THE EVIDENCE

www.evidencejournals.com

Research Article | Maternal and Child Health

Check for updates

Knowledge and practices of midwives on the administration of magnesium sulfate to pre-eclamptic or eclamptic women in a district level hospital in northern region of Ghana

Abdulai Abubakari[1], Balkisu Seidu[2], Adisa Osman[2], Abdulmalik Abdulai[2], Suraya Malle Mohammed[2], Fatimata Yakubu[2], Delilah Nonterah[2], Mohammed Mutawakil Ibrahim[2], Mohammed Abdulai Kojo[3], Mubarick Nungbaso Asumah[2*]

[1] Department of Global and International Health School of Public Health, University for Development Studies, Tamale, Northern Region, Ghana.
[2] Ministry of Health, Nurses and Midwives Training College, Tamale, Northern Region, Ghana.
[3] College of Nursing and Allied Health Sciences, Nalerigu, Northeast Region, Ghana.

*Correspondence:nungbaso.asumah@uds.edu.gh

evidence Journals

Cite this Article

Abubakari A, Seidu B, Osman A, Abdulai A, Mohammed SM, Yakubu F, Nonterah D, Ibrahim MM, Kojo MA, Asumah MN, Knowledge and practices of midwives on the administration of magnesium sulfate to pre-eclamptic or eclamptic women in a district level hospital in northern region of Ghana. The Evi. 2024:2(3):1-1.
DOI:10.61505/evidence.2024.2.3.100
Available From https://the.evidencejournals.com/index.php/j/article/view/86

Received:	2024-07-31
Accepted:	2024-09-15
Published:	2024-10-05

Evidence in Context

• 53.5% of midwives had good knowledge of MgSO4 administration. • 64.9% had experience administering MgSO4, influenced by age, experience, and workplace. • Only 26.3% correctly identified the antidote (calcium gluconate). • 89.5% received training, yet adherence to protocols was limited. • Recommendations include regular training and better system support.

To view Article

Abstract

Background: There is increasing evidence that magnesium sulfate (MgSO4) is widely recognized as the preferred medicine for preventing and treating pre-eclampsia/eclampsia. Several investigations have shown that one of the obstacles to the successful use of MgSO4 is the limited understanding of midwives about its administration. This study aims to assess midwives' knowledge and practice of magnesium sulfate administration to pre-eclamptic pregnant women in the Tamale West hospital. Methods: A total of 114 midwives were selected for the research using a process of simple random selection. The research used observational descriptive study with cross sectional study design. The data was analyzed using descriptive statistics via the use of SPSS version 26. Chi-square test was used to compare categorical variables, and a p-value less than 0.05 was deemed statistically significant. Results: A total of 114 respondents were recruited in this study. The minimum and maximum ages were 21 and 41 years, respectively. All midwives have heard about MgSO4. The majority of respondents (43.9%) have heard about magnesium sulfate from tutors/lecturers, 24.6% from other sources, 17.5% from the media (TV, Radio& Internet), and 14% from colleagues. More than half of the respondents (53.5%) had good knowledge of respondents on MgSO4 administration. The majority of the respondents (64.9%) have administered magnesium sulfate. The specific role of the midwives in preventing MgSO4 toxicity includes Calling a colleague (24.3%), giving an antidote (45.9%), regular BP monitoring (52.7%), and urine output and protein (55.4%). Also, 71.1% of the respondents prefer other medications for managing eclampsia. The research found a strong statistical correlation between the administration of MgSo4 and age (p=0.031), years of experience (p=0.001), and workplace (p=0.009). Conclusion: Most of the responders had understanding of magnesium sulfate dosage. Additionally, some midwives reported to have administered MgSO4 to their patients in the past. The research found a substantial statistical correlation between the administration of MgSo4 and factors such as age, years of experience, and workplace.

Keywords: *Knowledge, practices, midwives, Magnesium Sulfate, Pre-eclampsia, eclampsia, administration*

Introduction

Eclampsia is a significant contributor to both perinatal and maternal morbidity and death on a global scale [1]. Approximately 50,000 maternal fatalities worldwide, mostly in poor and middle-income nations, have been linked to eclampsia [2,3]. Pre-eclampsia and eclampsia are conditions characterized by high blood pressure during pregnancy and delivery. They affect 4.6% and 1.4% of women, respectively, according to a study by Njukang et al.,[4]. Preeclampsia is distinguished by elevated blood pressure, proteinuria, and, in advanced stages known as eclampsia, seizures that pose a life-threatening risk to both mothers and infants [5]. Hypertensive disorders rank second as the primary cause of maternal mortality, contributing to 14% of maternal fatalities [6,7]. Nevertheless, the exact impact remains uncertain in several low- and middle-income countries (LMICs) due to inadequate identification and documentation of these circumstances.

MgSO4 is endorsed by the World Health Organization (WHO) as a recommended treatment for women suffering from severe pre-eclampsia/eclampsia [6]. Its effectiveness has been demonstrated in significant clinical trials[8–10]and meta-analysis [6]. Administering magnesium sulfate to women with pre-eclampsia reduces their chance of developing eclampsia by 50% [8], and decreases their risk of mortality by more than 50% [6]. MgSO4 is an economical and secure substance that has been included on the World Health Organization's Essential Medicines list [11]. The current advice by the WHO for severe pre-eclampsia/eclampsia is to provide a complete regimen intravenously or intramuscularly. This includes an initial loading dose and subsequent maintenance doses over 24 hours [11]. It is advised that women be closely observed for indications of magnesium toxicity during the intervals between doses. Consequently, it is suggested that MgSO4 be delivered at healthcare institutions that possess sufficient personnel and clinical resources for monitoring purposes[12]. Researchers are now assessing several dose schedules for MgSO4[13].

Approximately 10% of pregnancies are affected by hypertension, particularly in women over the age of 35 and those carrying multiple fetuses[11]. The adverse consequences of this disorder include uteroplacental insufficiency, intrauterine growth restriction, placental abruption, premature birth, fetal distress, thrombocytopenia, and heightened susceptibility to developing chronic lung disease. Preeclampsia may lead to convulsions, which is why it is referred to as eclampsia[11]. Eclampsia has the potential to be lethal, particularly when it is accompanied by disseminated intravascular coagulation and multiple organ failure. Complications might occur as a result of the illness itself or the medications used to treat the condition.

Efficiently managing pre-eclampsia/eclampsia (PE/E) is a crucial aspect of Emergency Obstetric and Newborn Care (EmONC) that aims to prevent and promptly address complications, thereby reducing maternal and newborn mortality [14]. This effort aligns with the achievement of the Sustainable Development Goal 3. Various evidence-based methods have been used throughout the years to prevent and manage PE/E [7, 15]. Subsequent evidence has accumulated to support the use of magnesium sulfate as the preferred medicine for the prevention and treatment of preeclampsia and eclampsia [16]. In addition to its high efficacy, this treatment is also well-tolerated, safe, and reasonably affordable, costing just US$5 per patient [17–19].

Research studies have shown that the likelihood of eclampsia is reduced by 50% when individuals with severe pre-eclampsia get treatment with MgSO4[15].

Research done in Ghana found that pregnancy-induced hypertension, known as pre-eclampsia, accounted for 8.9% of maternal deaths[20]. Intensively trained midwives play a significant role in properly managing preeclampsia by administering the medication (MgSO4) and regulating seizures [21].

Although data supports the safety and effectiveness of using MgSO4 to control PE/E, its use remains limited in many healthcare institutions in low-income countries [6, 7, 22]. Prior research has identified several factors that contribute to the limited utilization of MgSO4 in the treatment of PE/E. These factors include the absence of appropriate treatment guidelines, the misconception that its use is limited to highly specialized clinical settings such as intensive care units, and the inadequate training of healthcare professionals in its safe administration.

In several Low- and Middle-Income Countries (LMIC), there is a suspicion that MgSO4 is significantly underutilized [23] Regrettably, there is a dearth of knowledge on the precise hurdles within the health system that impede the ideal use of this treatment, which has the potential

To save lives, in Ghana (Research has shown that a lack of information among midwives about the proper administration of MgSO4 is a significant obstacle to its efficient usage [24]. During a round table discussion in February 2023, several non-governmental organizations, and stakeholders with an interest in maternal and child health identified the primary reasons for the inadequate adherence to MgSo4 as the insufficient knowledge and practices among midwives, as well as the negative attitudes shown by midwives. Although there are evident problems with the administration of MgSo4, many institutions lack documented evidence of following the protocol.

However, no study has been conducted to evaluate the knowledge and practices regarding the administration of MgSO4 at the Tamale West hospital in the northern region of Ghana. This study aims to evaluate the knowledge and practices of midwives at the Tamale West hospital, who have important responsibilities in patient care. The study also aims to determine how this information can be utilized to enhance the current management of pre-eclampsia and eclampsia in hospitals across the country.

Methods and material

Study setting

The research was carried out at the Tamale West hospital. The Tamale West hospital was established in April 1998 as a polyclinic. In the same year, it was elevated to the rank of a district hospital. Currently, it functions as a referral hospital for the health facilities in the Tamale Metro sub-district. The facility offers round-the-clock services and consists of seven operational wards: male, maternity, labour, emergency, children, female, and surgical wards.

Study design

The study design used was observational, descriptive study design with a cross-sectional type with a specific emphasis on the quantitative method. The cross-sectional approach was used to enable the gathering of data simultaneously from two distinct locations, facilitating the assessment of disparities in research variables and data among groups including individuals of diverse ages or developmental stages[25].

Study population

The study population includes only midwives in the Tamale West hospital in the northern region of Ghana.

Inclusion & exclusive criteria

The inclusion criteria included midwives, working in the Tamale West hospital, who are willing to participate in the study. Eligible midwives who did not provide consent for the study and mothers whose are sick at the time of this study were excluded.

Sample size determination.

Using data from the hospital end-of-year report (2023), the total population of midwives is 158. The total sample size is obtained from the total population using Taro Yamane's simplified formula [26], that is,

. n = $N/1 + N (e)^2$

Where N = The total population of midwives (158)

. n = The desired sample size

. e = Margin of error (set at 5%)

Confidence interval = 95%

Sample size, n = $158/1+158 (0.05)^2$

= 158/ 1+158(0.0025)

= 158/1.395

= 113.4

= 114

Hence, the total sample size for the study is 114.

Sampling procedure

The study used simple random sampling to recruit the midwives. At the facility, a list of all midwives was collected from the health administration unit of each facility. Using Microsoft Excel, the list of all midwives was randomized, and the first 114 names were considered. However, where the midwives in the first 114 names were on leave, sick, or refused to participate in this study, those names were replaced with one of those outside the 114^{th} name after randomization.

Data collection tools and techniques

Questionnaires were utilized to collect data. The questionnaire was constructed using a variety of materials, including items based on literature relating to this topic[7, 27]. The questions used a combination of open-ended and close-ended formats. The questionnaire was organized according to the precise objectives of the research.

Data collection procedures

Data from respondents was obtained using a standardized questionnaire. All participants had literacy skills and were provided with a questionnaire to complete and submit at a later time. Before engaging in this research, both oral and written were obtained from the Medical Superintendents, Matrons, and Unit heads of the Tamale West hospital before the collecting of data. Each chosen unit's responders were provided with a concise explanation of the research and its methodology.

After the brief, balloting was done. Those who picked 'yes" were recruited in this study. Before administering, respondents are required to give oral and written consent first.

The questionnaire was converted into a digital format using Kobotoolbox. To maintain the accuracy and reliability of the replies, the questionnaire was specifically developed to restrict each responder to submitting just a single input with only three questions being open ended. The questionnaire was sent to participating midwives over WhatsApp, email, and text messages. To assist participants who did not have smartphones, a temporary smartphone was given to them to enable them to respond. Once they had completed their answer, the device was then returned to the enumerator.

Data analysis and presentation

To remove duplicate entries and incorrect data, the data was manually corrected. Following data cleaning in Microsoft Excel the Scientific Package for Social Sciences (SPSS) version 26.0 was used to code and do statistical analysis on the data. Graphs, percentages, and frequency tables were used to show the data. To characterize the data, we utilized the mean and standard deviation. Chi-square test was run to identify the association between socio-demographic characteristics and ever administered MgSo4 to a patient. A p-value of 0.05 or below (0.05) is regarded as statistically significant.

Results

Socio demographics characteristics

The study surveyed 114 respondents with an average age of 28.4 years. Most were older than 25 years (66.7%), and the majority were female (93.9%). Regarding marital status, 65.8% were married. In terms of professional experience, 66.7% had three or more years of experience. Only 5.3% worked part-time at another health facility. The professional ranks were mostly Staff Midwives (46.5%), followed by Senior Staff Midwives (36%) and Midwifery Officers (17.5%). Most of the respondents (46.5%) worked in the Antenatal Care (ANC) (Table 1).

Table 1: Socio-demographic characteristics of the respondents

Variable	Category	Frequency(n)	Percentage (%)

Age			
	≤ 25 years	38	33.3
	>25 years	76	66.7
	Minimum		21
	Maximum		41
	Mean ± SD		28.4 ± 5.7
Sex			
	Female	107	93.9
	Male	7	6.1
Marital status			
	Married	75	65.8
	Single	39	34.2
Experience category			
	< 3 years	38	33.3
	≥ 3 years	76	66.7
	Minimum		1
	Maximum		9
	Mean ± SD		3.6 ± 1.8
Do you do part-time work in another health facility?			
	Yes	6	5.3
	No	108	94.7
Ranks of staff			
	Staff Midwives (SM)	53	46.5
	Senior Staff Midwives (SSM)	41	36
	Midwifery Officers (MO)	20	17.5
Unit you worked			
	Antenatal Care (ANC) Unit	53	46.5
	Maternity Ward	36	31.6
	Labor Ward	9	7.9
	Other Units	16	14

Level of knowledge of midwives on magnesium sulfate administration

All respondents were aware of $MgSO_4$, with the majority (43.9%) having heard about it from tutors or lecturers. The primary recognized use of $MgSO_4$ was for the treatment of eclampsia (42.1%), with a significant portion (41.2%) acknowledging its use for treating pre-eclampsia, pregnancy-induced hypertension, and eclampsia. Most respondents (82.5%) were aware of

The loading and maintenance doses of MgSO4, with 69.1% identifying the correct loading dose of 14 grams and 44.7% recognizing the correct maintenance dose of 5 grams. Intravenous injection was the preferred route for the loading dose (54.3%), while intramuscular injection was preferred for the maintenance dose (56.4%). The common interval between successive doses was 4 hours (79.8%).

Regarding the side effects of MgSO4, 48.2% of respondents mentioned visual changes, followed by muscular paralysis (22.8%) and sweating (15.8%). Knowledge of the antidote for MgSO4 varied, with 47.4% incorrectly identifying potassium chloride as the antidote, while 26.3% correctly identified calcium gluconate. In terms of nursing considerations, the majority (66.7%) emphasized the importance of monitoring blood pressure, pulse, and respiration hourly. The study highlights the need for improved education on MgSO4 among healthcare professionals to ensure accurate knowledge and safe administration practices(Table 2).

Table 2: Level of knowledge of midwives on magnesium sulfate administration

Variable	Category	Frequency(n)	Percentage(%)
Heard of MgSo4 medication			
	Yes	114	100
Source of information			
	Tutors/Lecturers	50	43.9
	Other Sources	28	24.6
	Media (TV, Radio & Internet)	20	17.5
	Colleagues	16	14
Uses of Mgso4 medication			
	Treatment of Eclampsia	48	42.1
	Prevention of Pre-eclampsia	14	12.3
	Treatment of Pregnancy-Induced Hypertension	5	4.4
	Treatment of Pre-eclampsia, Pregnancy-Induced Hypertension, and Eclampsia	47	41.2
Are you aware there is a loading dose and maintenance load?			
	Yes	94	82.5
	No	20	17.5
How much in grams constitutes the loading dose (n=94)			
	10g	21	22.3
	14g	65	69.1
	20g	2	2.1
	4g	3	3.2
	5g	3	3.2
Which route of drug administration is employed for administering			
	All of the above	11	11.7

	Intramuscular injection'	32	34
	Intravenous injection	51	54.3
How much in grams constitutes the maintenance dose			
	10g	40	42.6
	14g	8	8.5
	20g	4	4.3
	5g	42	44.7
Which route of drug administration is employed for administering			
	All of the above	18	19.1
	Intramuscular injection'	53	56.4
	Intravenous injection	23	24.5
What is the interval between successive doses?			
	12 hours	8	7
	4 hours	91	79.8
	6 hours	5	4.4
	8 hours	10	8.8
Knowledge of participants regarding the antidote of MgSo4			
	All of them	24	21.1
	Calcium gluconate	30	26.3
	Don't know	6	5.3
	Potassium chloride	54	47.4
Participant knowledge regarding the main nursing consideration for monitoring			
	All of the above	6	5.3
	Four hourly tests of urinary protein	8	7
	Monitoring hourly blood pressure, pulse, and respiration	76	66.7
	One hourly urine measure	24	21.1
Knowledge about the Side Effects of MgSO4			
	Visual Change	55	48.2
	Muscular Paralysis	26	22.8
	Sweating	18	15.8
	Depressed Reflexes	12	10.5
	Loss of Patellar Reflexes	3	2.6

Overall knowledge of respondents

Overall, more than half of the respondents (53.5%) had good knowledge of respondents on MgSO4 administration and 46.5% of the respondents had poor knowledge of MgSO4 administration (figure 1).

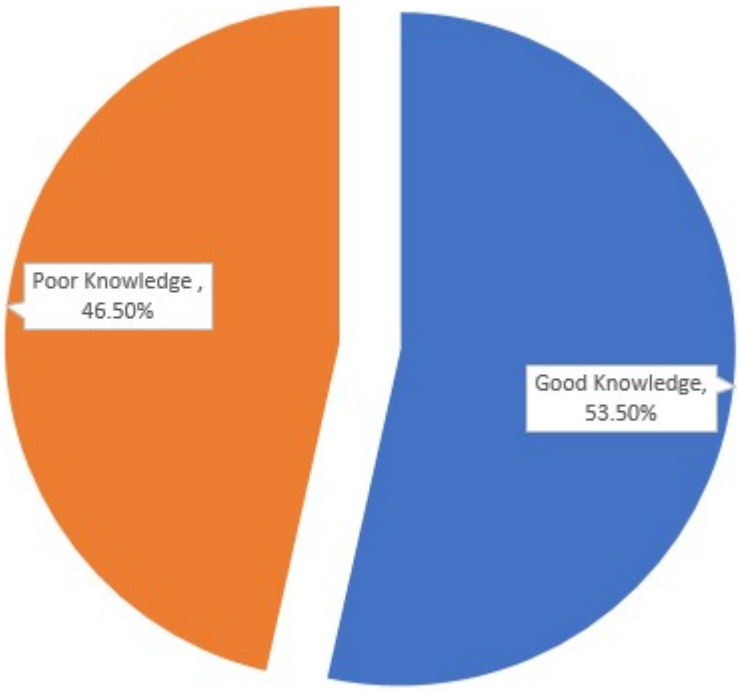

Figure 1: Overall knowledge of MgSO4 administration.

The practice of magnesium sulfate administration to pre-eclamptic eclamptic pregnant women

The majority of respondents (64.9%) have administered magnesium sulfate, with 53.5% following the protocols for administration. Among those, 54.1% documented all doses, and 55.3% observed an improvement in patient condition. Strategies to prevent magnesium sulfate toxicity included calling a colleague (24.3%), administering an antidote (45.9%), regular blood pressure monitoring (52.7%), and monitoring urine output and protein levels (55.4%). Reported side effects included breathing problems (33.3%), confusion (28.6%), diarrhea (33.3%), heart attack (38.1%), pain at the injection site (11.9%), redness and hardening (38.1%), and swelling (11.9%). These findings highlight the importance of adherence to protocols and vigilant patient monitoring to manage adverse effects(Table 3).

Table 3: Practice of magnesium sulfate administration to pre-eclamptic eclamptic pregnant women

Variable	Category	Frequency(n)	Percentage(%)
Have you administered magnesium sulfate?			
	Yes	74	64.9
	No	40	35.1
Did you follow the protocols for administering MgSo4?			
	Yes	61	53.5
	No	53	46.5

If you followed the protocols, do you document all the doses (n=53)		
Yes	33	54.1
No	28	45.9
Did the patient's condition get better		
Yes	63	55.3
No	51	44.7
Did the patient with whom you have the MgSo4 exhibit any signs and symptoms		
Yes	42	36.2
No	72	63.2
What specific role did you play in preventing the patient from MgSo4 toxicity (n=74)		
Called a colleague	18	24.3
Gave an antidote	34	45.9
Regular BP monitoring	39	52.7
Urine output and protein	41	55.4
Side effect after MgSo4 administration		
Breathing problems	38	33.3
Confusion	32	28.6
Diarrhea	38	33.3
Heart attack	43	38.1
Pain at the site of injection	13	11.9
Redness and hardening	43	38.1
Swelling	13	11.9

Association between socio-demographic characteristics and every administration of MgSo4

The study established a significant statistical association between ever administering MgSo4 and age (p=0.031), years of experience (p=0.001), and where you work (p=0.009) (Table 4).

Table 4: Association between sociodemographic characteristics and every administration of MgSo4

			Ever administered MgSO4		
Variable	Category	Frequency(N)	Yes (74)	No (40)	P-value
Age					
	≤ 25 years	38	19(50.0%)	19(50.0%)	P=0.031
	>25 years	76	55(73.4%)	21(26.6%)	
Sex					
	Female	107	72(67.3%)	35(32.7%)	P=0.079

	Male	7	2(28.6%)	5(71.4%)	
Marital status					
	Married	75	43(57.3%)	32(42.7%)	P=0.545
	Single	39	31(79.5%)	9(20.5%)	
What is your rank					P=0.058
	MO	23	13(56.5%)	10(44.5%)	
	SM	53	31(58.5%)	22(41.5%)	
	SSM	38	30(78.9%)	8(21.1%)	
Experience category					P=0.001
	<3 years	38	26(68.4%)	12(31.6%)	
	≥ 3 years	76	48(62.2%)	28(38.8%)	
Which do you work					P=0.009
	ANC	53	28(52.8%)	25(47.2%)	
	Labor	9	4(44.4%)	5(55.6%)	
	Maternity	36	28(77.8%)	8(22.2%)	
	Others	16	14(87.5%)	2(12.5%)	
Do you do part-work in another health facility					P=0.173
	YES	6	2(33.3%)	4(66.7%)	
	NO	108	72(66.7%)	36(33.3%)	

Factors influencing the use of magnesium sulfate in pre-eclampsia/eclampsia management among midwives

The data reveals that a significant majority of respondents (71.9%) confirm that magnesium medication is covered by the National Health Insurance Scheme (NHIS) and is readily available in their hospital (69.3%). Most respondents (72.8%) believe that patients' relatives can afford the medication. However, 78.1% of respondents think that some colleagues face challenges in administering magnesium sulfate. A notable 89.5% of respondents have received training on its administration, with the majority receiving this training quarterly (49.0%). Despite the availability of training, 71.1% of respondents prefer alternative medications for managing eclampsia (Table 5).

Table 5: Factors influencing the use of magnesium sulfate in pre-eclampsia/eclampsia

Variable	Category	Frequency(n)	Percentage (%)
Is magnesium medication covered by NHIS?			
	Yes	82	71.9
	No	32	28.1
Is it always available for use in the hospital?			
	Yes	79	69.3
	No	35	30.7
Are patients' relatives able to pay for the services of MgSo4?			

Yes	83	72.8
No	31	27.2
Do you think some of your colleagues have difficulty administering MgSo4?		
Yes	89	78.1
No	25	21.9
Have you been trained in the administration of MgSo4?		
Yes	102	89.5
No	12	10.5
How often are you trained in the administration of MgSo4?		
Bi-annually	37	36.3
More than a year	8	7.8
Quarterly	50	49.0
Yearly	9	8.8
Do you prefer other medications for managing eclampsia?		
Yes	81	71.1
No	33	28.9

Discussion

This research focuses on assessing midwives' knowledge and practice of section administering magnesium sulfate to pre-eclamptic pregnant women in the Tamale West hospital. In this section, the findings of this study are compared with previous literature.

Most of the respondents (43.9%) have heard about magnesium sulfate from tutors/lecturers. The findings are related to another places where schools or tutors are regarded as the main source of information among health workers[28, 29]. This is because all these midwives might have learned about how to manage through school where tutors or lecturers deliver lectures. Also, in situations where workshops are organized, it is the same teachers who would deliver the presentations. This therefore explains the reason for a high number of the respondents' choosing tutors or lectures as their main source of information.

Interestingly, the majority of the respondents (82.5%) were aware of the loading dose and maintenance load for MgSo4. Magnesium sulfate is recommended*as the first-line medication for prophylaxis and treatment of eclampsia[10, 30, 31]*. Therefore, the midwives need to understand how to administer this medication without further injuring the patient. The most common side effects of an overdose of MgSo4 include flushing, nausea, headache, generalized muscle weakness, and diplopia. To prevent all these ailments, the midwives ought to know the right dosage at all stages of MgSo4 therapy. Despite, less than half getting information about mgso4 via tutors, the majority knew that there was loading and maintenance dose. This means that varied sources can be used to achieve a high level of awareness among midwives regarding MgSo4. That said, given that the majority understands MgSO4 loading and maintenance dose it means that issues of magnesium toxicity can be prevented.

As mentioned above, the majority of the respondents (69.1%) knew that the loading dose of MgSo4 was 14g. This shows that a majority of the respondents would achieve a higher success story with their MgSo4 administration. The loading dosage is often administered via both the intramuscular and intravenous methods. The typical intramuscular treatment consists of an initial 4 g dosage given intravenously, followed immediately by a 10 g dose administered intramuscularly,

And then a further 5 g dose administered intramuscularly every 4 hours, alternating between the buttocks [32]. The intravenous regimen consists of an initial dosage of 4 grams, followed by a continuous infusion of 1 to 2 grams per hour using a regulated infusion pump. A loading dosage is required because around 40% of magnesium in the plasma is bound to proteins [30, 32, 33]. The free magnesium ion undergoes diffusion into the extravascular-extracellular space, bone, placenta, fetal membranes, fetus, and amniotic fluid. The apparent volumes of distribution in pregnant women often stabilize during the third and fourth hours after administration, with values ranging from 0.250 to 0.442 L/kg[10, 34]. From the foregoing, it is essential to give the loading so the medication can achieve its desired therapeutic function. It is therefore astonishing that almost 40.0% of the respondents do not know about the loading dose, which means these respondents when asked to administer MgSo4 were likely to do so but would not achieve a therapeutic function of the drug. From above, it is necessary to organize more in-service training for all health workers especially the midwives to be brought to speed on the administration of MgSo4.

Despite, the seemingly 100.0% awareness about MgSo4, only 26.3% knew that calcium gluconate was the antidote for MagSO4. This observation is supported by relevant research, which reveals that the antidote for magnesium poisoning is calcium gluconate 1 g IV over 3 minutes[35]. Repeat dosages may be required. Calcium chloride may also be used as an alternative to calcium gluconate. The recommended dosage of calcium chloride for magnesium poisoning is 500 mg of 10% calcium chloride IV over 5-10 minutes. In the present study, we do not explore whether these medications are readily available [36]. As such, we are suggesting that further researchers consider this area for more exploration. Indeed, knowing the antidote without its being available is tantamount to nothing.

Over half of the midwives (53.5%) had good knowledge of respondents on MgSO4 administration. This is consistent with a study that reports that an adequate level of Knowledge about pregnancy-related disorder (Preeclampsia) contributes greatly to its management, prevention, and control[37]. Furthermore, insufficient understanding among healthcare practitioners plays a critical role in the delayed decrease of maternal morbidity and death caused by pre-eclampsia in underdeveloped countries [38]. Contrary to these results, Chikalipo et al. [27] found that respondents had a limited degree of understanding of MgSo4 administration. Participants believed that providing and monitoring magnesium sulfate was a rigorous intervention that required sufficient knowledge, attitude, and abilities. Midwives reported a perceived lack of expertise, ability, resources, and standardized protocols for medication delivery and monitoring.

The majority of respondents (64.9%) has previously given magnesium sulfate. In contrast to this research, Olaoye et al.[39] found that midwives had inadequate treatment practices for pre-eclampsia in terms of proper medicine, route, and dose. Another study found that diazepam is favored in the treatment of severe preeclampsia and eclampsia[14].

Following the administration of MgSo4, several responders reported unpleasant effects. This has affected the usage of mgso4 in the treatment of eclampsia. Fear of problems or adverse events from MgSO4 might diminish trust in its safety and create hurdles to its usage. Some practitioners were scared, hesitant, or apprehensive about utilizing MgSO4 due to the perceived risk of adverse outcomes (e.g., maternal respiratory arrest, and mortality)[7, 10]. This concern was heightened when clinicians were in danger of being held responsible for adverse occurrences (high confidence) [7, 23]. Providers' worry, caution, and concern were mostly motivated by the anticipated danger that complications might cause damage or death. Some clinicians maintained persistent misconceptions regarding MgSO4's "toxicity". Some anxieties were based on personal experience [40, 41]. Fears may make caregivers feel inadequate or concerned about utilizing MgSO4, leading to hesitancy or avoidance [42].

The research found a statistically significant link between ever administering MgSo4 and age ($p=0.031$), years of experience ($p=0.001$), and where you work ($p=0.009$). Interestingly, the age and year of experience among midwives were associated with using or administering mgso4. This is so because, people would generally get more experience with them. With all things being equal, people would generally get more experience with increasing ages.

Also, the place of work was related to administering MgSo4 among midwives. Whilst it is difficult to obtain relevant support or disagree with the current literature, it can be noted that not all hospital

Units of the hospital can be said that not all hospital units are pointed out to be management cases like eclampsia. Oftentimes, ANC identifies the cases and refers to the maternity and/ or labor ward for management. It is therefore apparent for every midwife to be able to manage patients with eclampsia who may need assistance. But is also crystal clear that health workers in other medical wards other than the obstetrics and gynecological wards may have difficulties appreciating how MgSo4 should be administered.

The majority of the respondents (71.9%) indicated that NHIS covers MgSO4. This is essential to ensuring that people can afford the care. However, even if the National Health Insurance Scheme covers the medication yet it is not available, it would not yield the desired effect. This is because more and more people would still have to spend out of their pocket since the medications may not be available.

However, about 69.0% of indicated MgSO4 was available for use in the hospital. In contrast to this discovery, other studies have shown that MgSO4 is often inaccessible in some healthcare facilities, especially those located in rural areas or lower-level institutions in low- and middle-income countries (LMICs). The unavailability of MgSO4 due to stock-outs poses a hindrance to its use. MgSO4 is not consistently accessible in many low- and middle-income countries (LMICs) at many administrative levels, including national, regional, and district levels. This indicates that stock-outs at healthcare facilities may result from the unavailability of the drug at a broader system level. This conclusion is very confident. Stock-outs may happen in several healthcare institutions, such as primary care settings, secondary and tertiary hospitals, and rural facilities [23, 41, 42]. Even when MgSO4 is accessible, there may be a lack of awareness among administrative or policy personnel about stock-outs, or among facility-level staff about the availability of procurement[23].

Approximately 90.0% of the participants had received training in of managing MgSo4. Efficient and pragmatic training may enhance providers' understanding and (simulated) exposure to MgSO4, thus enhancing their competence and enthusiasm to use it. While training does not ensure utilization, it is often regarded as a necessary need for utilization (with a high level of confidence). Training enhances the views of providers' ability to appropriately give MgSO4. Training is more likely to provide positive results if it applies to real-life situations and has been conducted recently [7, 23, 40]. Relying just on training is insufficient for the administration of MgSO4. However, firsthand experience in giving MgSO4, which includes clinical experience and simulation or practical skills training, motivates caregivers to utilize MgSO4 correctly. On the other hand, not having recent and frequent experience might weaken the confidence, skill, and desire of providers to deliver MgSO4 (moderate confidence)[7]. Providers' views were positively changed by seeing the beneficial benefits of MgSO4, leading them to become persuaded and advocate for its usage. MgSO4 is often not accessible in some facilities, especially in rural areas or lower-level institutions in low- and middle-income countries (LMICs). The unavailability of MgSO4 poses a significant barrier to its use. MgSO4 is not consistently accessible in many low- and middle-income countries (LMICs) at the national, regional, and district levels. This indicates that stock-outs at the facility level may be a result of the unavailability of the product at the system level (high confidence)[23].

Conclusion

In conclusion, the majority of the respondents had adequate knowledge about magnesium sulfate administration. Additionally, many midwives have administered magnesium sulfate to patients. The study established a significant statistical association between ever administering MgSo4 and age, years of experience, and where you work. The side effects exhibited by the respondents include; breathing problems, confusion, diarrhea, myocardial infarction , pain at the site of injection, redness hardening, and swelling. It also emerged that MgSO4 was available for use in the hospital.

Recommendations

- The Ministry of Health and its agencies should organize periodic in-service training for its staff on topical issues, including but not limited to and problems of magnesium sulfate administration.

- The experiences, attitudes, and views of women and their partners or families towards the use of MgSO4 for pre- or eclampsia require more study, including, for example, the sensation of discomfort or negative consequences. Insights from these studies might be supplemented by context-specific research on facility-level stock audits or provider knowledge and preference surveys to support local implementation strategies.
- Policymakers, administrators, and providers at many levels of the health system must take action to boost the uptake of this life-saving medicine.

Supporting information

None

Ethical Considerations

None

Acknowledgments

None

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author contribution statement

All authors contributed equally and attest they meet the ICMJE criteria for authorship and gave final approval for submission.

Data availability statement

Data included in article/supp. material/referenced in article.

Additional information

No additional information is available for this paper.

Declaration of competing interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

[1] Bartal MF, Sibai BM. Eclampsia in the 21st century. Am J Obstet Gynecol. 2022; 226: S1237–S1253. *[Crossref][PubMed][Google Scholar]*

[2] Facca TA, Famá EAB, Mastroianni-Kirsztajn G, et al. Why Is Preeclampsia Still an Important Cause of Maternal Mortality Worldwide? Rev Bras Ginecol e Obs. 2020; 42: 586–587. *[Crossref][PubMed][Google Scholar] [Crossref][PubMed][Google Scholar]*

[3] Stitterich N, Shepherd J, Koroma MM, et al. Risk factors for preeclampsia and eclampsia at a main referral maternity hospital in Freetown, Sierra Leone: a case-control study. BMC Pregnancy Childbirth. 2021; 21: 413. *[Crossref][PubMed][Google Scholar]*

[4] Njukang NE, Thomas Obinchemti E, Sama M, et al. Prevalence and risk factors of hypertensive disorders in pregnancy: the case of mezam division, NWR Cameroon. J Womens Heal Dev. 2020; 3: 247–267. *[Crossref][PubMed][Google Scholar]*

[5] Adepoju AA, Vidler M, Akadri AA, et al. The ability and safety of community-based health workers to safely initiate lifesaving therapies for pre-eclampsia in Ogun State, Nigeria: An analysis of 260 community treatments with MgSO4 and/or methyldopa. Pregnancy Hypertens. 2021; 25:

179–184. *[Crossref][PubMed][Google Scholar]*

[6] Aukes AM, Arion K, Bone JN, et al. Causes and circumstances of maternal death: a secondary analysis of the Community-Level Interventions for Pre-eclampsia (CLIP) trials cohort. Lancet Glob Heal. 2021; 9: e1242–e1251. *[Crossref][PubMed][Google Scholar]*

[7] Eddy KE, Vogel JP, Zahroh RI, et al. Factors affecting use of magnesium sulphate for pre-eclampsia or eclampsia: a qualitative evidence synthesis. BJOG An Int J Obstet Gynaecol. 2022; 129: 379–391. *[Crossref][PubMed][Google Scholar]*

[8] Dehaene I, Van Steenstraeten T, De Coen K, et al. Correction to: Neonatal magnesium levels are safe after maternal MgSO4 administration: a comparison between unexposed preterm neonates and neonates exposed for fetal neuroprotection or maternal eclampsia prevention-a cohort study. Eur J Pediatr. 2022;181(8):2971-80. *[Crossref][PubMed][Google Scholar]*

[9] Hossain, Sharif M.I., Shongkour Roy, Kanij Sultana, and Charlotte E. Warren. Assessing the effect of a primary health care intervention for improving pre-eclampsia and eclampsia knowledge and practice in Bangladesh. Ending Eclampsia Endline Report. Washington, DC: Population Council. 2019. *[Crossref][PubMed][Google Scholar] [Crossref][PubMed][Google Scholar]*

[10] Padda J, Khalid K, Colaco LB, et al. Efficacy of magnesium sulfate on maternal mortality in eclampsia. Cureus; 13. *[Crossref][PubMed][Google Scholar]*

[11] World Health Organization. WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia: summary of recommendations. World Health Organization, 2011. *[Crossref][PubMed][Google Scholar]*

[12] Ulviana U, Novita N. Effectiveness of MGSO4 Administration Against Prevention of Eclampsia in Severe Pre-Eclampsia in RSIA Resti Mulya in 2022. J Keperawatan Komprehensif (Comprehensive Nurs Journal); 8, (Special Edition). *[Crossref][PubMed][Google Scholar]*

[13] Gordon R, Magee LA, Payne B, et al. Magnesium sulphate for the management of preeclampsia and eclampsia in low and middle income countries: a systematic review of tested dosing regimens. J Obstet Gynaecol Canada. 2014; 36: 154–163. *[Crossref][PubMed][Google Scholar]*

[14] Kim YM, Ansari N, Kols A, et al. Prevention and management of severe pre-eclampsia/eclampsia in Afghanistan. BMC Pregnancy Childbirth. 2013; 13: 1–10. *[Crossref] [PubMed][Google Scholar]*

[15] Duley L, Gülmezoglu AM, Henderson-Smart DJ, et al. Magnesium sulphate and other anticonvulsants for women with pre-eclampsia. Cochrane database Syst Rev. 2010(11). *[Crossref] [PubMed][Google Scholar]*

[16] Chappell LC, Cluver CA, Tong S. Pre-eclampsia. Lancet. 2021; 398: 341–354. *[Crossref] [PubMed][Google Scholar]*

[17] Arechvo A, Voicu D, Gil MM, et al. Maternal race and pre-eclampsia: Cohort study and systematic review with meta-analysis. BJOG An Int J Obstet Gynaecol. 2022; 129: 2082–2093. *[Crossref][PubMed][Google Scholar]*

[18] Tesfa E, Nibret E, Munshea A. Maternal lipid profile and risk of pre-eclampsia in African pregnant women: A systematic review and meta-analysis. PLoS One. 2020; 15: e0243538. *[Crossref][PubMed][Google Scholar]*

[19] Toloza FJK, Derakhshan A, Männistö T, et al. Association between maternal thyroid function and risk of gestational hypertension and pre-eclampsia: a systematic review and individual-participant data meta-analysis. Lancet Diabetes Endocrinol. 2022;10(4):243-52. *[Crossref] [PubMed][Google Scholar]*

[20] Khatri RB, Dangi TP, Gautam R, et al. Barriers to utilization of childbirth services of a rural birthing center in Nepal: A qualitative study. PLoS One. 2017; 12: 1–20. *[Crossref][PubMed] [Google Scholar]*

[21] Hughes AJ, Fraser DM. 'SINK or SWIM': the experience of newly qualified midwives in England. Midwifery. 2011; 27: 382–386. *[Crossref][PubMed][Google Scholar]*

[22] Bergman L, Torres-Vergara P, Penny J, et al. Investigating maternal brain alterations in preeclampsia: the need for a multidisciplinary effort. Curr Hypertens Rep. 2019; 21: 1–13. *[Crossref][PubMed][Google Scholar]*

[23] Bigdeli M, Zafar S, Assad H, et al. Health system barriers to access and use of magnesium sulfate for women with severe pre-eclampsia and eclampsia in Pakistan: evidence for policy and practice. PLoS One. 2013; 8: e59158. *[Crossref][PubMed][Google Scholar]*

[24] Adefemi SA, Adeleke IT, Gara P, et al. The rate, reasons and predictors of hospital discharge against medical advice among inpatients of a tertiary health facility in North-central Nigeria. Am J Heal Res. 2015; 3: 11–16. *[Crossref][PubMed][Google Scholar]*

[25] Polit DF, Beck CT. Nursing research: Generating and assessing evidence for nursing practice. Lippincott Williams & Wilkins, 2008. *[Crossref][PubMed][Google Scholar]*

[26] Yamane T. Elementary sampling theory.Englewood Cliffs;1967. *[Crossref][PubMed][Google Scholar] [Crossref][PubMed][Google Scholar]*

[27] Chikalipo MC, Phiri LK, Mndolo N, et al. Perception of midwives towards magnesium sulfate use at Chatinkha Maternity Wing in Blantyre, Malawi: a qualitative study. Int J Womens Health. 2020; 187–196. *[Crossref][PubMed][Google Scholar]*

[28] Pakenham-Walsh N, Bukachi F. Information needs of health care workers in developing countries: a literature review with a focus on Africa. Hum Resour Health. 2009; 7: 1–13. *[Crossref][PubMed][Google Scholar]*

[29] Alhassan RK, Beyere CB, Nketiah-Amponsah E, et al. Perceived needs of health tutors in rural and urban health training institutions in Ghana: implications for health sector staff internal migration control. PLoS One. 2017; 12: e0185748. *[Crossref][PubMed][Google Scholar]*

[30] Palmer L, Newby BD. Development of a simplified protocol for administration of 20% magnesium sulphate for prophylaxis and treatment of eclampsia. Can J Hosp Pharm. 2009; 62: 490. *[Crossref][PubMed][Google Scholar]*

[31] Long Q, Oladapo OT, Leathersich S, et al. Clinical practice patterns on the use of magnesium sulphate for treatment of pre-eclampsia and eclampsia: a multi-country survey. BJOG An Int J Obstet Gynaecol. 2017; 124: 1883–1890. *[Crossref][PubMed][Google Scholar]*

[32] Pratt JJ, Niedle PS, Vogel JP, et al. Alternative regimens of magnesium sulfate for treatment of preeclampsia and eclampsia: a systematic review of non-randomized studies. Acta Obstet Gynecol Scand. 2016; 95: 144–156. *[Crossref][PubMed][Google Scholar]*

[33] Vaishnav SB, Raithatha N, Kathawadia K, et al. Making Magnesium Sulfate Therapy Safer in Eclampsia: A Comparative Study of Zuspan Regime vs Low-dose Intravenous MgSO. J South Asian Fed Obstet Gynaecol. 2019; 11: 127. *[Crossref][PubMed][Google Scholar]*

[34] Lu JF, Nightingale CH. Magnesium sulfate in eclampsia and pre-eclampsia: pharmacokinetic principles. Clin Pharmacokinet. 2000; 38: 305–314. *[Crossref][PubMed][Google Scholar]*

[35] Chakraborty A, Can AS. Calcium gluconate. In: StatPearls [Internet]. StatPearls Publishing, 2022. *[Crossref][PubMed][Google Scholar]*

[36] Cascella M, Vaqar S. Hypermagnesemia.StatPearls Publishing: Treasure Island, FL, USA, 2023. *[Crossref][PubMed][Google Scholar] [Crossref][PubMed][Google Scholar]*

[37] Fondjo LA, Boamah VE, Fierti A, et al. Knowledge of preeclampsia and its associated factors among pregnant women: a possible link to reduce related adverse outcomes. BMC Pregnancy Childbirth. 2019; 19: 1–7. *[Crossref][PubMed][Google Scholar]*

[38] Sheikh S, Qureshi RN, Khowaja AR, et al. Health care provider knowledge and routine management of pre-eclampsia in Pakistan. Reprod Health. 2016; 13: 107–113. *[Crossref][PubMed][Google Scholar]*

[39] Olaoye T, Oyerinde OO, Elebuji OJ, et al. Knowledge, Perception and Management of Pre-eclampsia among Health Care Providers in a Maternity Hospital. Int J MCH AIDS. 2019; 8: 80–88. *[Crossref][PubMed][Google Scholar]*

[40] Barua A, Mundle S, Bracken H, et al. Facility and personnel factors influencing magnesium sulfate use for eclampsia and pre-eclampsia in 3 Indian hospitals. Int J Gynecol Obstet. 2011; 115: 231–234. *[Crossref][PubMed][Google Scholar]*

[41] Jana N, Dasgupta S, Das AK, et al. Experience of a low-dose magnesium sulfate regimen for the management of eclampsia over a decade. Int J Gynecol Obstet. 2013; 122: 13–17. *[Crossref][PubMed][Google Scholar]*

[42] Oguntunde O, Charyeva Z, Cannon M, et al. Factors influencing the use of magnesium sulphate in pre-eclampsia/eclampsia management in health facilities in Northern Nigeria: a mixed methods study. BMC Pregnancy Childbirth. 2015; 15: 1–8. *[Crossref][PubMed][Google Scholar]*

Disclaimer / Publisher's Note