Mansoura Nursing Journal (MNJ) Vol. 9. No. 2 – 2022
Print ISSN: 2735 – 4121 Online ISSN : 2735 – 413X

Original Article

Evaluate Magnesium Sulfate Administration Practice to Eclamptic Mothers

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1.ABSTRACT

Background: Pre-eclampsia is a multisystem disease characterized by hypertension, protein urea and edema. Preeclampsia affects the mother's and fetus. Errors related to the use of magnesium as mixing errors and dosages may aggravated by poor monitoring, the inability to identify early signs of magnesium toxicity and an uncoordinated and delayed response. **Aim:** To evaluate Nurses' magnesium sulfate administration practice to eclamptic mothers. **Sample:** A convenient sample of all available maternity nurses who caring for eclamptic women in the previously mentioned setting **Design:** A descriptive research design was used. **Tool:** Three tools were used, A Structured Interview Schedule, Observational checklist for administration of Magnesium Sulphate therapy and Nurses' self-reported barriers questionnaire. **Results:** Only (18.5 %) of the studied nurses had a total good knowledge scores compared to (55.8 %) of them had poor knowledge, Additional, 47% of the studied nurses had a total high practice scores while (53%) of them with a total low practice. Nurses' self-reported barriers facing during administering magnesium sulfate, as reported by the nurses are shortage in the number of nurses, excess number of patients, and lack of training courses for nurses. **Conclusion:** the majority of the studied nurses had poor knowledge scores regarding $MgSO_4$. Slightly less than half of the studied nurses had a total high practices scores compared with more than half of them had a low total practices scores. Nurses facing barriers during administration of magnesium sulfate. **Recommendation:** Greater attention should be given to monitor and observe nurses performance during administration of $MgSO_4$ therapy.

Keywords: *Administration, Eclamptic Mother, Magnesium Sulfate, Practice.*

2.Introduction:

Pregnancy is characterized by significant metabolic and hemodynamic changes that begin early in the gestational period. Major hemodynamic changes include an increase in the cardiac output during the first trimester, sodium and water retention leading to plasma volume expansion with a peak around week 30, and reductions in the systemic vascular resistance and systemic blood pressure. The reduction of the systemic vascular resistance is around 25% and is due to the increase in vasodilating agents, like nitric oxide and prostacyclin production, and the decrease in the sensitivity to norepinephrine and angiotensin **(Gongora & Wenger., 2015).**

One of the most prevalent disorders that occur during pregnancy is hypertension, which causes complications in 10% of all pregnancies. These disorders are not only dangerous for the pregnant women, but they also significantly increase the risk for the fetus **(Ricci., 2017).** Pre-eclampsia is a multisystemic disease characterized by the development of hypertension after 20 weeks of gestation in a previously normotensive woman, with the presence of proteinuria (as a result of kidney problems) or, in its absence, of signs or symptoms indicative of target organ injury. A condition that typically starts after the 20th week of pregnancy and is related to increased blood pressure. Preeclampsia affects the placenta, and it can affect the mother's kidney, liver, and brain. The clinical signs involve multiple organs, including the liver, kidneys, heart, lungs, brain, and pancreas **(Bartsch, Medcalf, Park & Ray., 2016).**

When preeclampsia causes seizures, the condition is known as eclampsia the second leading cause of maternal death in the U.S. Preeclampsia is also a leading cause of fetal complications, which include low birth weight, premature birth, and stillbirth**.** Eclampsia is defined as the development of convulsions or coma in a woman with Pre-eclampsia. Among pregnant women worldwide 7-15% develops PE and approximately 1-2% develops eclampsia **(Fadlala, Babikir, Ali & Gassmalla., 2019)**.

World health organization has recommended the use of magnesium sulphate ($MgSO_4$) as a safe and low-cost drug to manage severe pre-eclampsia and eclampsia cases. Studies have shown that the drug significantly lowers the possibility of seizures in women with severe pre-eclampsia or eclampsia, prevents progression from severe preeclampsia to eclampsia and generally

lowers maternal mortality**.** The nurse should focus primarily on careful assessment of the patient before and during administration of magnesium sulphate. This assessment includes, vital signs, fluids input and output, deep tendon reflexes, level of consciousness, headache, visual disturbances, lung sounds, epigastric pain, edema and evaluation of the fetal heart rate and uterine contractions **(Emam & Saber., 2018)**.

Significance of the study

Hypertensive disorders are associated with higher rate of maternal, fetal, and infant mortality and with severe morbidity; especially in case of severe pre-eclampsia, eclampsia, and Hemolysis, elevated liver enzyme levels, and low platelet levels (HELLP) syndrome. The incidence of eclampsia has been relatively stable at 1.6 to 10 cases per 10,000 deliveries in the developed countries. However in the developing countries, the incidence varies widely from 6 to 157 cases per 10,000 deliveries. Thus, despite rates of eclampsia declining in the developed world, Eclampsia remains a worldwide problem **(Emam & Saber., 2018).**

Errors related to the use of magnesium as mixing errors of solutions and dosages may aggravated by poor monitoring, the inability to identify early signs of magnesium toxicity and an uncoordinated and delayed response **(Hekal, Wafa and El-Mohandes., 2020)**. So, The nurse have a vital role in care of eclamptic mother treated with Magnesium sulfate including careful assessment before and during administration of magnesium sulphate including and also make sure that the dose provided is accurate dose and mixed in a right way to prevent complications.

Aim of the study:

This study aimed to evaluate nurses sulfate administration practices to eclamptic mothers.

Research questions:

To achieve the study aim, three questions were used:

1. Do maternity nurses have knowledge about magnesium sulphate?
2. Do maternity nurses administer magnesium sulphate correctly to eclamptic mothers?
3. What are the factors affecting administration of magnesium sulphate to eclamptic mothers?

3.SUBJECTS AND METHOD:

3.1 Research design:

A descriptive research design was used to achieve the aim of this study.

3.2 Study Setting:

This study was conducted in the inpatient obstetric departments of Mansoura University Hospital, Egypt.

3.3 Sampling

A convenient sample of all available registered maternity nurses (63) who caring for eclamptic mothers in the previously mentioned setting.

3.4 Tools of data collection:

To achieve the aim of this study, Three tools were utilized to collect data for this study.

Tool I: Structured interview Schedule

This tool was developed by the researcher to assess nurses' general characteristics and knowltedge related to magnesium sulfate therapy for eclamptic mothers and includes two parts:

Part one: General characteristics of studied nurses: it cover the nurses' personal data including age, year of experience, professional qualification and residence.

Part two: Nurses knowledge regarding $MgSO_4$: it assessed the nurses knowledge related to magnesium sulfate therapy for eclamptic mothers as indications, route of administration, total loading dose, maintenance dose, antidote for magnesium sulphate …etc. It includes 22 items (12 MCQ and 10 true and false questions).

Scoring system:

Each question was given two options (correct or incorrect), each item was given scores range from 0-1. Score : one was given for the correct answer, score zero were given for the wrong answer. The total scores of the knowledge ranged from 0 to 22. The knowledge level was classified to three categories: ***Poor < 50% of total scores (< 11)***, ***Fair = 50% to 75% of total sores (11- 16.5)*** and ***Good > 75% of total scores (> 16.5)***

Tool II: Observational checklist for administration of Magnesium Sulphate therapy:

This tool was adapted from **Kaur & Meenakshi, (2011)** and used to assess the nurse's practical performance related to administration of magnesium sulfate therapy for eclamptic Mothers. It includes 29 items: A-pre-assessment nursing measures before magnesium sulfate administration (10 Questions), B- nursing measures after magnesium sulfate administration (4 Questions), C-

availability of emergency equipment (2 Questions), D- patients' assessment throughout magnesium sulfate therapy period (13 Questions).

Scoring system:

Each item was given two options (done or not done). Score one was given for practice done item, and score zero was given for practice not done item. The total scores of the practices ranged from 0 to 29. The practical level was consisted of two categories:-

Competent if more than 75% of total scores (≥ 24.75)

Incompetent if less than 75% of total scores (< 24.75)

Tool III. Nurses' self-reported barriers questionnaire . This were developed by the researcher and concerned with barriers facing the maternity nurses pre, during and after administration of $MgSo_4$ therapy. It consists of 7 items scored as number and percentage with mean score of total barriers.

3.5 Validity and Reliability of the tools

- Study tools were revised by 5experts in the field of the study (three women's health experts from nursing field and two women's health experts from medical field, Mansoura University) to ensure content validity of tools and the necessary modification were done.
- Tools of data collection were tested for its reliability by using Cronbach Coefficient alpha test in Statistical Package for the Social Science (SPSS) program version 21.

Tool II: It strongly predicts outcomes and response to interventions, thus it has face validity (0.977) and test–retest reliability (r =0.865).

Tool III: Validity was found to be between 0.73 and 0.77, and demonstrated high inter-rater reliability (0.95) and test–retest reliability (r =0.89).

3.6 Pilot study:

A Pilot study was carried out on 10% of nurses (7 nurses) to test feasibility, objectivity, clarity and the applicability of the study tools, as well, identify difficulties that may be encountered during the application of the study, and to estimate the time needed for data collection. It excluded from sample size.

3.7 Ethical considerations:

Before conducting the study, an approval letter will be obtained from the head of Women's Health and Midwives Nursing Department, Faculty of Nursing, Mansoura University, followed by approval letter from the Faculty Ethical Research Committee, then an approval letter from the director of Mansoura University Hospital (MUH) to carry out the study. Informed consent will be obtained from each nurse prior to the procedure. All nurses had the right to refuse to participate in the study or to be withdrawal at any time. Anonymity, privacy, confidentiality & safety of the collected information were absolutely assured throughout the whole study as the tool was given code number instead of taking woman's name.

3.8 Field work:

- Once the necessary approvals were granted to proceed with the proposed study, the researcher introduce herself to study nurses and explain the aim of the study then nurses who met sampling criteria and agreed to participate in the study, were interviewed by the researcher to collect the necessary data.
- Data collection were started and continued for period of six months from the beginning of November 2020 to the end of April 2021.
- Informed consent approval was obtained from each participant prior to be included in the study.
- According to the previously mentioned study criteria, knowledge related to magnesium sulphate therapy was assessed and nurses' practical skills were observed as follow:

- **Tool I** was administered to all selected nurses to assess their general characteristics **(part I)** and level of nurse's knowledge about $MgSo_4$ **(part II).**
- **Tool II** observational checklist was used by the researcher to assess nurses practical performance related to administration of $MgSO_4$ and documentation procedures. Nurses were given the nursing assessment sheet to fill when mothers with preeclampsia/ eclampsia.
- **Tool III** was used by the researcher to assess barriers faced the maternity nurses pre, during and after administration of $MgSO_4$ therapy.

- Data was collected three days a week during morning and afternoon shift while they administering and caring for the patient receiving magnesium sulphate therapy by using observational checklist.
- Average time for completion of each nurse interview were around (30-40 minutes).

3.9 Statistical analysis

After data collection it were revised, coded, processed and then analyzed using the statistical software IBM SPSS version 21. The given

diagrams were constructed through Microsoft excel software. The quantitative data were presented in mean and standard deviation (SD), while the qualitative data were presented as number (N) and percent (%). Pearson correlation was done between variables and Cronbach's alpha was used to measure internal consistency.

4. RESULTS

Table (1) revealed that, less than one third (31.3%) of the studied nurses their age was ranged from (30-35 yr.) followed by age group of (18-23 yrs) (29.7%) with a mean age ± SD (29.6 ± 9.4). Concerning to educational level, 32.8% of the studied nurses had a Bachelor degree in nursing, and (28.1%) of them had Technical nursing institute.

Table (2) reflects that, there were positive, highly statistically significant correlations between nurses' total knowledge, and practice with nurses, age, qualifications and years of experience

Figure (1) illustrated that, only (18.5 %) of the studied nurses had a total good knowledge score compared to (55.8 %) of them had poor knowledge score whereas only (25.7 %) had fair knowledge score.

Figure (2) clarifies that (47%) of the studied nurses had a total high practice score compared with (53%) of them with a total low practice.

Figure (3) illustrated that the Nurses' self-reported barriers facing during administering magnesium sulfate, as reported by the nurses are shortage in the number of nurses, excess number of patients, lack of training courses for nurses (100%) and decrease of experience years (87.5%), other problems as lack of knowledge for treating cases of eclampsia, lack of practical skills for treating eclampsia pregnancy and shortage in equipment's needed for treat an overdose of mgso4 reported by only (46.9%, 34.4%, and 45.3% respectively

Table (1): Distribution of studied nurses according to their general characteristics.

General characteristics	Studied group (n = 64)	
	NO	%
Age		
18- 23	19	29.7
24-29	12	18.7
30- 35	20	31.3
≥ 36	13	20.3
Mean age	**29.6 ± 9.4**	
Qualifications		
Secondary school diploma	11	17.2
Technical nursing institute	18	28.1
Bachelor degree	21	32.8
Others (MSc, PHD)	14	21.9

Table (2): Correlation between studied nurses' knowledge and practice with different variables

Variables	age		Qualifications		Years of experience	
	r	*p*	*r*	*p*	*r*	*p*
Knowledge	0.318	**0.016***	0.249	**0.038***	0.322	**0.001***
Practice	0.272	**0.004***	0.254	**0.042***	0.251	**0.033***

R: Pearson's correlation coefficient. P: value by Pearson's correlation test.

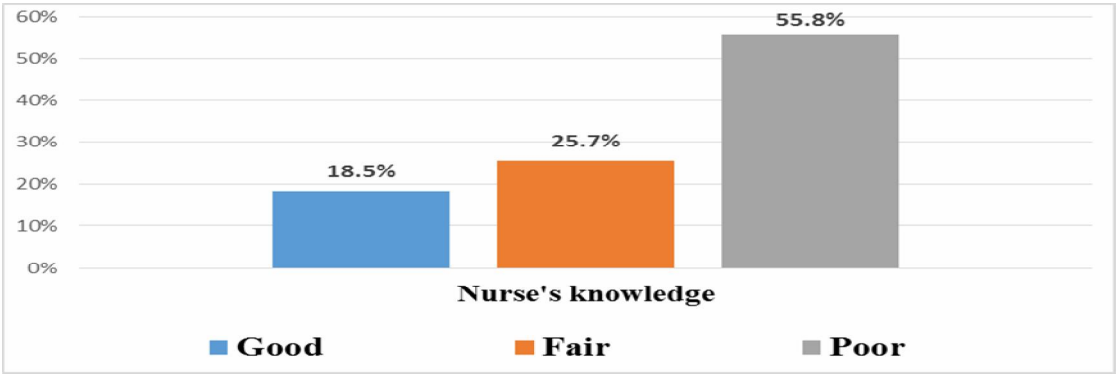

Figure (1): Nurse's knowledge scores regarding magnesium sulfate therapy for Eclamptic Mothers

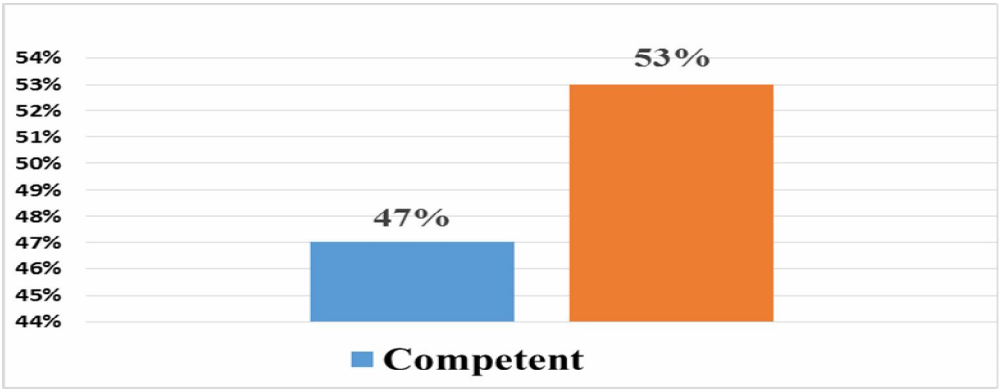

Figure (2): Total practical administration score of MgSo4 among studied nurses

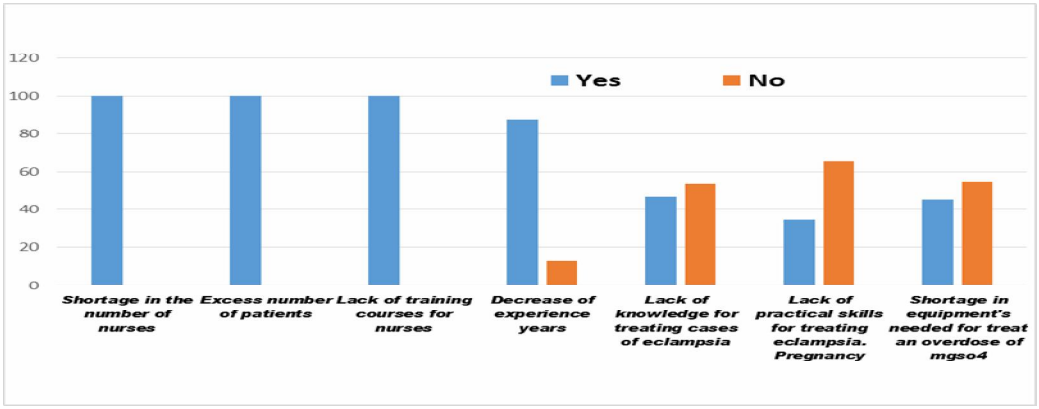

Figure (3): Nurse's self-reported barriers facing during administering magnesium sulfate

5. DISCUSSION

Pre-eclampsia and eclampsia are two hypertensive disorders of pregnancy, characterized by the new onset of hypertension and proteinuria **(Errol., 2020),** and associated with an increased risk of placental detachment, premature labor, and other complications that can resulting in maternal death **(Fleisher &Lee, 2018 & Portelli & Baron, 2018)**. Magnesium sulfate is a drug of choice in all health-care setting that used for prevention and control of seizures in eclamptic mothers, and as neuroprotective agent of the fetus. Magnesium sulphate toxicity can lead to apnea and death **(Martin, Hamilton & Osterman, 2017).**

The study aimed to evaluate magnesium sulfate administration practice to eclamptic mothers. this aim was achieved through study framework, which support research study questions.

As regard to the age, the most of the studied sample was in the age of thirty to thirty five years our results similar to this finding of **Emam & Saber., (2018)** who founded that most of their participants were in age group of 31- 40 years. Also study done by **Wisner., (2019),** who study about Gestational hypertension and preeclampsia reported that, the most of studied sample in the same age group. This result may be related to that nurses in this age more contact and caring for patients and other nurses in high age have other administrative duties.

Concerning to years of experience in the field of obstetric, our study showed that more than one third of nurses had 11-15 year of experience. In addition more than one tenth had experience more than 15 years. This result is supported by the work of the **Emam & Saber., (2018) and Remadurg et al., (2016),** who found that slightly above half of the respondents had worked for over 11years and above.

In relation to educational level, it was found that our study sample had various educational levels with the majority of them are highly educated (bachelor degree). It may attributed to that most of the nurses having bachelor degree are selected to work with patients with special conditions. These results in the same line with study by **Abasi & Alabrah., (2021)** who study about the use of magnesium sulphate in the management of severe preeclampsia and eclampsia in bayelsa State, Nigeria, reported that, the most of their included sample carry bachelor degree of nursing.

Nursing education is a collection of educational activities which are organized to accomplish a pre-determined objective or the completion of a specified set of educational tasks (**Boon, 2018**). In relation to nurses' knowledge about magnesium sulfate, our study illustrated that, the minority (less than one fifth) of the studied nurses had a total good knowledge score whereas more than half of them had poor knowledge score.

Our finding agreed with that of a study done by **Kavitha et al., (2014)** who study about knowledge of staff nurses on emergency obstetric management at orotta national referral maternity hospital, who founded that the minority of the staff nurses had adequate knowledge regarding managing eclamptic women treated with magnesium sulfate. Another study by **Bartsch, Medcalf, Park & Ray (2016)** who study about high risk of pre-eclampsia identification, clinical risk factors for ore-eclampsia determined in early pregnancy, documented that their studied nurses caring for eclamptic mothers have poor knowledge regarding magnesium sulfate.

Also the finding of the studies done by **Remadurg et al., (2016)** showed that one of the difficult needs of nurses is to update their knowledge for early detection and proper treatment of pre-eclamspia, so more than three quarters of their studied sample have poor knowledge score and emphasized that, to reach the competence, nurses need to improve both knowledge and skills.

Majority of nurse's in the study were able to know that magnesium sulphate is the most common drug for managing eclampsia and most of the study sample had given $MgSO_4$ to Eclamptic women. This result was similar to study done by **Jeffrey & Dana., (2017).** who found that most participants in his study, were knowledgeable about the recommended drug for controlling convulsion in eclamptic women.

Professional nurse will act through care protocols, obtaining better planning of nursing care, and together will systematization of nursing care, which will promote the implementation of effective interventions for patients in order to promote and achieve better prognosis **(Duarte et al., 2016).** So, nurses should go through a series of procedures, which establishes allowable actions and serves as a tool where nurses can implement them for immediate interventions involving unifying risks of life with the nursing staff in their daily practice, enabling professional practice safer and effective (**Maia & Sade., 2016**).

In relation to nurses' practice our results illustrated that the majority of our studied nurses have low practice score. This may be attributed to limited number of workshops attended by these nurses, lack of training program about magnesium sulfate, and lack of time due to workload. In the same line with our results **Bartsch, Medcalf, Park & Ray (2016)** documented that the majority of their studied nurses caring for eclamptic mothers have low total practice score regarding magnesium sulfate and there was some hesitancy to manage such complicated cases

This finding is also to study done by **Stellenberg & Ngwekazi., (2016)** who observed that the data obtained from observational checklist about managing eclampsia revealed that, more than half of respondents had poor skills in managing eclampsia and in needs to reach competencies by improving both knowledge and skills. Study done by **Sperling, Gossett & Dana., (2017)** clarified that professional nurse can play a major role to save lives of eclampstic and pre-eclampstic women. Therefore, the nurses role are very crucial; they must be competent in their knowledge and practices, as they should be aware accurately for who they are dealing before, during and after monitoring the fits.

Our results goes hand on hand with the study by **Abasi & Alabrah., (2021).** who revealed that, nurse caring for eclamptic mothers didn't focus on careful assessment of the patient before and during administration of magnesium sulphate, to manage any complications or side effects related to therapy. In this respect **Stellenberg & Ngwekazi., (2016)** clarifies that absence of guidelines, unclear job descriptions of the nurse and physicians, inadequate training course, unclear policies, unclear role of nurse in documentation of finding with their signature, different level of education among nurse, and a lack of proper respect and communication with mothers are the main reasons for the lack of adherence to proper practice.

Research conducted by **Remadurg et al., (2016)**, emphasized that one of the bad needs of nurses is to update their knowledge and skills for early detection and proper treatment of preeclamspia. Also to reach the competence, nurses need to improve both knowledge and skills. In the same line with our results **Mohamed, Mohamed & taha., (2018)** revealed nurse's knowledge update help to give the most recent and best patient's care. This could direct the attention toward continuing education of nurses particularly those with different educational background, and years of experience

especially those of less than 10 years, so they require periodical update of their knowledge.

In relation to nurses' self-reported barriers facing during administering magnesium sulfate the vast majority of the studied sample agreed that shortage in nurses, excess number of patients, lack of training courses for nurses and decrease of experience years the most important barriers followed by lack of knowledge and practical skills and shortage in equipment's needed for treat an overdose of $MgSO_4$

Our finding agreed with that of a study done by **Kavitha et al., (2014)** who found that inadequate resources, increased workload, and inadequate staffing are the main barriers faced during administration of magnesium sulfate. Another study carriedout by **(Bartsch, Medcalf, Park & Ray (2016)** documented that emergency drugs and resuscitation equipment deficiency are barriers complicating nurses work and affecting eclamptic mother's care.

6. CONCLUSION

In conclusion, Most nurses' self-reported barriers facing during administering magnesium sulfate are shortage in the number of nurses, excess number of patients, lack of training courses for nurses and decrease of experience years, other barriers are lack of knowledge for treating cases of eclampsia, lack of practical skills for treating eclampsia pregnancy and shortage in equipment's needed for treat an overdose of $MgSO_4$. There were positive, highly statistically significant correlations between nurses' total knowledge, and practice with nurses, age, qualifications and years of experience.

7. RECOMMENDATIONS

In light of the study finding, the following recommendations are suggested:

- Greater attention should be given to monitor and closely observe nurses performance during administration of $MgSO_4$ therapy.
- Training program should be arranged for nurses about administration of $MgSO_4$ therapy.
- Simple and comprehensive educational booklet about administration of $MgSO_4$ therapy should be available to nurses.
- Further studies have to be carried out in order to assess factors associated with poor level of nurses knowledge and practice regarding administration of $MgSO_4$ therapy.

8.Acknowledgments

The authors would like to offer their appreciation and gratitude to all nurses who participated in the study willingly.

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