

Effectiveness Of Simulation- Based Learning In Term Of Competency Regarding Pre-Term Newborn Care Among Nursing Students: An Quasi Experimental Study

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Abstract

Background: Premature birth is a sudden event of birth below the 37th week of pregnancy. In the third trimester, that is, 27-40 weeks of gestation when the baby's major stages of development take place, the baby receives a wonderful blood supply to its respiratory system that enables it to breathe for the first time.

Material And Method: A Quasi- experimental Non- equivalent control group pre-test post-test design was adopted to assess the effectiveness of simulation based learning in terms of competency of nursing students. Data was collected from 114 students studying BSc. 3rd Year in M.M. College of Nursing, and M.M. Institute of Nursing, Mullana, Ambala, Haryana. Study participants were randomly allotted in experimental group (n=55) and comparison group (n=59) by using purposive sampling technique. The data was collected by using selected variables, Structured Knowledge Questionnaires, Objective Structured Clinical Examination (OSCE) and Clinical Decision Making Ability Questionnaires.

Results: The study findings showed that majority of the nursing students (80%) were female in experimental group and (79.66%) in comparison group. The mean post-test knowledge score (26.22±5.24) of nursing students in experimental group was higher than the mean post -test knowledge score (22.46±6.54) of comparison group. The mean post-test skills score (45.40±7.45) of nursing students in experimental group was lower than the mean post -test skills score (45.51±8.36) of comparison group. The mean post-test clinical decision making ability score (17.84±2.84) of nursing students in experimental group was higher than the mean post-test clinical decision making ability score (14.39±5.47) of comparison group. The calculated 't' value of post-test knowledge scores in experimental and comparison group (p=0.00*) and the calculated 't' value of post-test skills scores in experimental and comparison group (p=0.94*) The calculated t value of post-test clinical decision making ability scores in experimental and comparison group(p=0.00*) was found to be statistically significant at 0.05 level of significance.

Conclusion: The study concluded that Simulation based learning was effective in enhancing the competency in terms of knowledge, skills and clinical decision making ability regarding Preterm Newborn Care among Nursing Students.

Keywords: Effectiveness; Simulation based learning; Competency (Knowledge, Skills, Clinical decision making ability), Preterm Newborn Care; Nursing students.

1. BACKGROUND

Premature birth is a sudden event of birth below the 37th week of pregnancy. In the third trimester, that is, 27-40 weeks of gestation when the fetus major stages of development take place, the baby receives a wonderful blood supply to its respiratory system that enables it to breathe for the first time. After the third trimester, the fetus usually adjusts its birth¹. According to the World Health Organization (WHO) epidemiology, in every 10 newborn infants, one infant is considered a preterm infant. one million infant died due to prematurity. The preterm deliveries were then ranked as the first cause of mortality of preterm infants, during the first month of birth and after birth.² According the statistics of Tehran Medical Science University the preterm birth rates are high and account for 7.2% in India. The use of modern technology and

advance medical science regarding the care of preterm infant ensures the biological survival of these infants. These babies need special care in the intensive care unit for a long time.³

Immaturity affects a wide range of organ systems and developed complications of preterm birth which including inflammation and cytokine damage are also associated with the pathogenesis of chronic lung disease, necrotizing enterocolitis, retinopathy of prematurity (ROP) and brain white matter injury in the preterm infant⁴.

Nursing students need training programs to deal effectively with the emergencies they often encounter in the intensive care unit, which can help nursing students switch to occupation after graduation.⁵To overcome these limitations in clinical practice, reversible learning and nursing simulation training methods were used.⁶ Transformed learning with imitation training techniques gives students the opportunity to practice clinical judgment, gain engagement experience and work experience.⁷ The modified learning approach provides more classroom time and practical learning tests that students' identities of their learning processes allow and allows students to share their ideas and ideas and link content with their personal knowledge and expertise. The practice provides opportunities to practice clinical thinking and judgment and develop the ability to “think like a nurse”.⁸

In this study, the simulation based learning is used for enhancing the competency (knowledge, skills and clinical decision making ability) regarding preterm newborn care among nursing students.

1.2 Objectives

1.2.1 To assess and compare the effectiveness of simulation based learning on preterm newborn care in terms of competency (knowledge, skill and clinical decision-making ability) among nursing students in experimental and comparison group.

1.2.2 To determine the relationship between knowledge, skill and clinical decision-making ability regarding Preterm newborn care among nursing students in experimental and comparison group.

2 METHODS

2.1 Study Design

A Quasi- experimental Non- equivalent control group pre-test post-test design was adopted to assess the effectiveness of simulation based learning in terms of competency (knowledge, skills and clinical decision making ability) regarding preterm newborn care among nursing students.

2.2 Setting

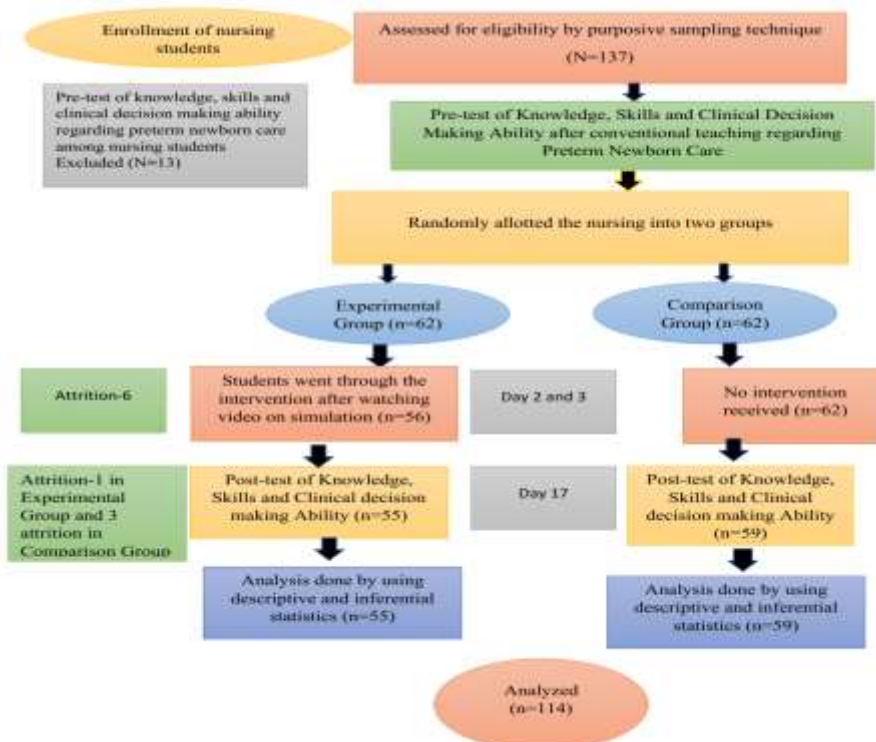
The study was conducted in the M.M College of Nursing and M.M Institution of Nursing, Mullana, Ambala, Haryana.

2.3 Sample And Sample Technique

Data was collected from 114 students studying BSc. 3rd Year in M.M. College of Nursing, and M.M. Institute of Nursing, Mullana, Ambala, Haryana. Study participants were randomly allotted in experimental group (n=55) and comparison group (n=59) by using purposive sampling technique.[Figure 1]

Consort Diagram

The consort diagram for the sample selection is depicted in figure 1



2.4 Ethical Approval

Formal administrative approval for conducting the study was obtained from the institutional ethical committee of MM (deemed to be) University for conduct the study (Project no: IEC2133). The study participant was explained about the research study and its purpose before data collection. Informed consent was obtained from the study participants and they were assured about the confidentiality of the response.

2.5 Variable

- Independent Variable: Simulation Based Learning regarding Preterm Newborn Care
- Dependent Variable: Competency (Knowledge, skills and clinical decision making ability) among Nursing Students.
- Selected Variables: Gender, previous sessional marks, nursed preterm newborn.

2.6 Sample Size And Power Analysis

Power analysis was carried out by Cohen's d formula $d = (\mu_1 - \mu_2) / \sigma$ based on the mean score of previous studies where calculated sample size was 124 for each group (effect size 0.56) and (power 0.80). Hence sample size were 62 in experimental group and 62 in comparison was taken in the study.

2.7 Data Collection

Data were collected by using four tools. Selected sample characteristics that were prepared by researcher are gender, previous sessional exam marks and whether you have nursed preterm newborn. Structure knowledge questionnaire (KR 20=0.76) included 45 multiple choice question that were designated into the Concept of preterm newborn care, Hypothermia, Radiant Warmer, KMC, EBM, Paladai feeding and Oro-gastric feeding. Objective structure clinical examination checklist was consisted 75 items, which further categorized into subdomains that are Records the temperature of preterm newborn baby (Inter-rater reliability 0.82), Thermal Care (Inter-rater reliability 0.87), Radiant Warmer (Inter-rater reliability 0.90), Kangaroo Mother Care (Inter-rater reliability 0.76), Preparation for Expression of Breast Milk (Inter-rater reliability 0.76), Expression of Breast Milk (Inter-rater reliability 0.70), Oro-gastric Feeding (Inter-rater reliability 0.80), Paladai Feeding (Inter-rater reliability 0.90). For each correct response and correct step, score was 1 awarded and for every wrong answer or wrong step 0 score was awarded. Clinical decision making ability included 6 case scenario that were based on Hypothermia, Radiant warmer, Kangaroo mother care, Expression of breast milk, Paladai feeding, Oro-gastric Feeding. The reliability of clinical decision making ability questionnaire was found to be 0.65. Video on simulation based learning regarding preterm newborn care was prepared by the researcher.

Before giving intervention to the experimental group, Pre-test assessment of competency (knowledge, skills and clinical decision making ability) regarding preterm newborn care was conducted by using structured knowledge Questionnaire, Objective Structured Clinical Examination (OSCE) Checklist and Clinical Decision Making Ability Questionnaire after Conventional teaching given by teacher on preterm newborn care. Intervention comprising Video regarding simulation based learning was administration to the nursing students then SBL regarding preterm newborn care was administered based on two parallel case scenarios with the help of standardized simulator on the next day of the pre test. Post test assessment of (knowledge, skills and clinical decision making ability) regarding preterm newborn care was conducted by using structured knowledge Questionnaire, Objective Structured Clinical Examination (OSCE) Checklist and Clinical Decision Making Ability Questionnaire was carried out on the 17th day.

2.8 Statistical Analysis

According to the objectives, hypotheses of the study and opinion of the expert, it was planned to organize and interpret the data by using both descriptive and inferential statistics. By using SPSS 20.00 software after checking normality of the data by Kolmogorov-Smirnov Test.

KS TEST

KS test was used and it was found that among experimental and comparison group both pretest knowledge score experiment group ($p=0.20$), comparison group (0.00), skill score ($p=0.20$), ($p=0.20$) and CDMA score (0.20), (0.16) were not significant at 0.05 level of significance.

Hence parametric test was applied for knowledge, skill, and clinical decision making ability.

3. RESULT

3.1 Description Of Selected Variables Of Experimental And Comparison Group

The calculated Chi-square value was found to be statistically nonsignificant regarding gender, previous sessional marks in CHN, whether you have nursed preterm newborn. majority of nursing students (80%) and (79.66%) were female in experimental and comparison group respectively. More than the half nursing student (63.63%) and (62.71%) in experimental group and comparison group had sessional marks between 0-37. Maximum of nursing students (90.90%) in experimental group had never nursed preterm newborn and (83.05%) in comparison group had nursed preterm newborn.

3.2 Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference And “T” Value Of Pre-Test And Post-Test Of Knowledge Score Regarding Preterm Newborn Care

The result of paired t-test showed significant difference ($p < 0.05$) in mean knowledge score ($t = 9.54, p = 0.00^*$) in experimental group [Table 1].

Table 1
Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference and “t” value of Pre-test and Post-test of Knowledge Score regarding Preterm Newborn Care among Nursing Students in Experimental and Comparison Group

		N=114						
Variable	Group	Mean ± SD	MD	SEMD	t value	df	p value	
Knowledge	Experimental group (n=55)	Pre-test	20.35±6.60	5.87	0.61	9.54	54	0.00*
		Post-test	26.22±5.24					
	Comparison group (n=59)	Pre-test	21.10±6.76	1.35	0.96	1.40	58	0.16 ^{NS}
		Post-test	22.46±6.54					

*Significant ($p < 0.05$)
^{NS}Not significant ($p > 0.05$) $t(54)(58) = 2.00$ ^{NS} Not significant

3.3 Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference And “T” And “P” Value Of Post-Test Knowledge Score

The result of independent ‘t’-test revealed significant difference between the experimental and comparison group regarding preterm newborn care. The experimental group, mean post-test knowledge score of the nursing students was found to be 26.22±5.24 and 22.46±6.54 in comparison group with the mean difference of 3.76 and standard error of mean difference of

1.11. The calculated ‘t’ value was found to be 3.36 $t(112) = 1.984$; $p = 0.00$ which was significant at 0.05 level of significance. [Table 2]

Table 2
Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference And “T” And “P” Value Of Post-Test Knowledge Score Regarding Preterm Newborn Care Among Nursing Students In Experimental And Comparison Group

		N=114						
Variable	Group	Mean±SD	M _D	SEMD	t value	df	p value	
Knowledge	Experimental Group (n-55)	26.22±5.24	3.76	1.11	3.36	112	0.00*	
	Comparison group (n-59)	22.46±6.54						

*Significant ($p < 0.05$)
^{NS}Not significant ($p > 0.05$) $t \text{ at } (112) = 1.98$

3.4 Mean, Standard Deviation , Mean Difference, Standard Error Of Mean Difference And ‘T’ And P’ Value Of Pre-Test And Post-Test Skill Score

Mean post-test skill score 45.40±7.45 of nursing students in experimental group was higher than the mean pre-test skill 23.42±8.80 with mean difference of 21.98 and standard error of mean difference was 0.84. In Experimental group, the calculated ‘t’ value of 26.12 was found to be statically significant, $t(54) = 2.00$; $p = 0.00$ at 0.05 level of significance. [Table 3]

Table 3
Mean, Standard Deviation ,Mean Difference, Standard Error Of Mean Difference And ‘T’ And P’ Value Of Pre-Test And Post-Test Skill Score Regarding Preterm Newborn Care Among Nursing Students In Experimental And Comparison Group

		N=114						
Variable	Group	Assessment	Mean ± SD	M _D	SEMD	t value	df	p value
Skill	Experimental group (n=55)	Pre-test	23.42±8.80	21.98	0.84	26.12	54	0.00*
		Post-test	45.40±7.45	18.72	0.96	19.50	58	0.00*
	Comparison group (n=59)	Pre-test	26.78±6.85					
		Post-test	45.51±8.363					

*Significant ($p < 0.05$)
^{NS} Not significant ($p > 0.05$) $t(54) (58) = 2.00$

3.5 Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference And ‘T’ And ‘P’ Value Of Post- Test Skill Score

In the experimental group, mean post-test skill score of the nursing student was found to be 45.40±7.45 and 45.51±8.36 in the comparison group with the mean difference of 0.10 and standard error of mean difference was 1.48. The difference in the mean scores between the experiment and comparison group was computed by independent 't' test. The calculated 't' value was found to be 0.07; t(112)=1.98; p=0.94 which was not significant at 0.05 level of significance. [Table 4]

Table 4
Mean, Standard Deviation, Mean Difference, Standard Error of Mean Difference and 't' and 'P' value of Post- test Skill Score regarding Preterm Newborn Care among Nursing Students in Experimental and Comparison Group

N=114							
Variable	Group	Mean±SD	MD	SE MD	t value	df	p value
Skill	Experimental Group (n=55)	45.40±7.45	0.10	1.48	0.07	112	0.94 NS
	Comparison Group (n=59)	45.51±8.36					

^{NS}not Significant (P>0.05)

T At 112 =1.98 *Significant (P<0.05)

3.6 Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference And "T" Value Of Pre-Test And Post-Test Clinical Decision Making Ability

The mean post-test clinical decision making ability score 17.84±2.84 of nursing students in experimental group was higher than the mean pre-test clinical decision making 12.22±4.89 with mean difference of 5.61 and standard error of mean difference was 0.56. In experimental group, the calculated 't' value of 9.91 was found to be statically significant, t (112) =1.98; p=0.00 at 0.05 level of significance. [Table 5]

Table 5
Mean, Standard Deviation, Mean Difference, Standard Error Of Mean Difference And "T" Value Of Pre-Test And Post-Test Clinical Decision Making Ability Regarding Preterm Newborn Care Among Nursing Students In Experimental And Comparison Group

N=114								
Variable	Group	Mean±SD	MD	SEMD	t value	df	P value	
Clinical Decision Making Ability	Experimental group (n=55)	Pre-test	12.22±4.89	5.61	0.56	9.91	54	0.00*
		Post-test	17.84±2.84	2.16	0.96	2.92	58	0.00*
	Comparison group (n=59)	Pre-test	12.22±5.08					
		Post test	14.39±5.47					

*Significant (P<0.05)

t(54)=2.00

^{NS} not Significant (P>0.05)

t(58)=2.00

3.7 Mean, Mean Difference, Standard Deviation, Standard Error Of Mean Difference, "T" And "P" Value Of Post Test Clinical Decision Making

In the experimental group, mean post-test clinical decision-making ability score of the nursing students was found to be 17.84±2.84 and 14.39±5.47 in comparison group with the mean difference of 3.44 and standard error of mean difference of 0.82. The difference in the mean scores between the experimental group and comparison group was computed by independent 't' test. The calculated 't' value was found to be 4.17 t (112) =1.98; p=0.00 which was significant at 0.05 level of significance. [Table 6]

It can be concluded that simulation-based learning was effective in enhancing the clinical decision making ability regarding preterm newborn care among nursing students.

Table 6
Mean, Mean Difference, Standard Deviation, Standard Error Of Mean Difference, "T" And "P" Value Of Post Test Clinical Decision Making Ability Regarding Preterm Newborn Care Among Nursing Students In Experimental And Comparison Group

N=114						
Groups	Mean±SD	MD	SEMD	t value	df	p value
Experimental group(n=55)	17.84±2.84	3.44	0.82	4.17	112	0.00*
Comparison group(n=59)	14.39±5.47					

*Significant (p<0.05)

t(112) =1.98

^{NS} Not significant (p>0.05)

These findings were consistent with the study conducted by **Roghayeh Mehdipour**,¹² Simulation-based mastery improves nursing skills in B. S. c nursing students showed that there was, the mean scores of skills in the intervention group were statistically significant before (25.4 ± 1.27) and after the intervention (35.4 ± 0.46) ($p < 0.05$).

In the experimental group, mean post-test skill score of the nursing student was found to be 45.40 ± 7.45 and 45.51 ± 8.36 in the comparison group with the mean difference of 0.10 and standard error of mean difference was 1.48. The difference in the mean scores between the experiment and comparison group was computed by independent 't' test. The calculated 't' value was found to be $0.07; t(112) = 1.98; p = 0.94$ which was not significant at 0.05 level of significance.

These findings were consistent with the study conducted by **Ayşe Karakoc**¹³ et al on effects of simulation based education on initial neonatal evaluation and care skills; the results of each implementation step of the evaluation from were compared between the groups. The difference between the groups was statistically significance in all application steps (< 0.005), except for umbilical cord clamping ($\chi^2 = 1.360, p = 0.50$), vitamin- K vaccination ($\chi^2 = 2.56, p = 0.10$) and hepatitis vaccination ($\chi^2 = 2.56, p = 0.10$)

The mean post-test clinical decision making ability score 17.84 ± 2.84 of nursing students in experimental group was higher than the mean pre-test clinical decision making 12.22 ± 4.89 with mean difference of 5.61 and standard error of mean difference was 0.56. In experimental group, the calculated 't' value of 9.91 was found to be statically significant, $t(112) = 1.984; p = 0.00$ at 0.05 level of significance. The mean post-test clinical decision making ability score 14.39 ± 5.47 of nursing students in comparison group was higher than the mean pre-test clinical decision making (12.22 ± 5.08) with mean difference of (2.16) and standard error of mean difference was (0.96). In comparison group, the calculated 't' value of (2.92) was found to be statically significant, $t(112) = 1.984; p = 0.00$ at 0.05 level of significance.

RECOMMENDATIONS

- A study can be replicated on a large sample of nursing students for wider generalization of findings.
- A study can be carried out on nursing staff to assess their competency regarding Preterm Newborn Care.
- A similar study can be conducted to explore the experience of nursing students regarding Preterm Newborn Care.
- A comparative study can be conducted to find out the effectiveness of simulation based learning with other traditional teaching strategies in terms of competency regarding Preterm Newborn Care.
- A study can be carried out using innovational teaching strategies like self instructional module, structured teaching program and E-learning strategy.
- A mixed method study may be conducted to identify barriers to the development of case scenario or different that may be encountered.
- A study can be carried out by using video based simulation strategies.

CONCLUSION

Based on the findings of the study it can be concluded that simulation- based learning was significantly effective in improving the knowledge and clinical decision making ability among nursing students.

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AUTHOR DECLARATION

We the undersigned declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

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