnesium sulfate was included in the Mexican National Essential Drug List in 2006 [17], and guidelines and supplies were distributed nationwide at all levels of care and to providers at public facilities trained in its use.

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In response to a call to action in 2008 to scale-up the use of magnesium sulfate for the treatment of eclampsia and severe pre-eclampsia [7], the aim of the present study was to review maternal mortality records in Mexico in order to establish a baseline history of magnesium sulfate use prior to publication of the updated 2006 technical guidelines on pre-eclampsia and eclampsia in Mexico, and to identify perceived barriers to treating pregnant women with magnesium sulfate when it is clinically indicated.

2. Materials and methods

In a quantitative study to establish a baseline of magnesium sulfate utilization prior to 2006, the records of maternal mortality in 2005, listed by the Federal MOH according to cause of death, were reviewed. In addition, in a qualitative study in-depth interviews with key Mexican maternal health experts were conducted to identify perceived barriers to treating pregnant women with magnesium sulfate. The analyses were carried out in compliance with the ethical procedures of the Federal MOH and were exempt from full committee review by the Population Council Institutional Review Board because they involved secondary data analysis.

The Federal MOH records included death certificates, clinical summaries and/or patient charts (frequently from different medical facilities), and administrative documents not included in the present analysis. Researchers from the Population Council and staff from the Federal MOH jointly reviewed the maternal mortality records. An epidemiologist obtained hard copies of records and researchers extracted relevant variables and entered them into an Excel 2007 spreadsheet (Microsoft, Redmond, WA, USA).

The timeframe for relevant information in the record was taken from the first mention of hypertensive disorder-related symptoms (listed in the Mexican guidelines to include hypertension, proteinuria, severe headache, edema, blurred vision, and/or photopsia) to death. Data were gathered on sociodemographic characteristics, reproductive history, healthcare facilities where the women went on the initial date of medical recognition of symptoms, and facility type (primary care health centers, state-level MOH hospitals, IMSS [Mexican Institute of Social Security] hospitals, ISSSTE [Institute for Social Security and Services of State Employees] hospitals, Federal MOH hospitals, and private hospitals).

From records at the hospital of death, data were abstracted on 2 main objective symptoms—clinical hypertension and proteinuria—which were classified according to technical guidelines in accordance with international classifications [16,18]. Information was gathered on the main clinical diagnosis, anticonvulsant treatment (dose, administration route, and presence and/or management of adverse effects to magnesium sulfate), the time between diagnosis and magnesium sulfate administration, and whether the woman was treated in an intensive care unit (ICU).

Women diagnosed with HELLP syndrome without mention of pre-eclampsia or eclampsia were classified as having severe pre-eclampsia. Women diagnosed with pre-eclampsia without mention of severity (mild or severe) were classified as having severe pre-eclampsia. This assumption was considered to be reasonable given that all of the women died from hypertensive disorders. Data not found in the records were considered "not recorded." Patient identifiers were kept blind, and each record had a unique ID code. Nevertheless, investigators were required to fully describe the procedures used for ensuring confidentiality of medical record information.

For the qualitative study, in-depth interviews were conducted with key maternal health experts working at public health facilities in urban and rural areas, with researchers, and with obstetricians and gynecologists. Individuals involved in drafting the eclampsia and pre-eclampsia guidelines were first recruited; others were then selected through snowball sampling. All participants lived in Mexico City, participated willingly, and provided informed consent.

Interviews were conducted by trained interviewers in a private setting, were audio-recorded, transcribed, and deleted after the analysis was completed. The interview guide included questions on the use of evidence-based practices, adherence to technical guidelines, and gestational use of magnesium sulfate or other anticonvulsants. Transcripts were analyzed by manual content analysis according to broad predefined themes; saturation of themes was achieved because most key issues were echoed among participants.

Data are presented as number (percentage). Data were analyzed via SPSS version 14.0 (IBM, Armonk, NY, USA).

3. Results

In 2005 there were 1242 records of maternal death, of which 322 were due to pregnancy-induced hypertension (ICD-10 codes O10–O16). Of these, a sample of 101 records was analyzed. Records that lacked a clinical summary and patient chart (14%) were subsequently excluded, leaving a final sample of 87 records from 20 of the 32 states in Mexico (Table 1).

The mean age of women in the sample was 28 years (range, 15–44 years), and almost half (45.9%) were between the ages of 20 and 29 years. More than one-third (36.8%) died during their first pregnancy or delivery. Most received prenatal care, and 40.2% reported 3 or more prenatal care visits (Table 1).

Once hypertensive disorder-related symptoms developed, 55 women (63.2%) were seen in at least 1 other facility before being admitted to hospital and eventually dying. Twenty-two women visited 2 other facilities, and 3 women visited 3 or more before being admitted to the hospital where they eventually died (data not shown). Table 2 summarizes the women's clinical variables recorded at the hospital where they died. Among the 87 women, 7 died at home or on the way to hospital. Among the remaining 80 women, 49.4% were treated at a state-level MOH hospital and 21.8% at an IMSS hospital. In the facilities, 26.4% of the records did not include a report of blood pressure and 65.5% lacked urine test results. For 27.6% of women, severe pre-eclampsia was diagnosed; and for 50.6%, eclampsia was diagnosed.

Table 3 describes the use of magnesium sulfate and other anticonvulsants per diagnosis of pregnancy-induced hypertension. Of the 24

Table 1
Obstetric characteristics of women who died due to pregnancy-induced hypertension in Mexico in the year 2005 (n = 87).

Characteristic	No. (%) of women
Age, y	
15–19	12 (13.8)
20–24	21 (24.1)
25–29	19 (21.8)
30–34	16 (18.4)
35–39	14 (16.0)
≥40	5 (5.7)
Previous pregnancies	
0	32 (36.8)
1–2	29 (33.3)
>2	25 (28.7)
Not recorded	1 (1.1)
Gestational age, wk[a]	
20–29	8 (9.2)
30–37	48 (55.2)
38–42	26 (28.9)
Postpartum period	2 (2.3)
Not recorded	3 (3.4)
Number of prenatal care visits	
0	18 (20.7)
1–2	22 (25.3)
3–5	25 (28.7)
≥6	10 (11.5)
Not recorded	12 (13.8)

[a] When first diagnosed with hypertensive disorder.

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