

Effectiveness of Skill-based Training on Magnesium Sulfate (mgso_4) Administration Among Fourth-year Nursing Students at PES College of Nursing, Kuppam

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ABSTRACT

Background: Magnesium sulphate (MgSO_4) administration is a key intervention in the management of preeclampsia and eclampsia, which are major causes of maternal and neonatal morbidity and mortality worldwide. It is considered the drug of choice for the prevention and control of seizures in women with severe preeclampsia and eclampsia. Effective and timely administration of magnesium sulphate can significantly reduce complications such as maternal death, cerebral hemorrhage, and fetal distress. However, inadequate knowledge and skills among healthcare providers may lead to improper dosage, delayed administration, and poor monitoring, increasing the risk of adverse outcomes. Proper training and adherence to standard protocols are essential to ensure safe administration and to prevent toxicity. Continuous monitoring of maternal condition, including reflexes, respiratory rate, and urine output, is crucial during therapy. Enhancing the competency of nursing students and healthcare professionals in magnesium sulphate administration is vital for improving maternal and neonatal outcomes and ensuring quality obstetric care.^{1,2}

Methods: The present study adopted a quantitative research approach with a pre-experimental one-group pre-test and post-test design to evaluate the effectiveness of skill-based training on magnesium sulfate (MgSO_4) administration among fourth-year nursing students. The study was conducted at PES College of Nursing, Kuppam, Andhra Pradesh. A total of 100 fourth-year B.Sc. Nursing students were selected using a non-probability convenience sampling technique. The independent variable of the study was skill-based training on MgSO_4 administration, while the dependent variable was the knowledge level of the students regarding MgSO_4 administration. Data were collected using a structured tool consisting of three sections: socio-demographic variables, a 25-item structured knowledge questionnaire, and a skill assessment checklist based on the Objective Structured Clinical Examination (OSCE). After obtaining formal permission and informed consent, a pre-test was conducted to assess baseline knowledge and skills. This

was followed by a structured skill-based training program, which included lecture, demonstration, simulation, and return demonstration. A post-test was then administered to evaluate the effectiveness of the training. The collected data were analyzed using descriptive and inferential statistics, including mean, standard deviation, paired t-test, and chi-square test, with a p-value of less than 0.05 considered statistically significant.

Results: In regards to age, the majority of the fourth-year B.Sc. nursing students, 39 (78%), belonged to the 21–22 years age group, followed by 10 (20%) who were above 22 years and 1 (2%) who was below 20 years. In regards to gender, all 50 (100%) participants were female. The majority, 46 (93%), were from private institutions, while 4 (7%) were from government institutions. Regarding the area of residence, 26 (51%) participants were from rural areas, followed by 14 (28%) from semi-urban areas and 10 (21%) from urban areas. About 30 (59%) participants had no previous exposure to Magnesium Sulfate (MgSO_4), whereas 20 (41%) had previous exposure. The majority, 28 (56%), gained previous knowledge through clinical postings, followed by 19 (37%) through classroom lectures, while 1 (2%) reported simulation/laboratory training and 2 (5%) had no previous knowledge. With respect to academic performance, the majority, 34 (67%), had secured first class, followed by 9 (18%) with second class and 6 (12%) with distinction. Regarding completed clinical hours in Obstetrics and Gynecology, 20 (40%) participants had completed 100–150 hours, another 20 (40%) had completed more than 150 hours, and 10 (20%) had completed less than 100 hours. More than half of the participants, 28 (56%), had not attended any previous skill-based training, whereas 22 (44%) had participated in such training. Before the intervention, the majority, 31 (61%), reported moderate confidence in administering intravenous medications, followed by 14 (28%) who were very confident and 5 (11%) who were not confident. Most participants, 42 (84%), were from Andhra Pradesh, followed by 6 (12%) from Kerala, 2 (3%) from Tamil Nadu, and 1 (1%) from Karnataka. The majority, 39 (77%), stayed in hostels or on campus, while 11 (23%) commuted from home. The comparison of pre-test and post-test skill acquisition scores demonstrated a statistically significant improvement following the Skill-Based Training Programme. The mean pre-test skill score was 12.970 (SD = 1.3056), whereas the mean post-test skill score was 8.750 (SD = 1.4316). The paired t-test revealed a t-value of 21.285 with a p-value of 0.000, indicating a highly statistically significant difference ($p < 0.05$) between the pre-test and post-test scores. These findings demonstrate that the Skill-Based Training Programme on Magnesium Sulfate (MgSO_4) administration was highly effective in improving the practical skill acquisition of fourth-year B.Sc. nursing students, thereby enhancing their clinical competency and preparedness for safe and effective MgSO_4 administration in obstetric practice.

Keywords: Skill-based training , Magnesium Sulfate (MgSO_4) administration

1. INTRODUCTION

Maternal health continues to be a major public health concern across the globe, particularly in developing countries where access to timely and quality healthcare remains uneven. Among the various complications of pregnancy, hypertensive disorders such as preeclampsia and eclampsia are significant contributors to maternal and perinatal morbidity and mortality. These conditions are characterized by elevated blood pressure and can progress rapidly to life-threatening complications including seizures, organ failure, and death if not managed effectively. Early recognition and prompt intervention are therefore essential to ensure safe maternal outcomes. The availability of effective treatment options, along with skilled

healthcare providers, plays a crucial role in reducing the burden of these preventable complications.³ Magnesium Sulfate (MgSO_4) is widely regarded as the gold standard for the prevention and management of eclamptic seizures. It has been extensively studied and recommended by global health authorities due to its superior efficacy and safety when compared to other anticonvulsants. MgSO_4 acts by depressing the central nervous system and reducing neuromuscular transmission, thereby controlling convulsions and preventing recurrence. Its timely and correct administration has been shown to significantly reduce maternal mortality and morbidity associated with eclampsia. As a result, it is included in standard treatment protocols for hypertensive disorders of pregnancy across the world.² Despite its clinical importance, MgSO_4 is categorized as a high-alert medication due to its narrow therapeutic index. This means that even slight deviations in dosage or administration technique can result in severe adverse effects such as respiratory depression, loss of deep tendon reflexes, or cardiac arrest. Therefore, the safe administration of MgSO_4 requires not only sound theoretical knowledge but also precise clinical skills and continuous patient monitoring. Nurses, being the primary caregivers and frontline healthcare providers, play a pivotal role in the preparation, administration, and monitoring of this medication. Any lack of competency in these areas can directly impact patient safety and treatment outcomes.⁴

2. METHODS AND MATERIALS

The present study adopted a quantitative research approach with a pre-experimental one-group pre-test and post-test design to evaluate the effectiveness of skill-based training on magnesium sulfate (MgSO_4) administration among fourth-year nursing students. The study was conducted at PES College of Nursing, Kuppam, Andhra Pradesh. A total of 100 fourth-year B.Sc. Nursing students were selected using a non-probability convenience sampling technique. The independent variable of the study was skill-based training on MgSO_4 administration, while the dependent variable was the knowledge level of the students regarding MgSO_4 administration. Data were collected using a structured tool consisting of three sections: socio-demographic variables, a 25-item structured knowledge questionnaire, and a skill assessment checklist based on the Objective Structured Clinical Examination (OSCE). After obtaining formal permission and informed consent, a pre-test was conducted to assess baseline knowledge and skills. This was followed by a structured skill-based training program, which included lecture, demonstration, simulation, and return demonstration. A post-test was then administered to evaluate the effectiveness of the training. The collected data were analyzed using descriptive and inferential statistics, including mean, standard deviation, paired t-test, and chi-square test, with a p-value of less than 0.05 considered statistically significant.

Objectives of the present study includes

1. To assess the pre-test knowledge and skill scores regarding Magnesium Sulfate (MgSO_4) administration among fourth-year nursing students.
2. To assess the post-test knowledge and skill scores regarding Magnesium Sulfate (MgSO_4) administration among fourth-year nursing students after skill-based training.
3. To compare the pre-test and post-test knowledge and skill scores regarding Magnesium Sulfate (MgSO_4) administration among fourth-year nursing students.
4. To determine the association between pre-test knowledge and skill scores regarding Magnesium Sulfate (MgSO_4) administration with selected socio-demographic variables of nursing students.

3. RESULTS

The results of the study were presented as Tables and graphs as per the objectives of the study.

Section-A Frequency and percentage distribution of the socio- demographic variables

Table 1 Frequency and percentage distribution of the socio- demographic variables among among 4th year b.sc nursing students.
(N=100)

S. N	Demographic variables	Frequency (f)	Percentage (%)
1	Age		
	A. Below 20 years	2	2.00
	B.21-22 years	78	78.00
	C. Above 22 years	20	20.00
2	Gender		
	A. Female	100	100
3	Institution type		
	A. Government	7	7
	B. Private	93	93
4	Area of residence		
	A. Urban	21	21
	B. Rural	51	51
	C. Semi-Urban	28	
5	Previous exposure to mgso4		
	A. Yes	41	41
	B. No	59	59
6	Source of previous knowledge		
	A. Classroom lecture	37	37
	B. Clinical Postings	56	56
	C. Simulation /Lab	2	2
	D. None	5	5
7	Grade point average (gpa) or academic performance		
	A. Distinction	12	12
	B. First class	67	67
	C. Second class	18	18
8	Completed clinical hours in obstetrics and gynecology [obg]		
	Less than 100 hours	20	20.00
	100 to 150 Hours	40	40.00
	More than 150 Hours	40	40.00
9	Participation in any skill based training before		
	Yes	44	44.00
	No	56	56.00
10	Confidence level in administering iv medications [before training]		
	Very Confident	28	28.00

	Moderate Confident	61	61.00
	Not Confident	11	11.00
11	Region/state [option if multicenter]		
	Andhra Pradesh	84	84.00
	Tamil Nadu	3	3.00
	Karnataka	1	1.00
	Kerala	12	12.00
12	Mode of transportation to clinical site		
	Hostel/On -Campus	77	77.00
	Commutes From Home	23	23.00

Table 1 depicts the frequency and percentage distribution of the socio-demographic characteristics of 4th year B.Sc. Nursing students. With regard to age, the majority of the participants (78%) belonged to the 21–22 years age group, followed by those above 22 years (20%), while only 2% were below 20 years. All participants in the study were female (100%). Most of the participants were studying in private institutions (93%), whereas only 7% were from government institutions. Regarding the area of residence, more than half of the participants (51%) belonged to rural areas, followed by semi-urban (28%) and urban areas (21%). A majority of the participants (59%) had no previous exposure to magnesium sulfate (MgSO_4), while 41% reported prior exposure. Among those with previous knowledge, clinical postings were the most common source (56%), followed by classroom lectures (37%), whereas only 2% gained knowledge through simulation or laboratory training, and 5% had no prior knowledge. In terms of academic performance, most participants secured a first class (67%), followed by second class (18%) and distinction (12%). Regarding clinical experience in Obstetrics and Gynecology (OBG), 40% had completed 100–150 hours of clinical training and another 40% had completed more than 150 hours, while 20% had completed less than 100 hours. More than half of the participants (56%) had not attended any previous skill-based training, whereas 44% had participated in such training. Before the intervention, the majority of the students (61%) reported a moderate level of confidence in administering intravenous (IV) medications, followed by 28% who were very confident, while 11% reported that they were not confident. Most participants were from Andhra Pradesh (84%), followed by Kerala (12%), Tamil Nadu (3%), and Karnataka (1%). Regarding transportation to the clinical site, the majority of the participants (77%) stayed in hostels or on-campus, whereas 23% commuted from home.

Section:-B frequency and percentage distribution of pre-test and post-test knowledge scores

Table 2 Frequency and percentage distribution of pre-test and post-test knowledge scores regarding mgso4 administration among 4th year b.sc nursing students.

(N=100)

S.no	Level of knowledge	Pre test		Post test	
		f	%	f	%
1	Inadequate Knowledge	58	58.00	6	6.06
2	Moderate Knowledge	39	39.00	26	26.26
3	Adequate Knowledge	3	3.00	67	67.68

Table 2 shows that in the pre-test, the majority of participants 58 (58.00%) had inadequate knowledge, followed by 39 (39.00%) who had moderate knowledge, and only 3 (3.00%) had adequate knowledge regarding magnesium sulphate (MgSO_4) administration. In contrast, the post-test findings revealed that

the majority of participants 67 (67.68%) had adequate knowledge, while 26 (26.26%) had moderate knowledge, and only 6 (6.06%) had inadequate knowledge. These findings indicate a significant improvement in the knowledge level of participants after the skill-based training on MgSO₄ administration.

Section C: frequency and percentage distribution of pre-test and post- test skills acquisition scores

Table 3 Frequency and percentage distribution of pre-test and post- test skills acquisition scores regarding mgso4 administration among 4th year B.sc nursing students.

Sl no	Skill scores	Pre test		Post test	
		f	%	f	%
1	High Skill Acquisition	9	9	95	95
2	Moderate Skill Acquisition	91	91	5	5
3	Low Skill Acquisition	0	0	0	0

In the pre-test, the majority of students demonstrated moderate skill acquisition (91%), while only 9% showed high skill acquisition, and none had low skill acquisition. In the post-test, a marked improvement was observed, with 95% of students achieving high skill acquisition and only 5% remaining in the moderate skill acquisition category. No students were classified as having low skill acquisition in either the pre-test or post-test. These findings indicate that the intervention was highly effective in improving the skill acquisition levels of the students.

Section –D :Comparison of pre-test and post-test, mean, s.d “t” and p-values of knowledge scores

Table 4 Comparison of pre-test and post-test, mean, s.d “t” and p-values of knowledge scores on mgso4 administration among 4th year B.sc nursing students.

(N=100)

	Mean	Standard Deviation	p value	t value	Result
Pre test	10.44	4.63	0.000	-12.75	The intervention was effective.
Post test	20.17	5.04			

The above Table shows that the pre-test mean score was 10.44 with a standard deviation of 4.63, which increased to a post-test mean score of 20.17 with a standard deviation of 5.04. The paired t-test revealed a highly significant difference ($t = -12.75$, $p = 0.000$). Therefore, the intervention was effective in improving the participants knowledge.

Section E : Comparison of pre-test and post-test, mean, s.d “t” and p-values of skill acquisition scores

Table 5 Comparison of pre-test and post-test, mean, s.d “t” and p-values of skill acquisition scores regarding mgso4 administration among 4th year B.sc nursing students.

Comparsion of skill	Mean	SD	p- value	“t” value
pretest	12.970	1.3056	0.000	21.285
posttest	8.750	1.4316		

The comparison of pre-test and post-test skill acquisition scores demonstrates a significant change in participants' performance following the intervention. The mean pre-test score was 12.970 (SD = 1.3056), while the mean post-test score was 8.750 (SD = 1.4316). The paired t-test yielded a t-value of 21.285 with

a p-value of 0.000, indicating a highly statistically significant difference ($p < 0.05$) between the pre-test and post-test scores. These findings suggest that the intervention was effective in producing a significant improvement in the participants' skill acquisition.

Section F : Association of pretest knowledge scores on mgso4 administration among 4th year b.sc nursing students with their selected socio -demographic variables.

Table 5:6 Association of pretest knowledge scores on mgso4 administration among 4th year B.sc nursing students with their selected socio -demographic variables .

(N=100)

Si. No	Socio demographic, menstrual variables	Level of knowledge			chi ² value	“p” value	
		Inadequate knowledge	Moderate knowledge	Adequate knowledge			
1	Age (in years)					2.4572	0.652
	21-22 years	45(77.59)	30(76.92)	3(100.00)			
	Above 22 years	11(18.97)	9(23.08)	0.(0.00)			
	Below 20 years	2(3.45)	0(0.00)	0(0.00)			
2	Gender					-	-
	Female	58(100.0)	39(100.0)	3(100.0)			
3	Institution type					2.40104	0.301
	Government	6(10.34)	1(2.56)	0(0.00)			
	Private	52(89.66)	38(97.44)	3(100.0)			
4	Area of residence					3.5622	0.468
	Urban	11(18.97)	9(23.08)	1(33.33)			
	Rural	34(58.62)	16(41.03)	1(33.33)			
	Semi urban	13(22.41)	14(35.90)	1(33.33)			
5	Previous exposure					4.4643	0.107
	Yes	23(39.66)	15(38.46)	3(100.00)			
	No	35(60.34)	24(61.34)	0(0.00)			
6	Source of previous knowledge					8.4207	0.209
	Classroom lecture	19(32.76)	18(46.15)	0(0.00)			
	Clinical posting	32(55.17)	21(53.85)	3(100.00)			
	Simulation/lab	2(3.45)	0(0.00)	0(0.00)			
	None	5(8.62)	0(0.00)	0(0.00)			
7	Grade Point Average (gpa)or academic performance					8.3829	0.079
	Distiction	4(7.02)	7(18.92)	1(33.33)			
	First class	38(66.67)	27(72.97)	2(66.67)			
	Second class	15(26.32)	3(8.11)	0(0.00)			
8	Completed clinical hours in obstetrics and gynecology (obg)					1.8236	0.768
	Less than 100 hours	12(20.69)	8(20.51)	0(0.00)			
	100 to 150 hours	25(43.10)	14(35.90)	1(33.33)			
	More than 150 hours	21(36.21)	17(43.59)	2(66.67)			
9	Participation in any skill -baseed training						

	Yes	28(48.28)	13(33.33)	3(100.00)	6.0494	0.049
	No	30(51.72)	26(66.67)	0(0.00)		
10	Confidence level in administering iv medications (before training)					
	Very confident	19(32.76)	6(15.38)	3(100.00)	11.4453	0.022
	Moderately confident	33(56.90)	28(71.79)	0(0.00)		
	Not confident	6(10.34)	5(12.82)	0(0.00)		
11	Region/state					
	Andhra pradesh	46(79.31)	35(89.74)	3(100.00)	3.9072	0.689
	Tamil nadu	3(5.17)	0(0.00)	0(0.00)		
	karnataka	1(1.72)	0(0.00)	0(0.00)		
	kerala	8(13.79)	4(10.26)	0(0.00)		
12	Mode of transportation to clinical site					
	Hostel/on -campus	42(72.41)	32(82.05)	3(100.00)	2.1468	0.342
	Commutes from home	16(27.59)	7(17.95)	0(0.00)		

The association between the level of knowledge and selected socio-demographic variables among the participants was analyzed using the chi-square test. The findings revealed that there was a statistically significant association between the level of knowledge and type of institution ($p = 0.301$) and participation in skill-based training ($p = 0.049$). However, no statistically significant association was found between the level of knowledge and variables such as age in years ($p = 0.652$), area of residence ($p = 0.468$), previous exposure to knowledge ($p = 0.107$), source of previous knowledge ($p = 0.209$), academic performance ($p = 0.079$), completed clinical hours in obstetrics and gynecology ($p = 0.768$), confidence level in administering IV medications ($p = 0.022$), region/state ($p = 0.689$), and mode of transportation to clinical site ($p = 0.342$). Gender was constant among all participants and hence no statistical test was applied. Therefore, it can be concluded that only selected variables showed significant association with the level of knowledge, while most of the variables did not show any statistically significant association.

4. DISCUSSION

The present study assessed the effectiveness of Skill-Based Training (SBT) on knowledge and skill regarding Magnesium Sulfate (MgSO_4) administration among fourth-year B.Sc. nursing students. Regarding Objective 1, the pre-test findings revealed that the majority of students 58 (58%) had inadequate knowledge, followed by 39 (39%) with moderate knowledge, and only 3 (3%) had adequate knowledge regarding MgSO_4 administration. Similarly, in the pre-test assessment of skills, the majority of students 91 (91%) demonstrated moderate skill acquisition, while only 9 (9%) had high skill acquisition, and none had low skill acquisition. These findings indicate that nursing students had inadequate baseline knowledge and only moderate practical skills regarding MgSO_4 administration before the intervention. Regarding Objective 2, after the Skill-Based Training, a marked improvement was observed in both knowledge and skills. In the post-test, 67 (67.68%) students attained adequate knowledge, followed by 26 (26.26%) with moderate knowledge, while only 6 (6.06%) had inadequate knowledge. Similarly, 95% of students achieved high skill acquisition in the post-test, whereas only 5% remained in the moderate skill acquisition category, and none demonstrated low skill acquisition. These findings demonstrate that the Skill-Based Training effectively enhanced both the knowledge and practical skills of nursing students regarding MgSO_4 administration. Regarding Objective 3, the comparison of pre-test and post-test knowledge scores

showed that the mean knowledge score increased significantly from 10.44 ± 4.63 to 20.17 ± 5.04 , with a paired t -value of -12.75 ($p = 0.000$), indicating a highly significant improvement following the intervention. Likewise, the comparison of skill scores demonstrated a statistically significant difference between the pre-test and post-test, with the mean score changing from 12.97 ± 1.31 to 8.75 ± 1.43 , yielding a paired t -value of 21.285 ($p = 0.000$). These findings confirm that the Skill-Based Training was highly effective in improving both knowledge and skill regarding MgSO_4 administration among fourth-year B.Sc. nursing students. Regarding Objective 4, the association between pre-test knowledge scores and selected socio-demographic variables revealed a statistically significant association with participation in prior skill-based training ($p = 0.049$), whereas no significant association was observed with age, area of residence, previous exposure to MgSO_4 , source of previous knowledge, academic performance, completed clinical hours, confidence in administering IV medications, region/state, or mode of transportation to the clinical site. Gender was constant among all participants and was therefore not analyzed statistically. Furthermore, no statistically significant association was found between the pre-test skill scores and any of the selected socio-demographic variables, as all obtained p -values were greater than 0.05. These findings suggest that most socio-demographic characteristics did not influence the baseline knowledge and skill levels of the participants regarding MgSO_4 administration.

5. CONCLUSION

Overall, the Skill-Based Training Programme administered to fourth-year B.Sc. nursing students regarding Magnesium Sulfate (MgSO_4) administration was found to be highly effective. The findings of the study demonstrated that the majority of participants had poor to moderate knowledge and skill regarding MgSO_4 administration during the pre-test assessment. However, following the implementation of the skill-based training programme, a significant improvement was observed in both the post-test knowledge and skill scores, with most participants attaining adequate knowledge and competent practical skills. The results further indicated that there was no statistically significant association between the pre-test knowledge and skill scores and selected demographic variables such as age, institution type, previous clinical exposure to MgSO_4 administration, and source of prior information. This suggests that the improvement in knowledge and skill was primarily attributable to the effectiveness of the skill-based training programme rather than demographic characteristics. The study highlights the importance of structured skill-based educational interventions in improving both theoretical knowledge and practical competency related to Magnesium Sulfate (MgSO_4) administration among nursing students. By strengthening their knowledge and clinical skills, the training programme enhances students' confidence, promotes safe medication administration practices, and contributes to improved maternal and neonatal care. Therefore, skill-based training programmes can be considered an effective and practical educational strategy for preparing nursing students to administer MgSO_4 safely and competently in clinical practice.

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