

Effect of Simulation Training on Intern Nurses' Competence and Self-Confidence regarding Primary Postpartum Hemorrhage

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Abstract

Background: Simulation training have been recommended for promoting intern nurses' competence in maternal care delivery. **Aim:** The study aimed to evaluate effect of simulation training on intern nurses' competence and self-confidence regarding primary postpartum hemorrhage. **Design:** Quasi-experimental (pre-post design), was used to fulfill the aim of the study. **Setting:** The study was conducted in the clinical obstetrics skill lab and the classroom of faculty of Nursing at Benha University. **Sample:** A systematic random sample of (56) intern nurses. **Tools:** (I) A self-administrated questionnaire, (II) Creighton competency evaluation instrument, (III) observational checklists regarding primary postpartum hemorrhage, (IV) satisfaction and self-confidence in learning scale. **Results:** There was a highly statistically significant improvement in relation to all competency domains related to assessment, communication, clinical-judgment and patient safety after simulation training than before ($P \leq 0.001$). Moreover, there was a higher satisfaction and self-confidence after simulation training than before ($P \leq 0.001$). **Conclusion:** Intern nurses would have higher competent level of practices, satisfaction and self-confidence after simulation training than before. **Recommendations:** Implementing of periodical simulation training programs for intern nurses to enhance competent skills for achieving advanced nursing care regarding prevention and management of primary postpartum hemorrhage.

Keywords: Competence, Intern nurses, Primary postpartum hemorrhage, Self-Confidence, Simulation training.

Introduction

Postpartum hemorrhage (PPH) remains the most common complication of childbirth and leads to significant maternal morbidity and mortality when diagnosis and management are delayed. PPH affects around 5–10 % of deliveries worldwide. It can be instigated by excessive blood loss which occurs frequently after the delivery that can result in volume depletion and catastrophic complications (*Bihan et al., 2023; Krishnamoorthy et al., 2022*).

Postpartum hemorrhage can be classified as primary if the bleeding occurs before delivery of the placenta and up to 24 hours after delivery of the fetus, or secondary if it occurs more than 24 hours after delivery. Primary PPH is classically defined as a blood loss of more than 500 cc in a vaginal birth or more than 1000 cc in a cesarean delivery, accompanied by signs or symptoms of

hypovolemia and fall in hematocrit $>10\%$ after the birth process (*Hofer et al., 2023; Gupta et al., 2023*).

Primary PPH may develop in women with no risk factors and only about one-third of primary PPH cases have identifiable risk factors (*Bazirete et al., 2021*). The leading causes of primary PPH that account for the majority of cases can be remembered by the 4T mnemonic: Tone (uterine atony), Trauma (laceration), Tissue (retained placenta), and Thrombin (coagulopathy). Uterine atony (failure of active contraction of the uterine smooth muscles) is the leading preventable cause of PPH, accounting for 70–80% of all PPH (*Baltaji et al., 2023*).

Prevention of primary PPH should start during the third stage of labor. Current guidelines recommend active management as opposed to physiologic or expectant management. Active management is made up

by a set of maneuvers to prevent primary PPH. It consists of administration of prophylactic uterotonic agents, controlled cord traction and uterine massage after delivery of the placenta (*Vermeulen and Van de Velde, 2022*).

Simulation training is considered the gold standard in training novice nurses to respond to high-risk clinical obstetric emergencies such as primary PPH. Nursing students need opportunities to practice skills in a low-risk, safe, supportive learning environment while identifying process breakdowns and practice gaps and supporting quality improvement (*Nauta and Springett, 2021*).

Nursing internship is the main transition period from academic education to a professional nursing career and it is essential to enable new nursing professionals to apply academic knowledge in clinical practice and bridging the theory-practice gap among newly qualified professionals (*Eweida et al., 2023*). Clinical learning helps nursing students to learn a role and develop a professional identity as well as present reality, acquire cognitive, reflective and effective nursing skills (*Depalma et al., 2023*).

Moreover, professional nursing requires knowledge and skills to deal with a number of challenges; well-planned and organized simulation exercises that could help in developing students' critical reflection and clinical competence. The competence gained through simulation helps nursing student to raise confidence and reduce stress levels (*Akselbo and Aune, 2023*).

Significance of the study

Postpartum hemorrhage is a serious obstetric emergency and one of the top five causes of maternal mortality globally. Each year, about 14 million women experience PPH resulting in about 70,000 maternal deaths globally (*World Health Organization,*

2022). In developing countries, the estimated mortality rate is 140,000 per year or one maternal death every 4 minutes due to postpartum hemorrhage (*Menezes et al, 2021*).

The incidence of primary postpartum hemorrhage in Egypt was found to be 2.5%, the most common risk factors are placenta previa 28.4%, and pregnancy induced hypertension 21.6%. While the most common causes are uterine atony 71.6%, obstetric trauma 18.9% (*Ahmed et al., 2020*). Primary PPH is the most common cause of death in malpractice, indicates the quality of obstetric care in Egypt needs further improvement in the health care providers (*Ghaleb et al., 2021*).

Aim of the study:

The study was aimed to evaluate effect of simulation training on intern nurses' competence and self-confidence regarding primary postpartum hemorrhage.

Research hypotheses

H1: Intern nurses would have higher competent level of practices after simulation training than before.

H2: Intern nurses would have higher satisfaction and self-confidence level after simulation training than before.

Operational definitions:

Simulation training: Refers to the training scenario empower intern nurses to deal with primary postpartum hemorrhage women and providing priority of nursing care in the clinical obstetrics skill lab as in real situation.

Competence: Refers to knowledge, skills and attitude of intern nurses required for advanced nursing care for preventing and managing primary postpartum hemorrhage. This was measured by Creighton competency evaluation instrument and observational checklists regarding primary postpartum hemorrhage.

Subjects and method

Research design:

Quasi-experimental (pre-post design), was used to fulfill the aim of the study.

Setting:

The study was conducted in the clinical obstetrics skill lab and the classroom of faculty of Nursing, Benha University.

Sample type:

A systematic random sample was used from the above mentioned study setting.

Sample size:

The sample of the present study consisted of (56) intern nurses which represented 20% of total study sample (281).

Tools of data collection:

Tool I: A self-administered questionnaire

It was designed by the researcher after reviewing related literature (*McKinney et al., 2021; Chandrabharan and Arulkumar, 2021; and Padumadasa and Goonewardene, 2021*) and was written in Arabic language in the form of close and open ended questions. It encompassed the following two parts:

Part 1: Intern nurses' general characteristics included (age, gender, marital status, residence, attendance of any workshops about postpartum hemorrhage, participation in previous simulation training, name of simulation training and experience in obstetrics and gynecological department).

Part 2: Intern nurses' knowledge regarding primary postpartum hemorrhage included 15 items in the form of multiple choice: (definition and classifications of postpartum hemorrhage, definition of primary postpartum hemorrhage, risk factors, causes, signs and symptoms, complications, initial laboratory tests of primary postpartum hemorrhage, methods of blood loss estimation, preventive measures of primary postpartum hemorrhage during antepartum and intrapartum period, active management of the third stage of labor, preventive measures

of primary postpartum hemorrhage during postpartum period, nursing interventions and management, and medications used in primary postpartum hemorrhage).

Scoring system:-

Each knowledge item was weighted according to: complete correct answers (3 points), incomplete correct answers (2 points) and don't know (1 point). The total knowledge score was calculated by summation of the scores of all items. The total score of knowledge was ranged from (15- 45) and was categorized as the following: satisfactory knowledge: ($\geq 80\%$ correct answers) and unsatisfactory knowledge: ($< 80\%$ correct answers).

Tool II: Creighton Competency Evaluation Instrument (CCEI)

The Creighton simulation competency instrument was developed by (*DiGiacomo, 2017*) and adapted by the researcher to assess intern nurses' competence during the simulation training of primary postpartum hemorrhage. The CCEI, composed of 59 items including 15 domains, covering four sections.

Scoring system:-

Each item of competency was scored as follows: demonstrate competently (1point), and doesn't demonstrate competently (0 point). The total score was ranged from (0-59).The total level of competency was classified as follows:- competent $\geq 85\%$ and incompetent $< 85\%$.

Tool III: Observational checklists regarding primary postpartum hemorrhage

This tool was designed by the researcher after reviewing related literature (*Wilkinson et al., 2020; Sorrentino et al., 2020 and World Health Organization, 2017*) to assess intern nurses' practices during providing nursing care for women with primary postpartum hemorrhage and included four

procedures; urinary catheterization (24 items), uterine massage (19 items), perineal care (24 items), and blood transfusion (17 items).

Scoring system:-

Each item of procedure was scored as follows: (1 point) for done and (0 point) for not done. The scores were calculated by summed up the grades of items of procedure's checklist. The total score was ranged from (0-84). The scores were converted into percent score. The level of practice was considered as follows; competent practice: $\geq 85\%$ of total practice scores and incompetent practice: $< 85\%$ of total practice scores.

Tool IV: Satisfaction and self-confidence in learning scale

This tool was adapted from *Jeffries and Rizzolo, (2006)*, and translated into Arabic language to assess intern nurses' satisfaction and self-confidence in learning toward simulation training regarding primary postpartum hemorrhage. This tool consists of two sub-dimensions, "satisfaction with learning" and "self-confidence", and composed of a 13 items. There are five items in the satisfaction with learning sub-dimension and eight items in the self-confidence sub-dimension.

Scoring system:-

Each item was rated on a 3-point Likert scale and assigned as agree (3), uncertain (2), disagree (1). Total score was classified into:
- High level of satisfaction/self-confidence $> 75\%$, moderate level of satisfaction/self-confidence $60\% - 75\%$ and low level of satisfaction/self-confidence $< 60\%$.

Validity of tools: -

Tools of data collection was reviewed by three experts composed of 2 professors of obstetrics and gynecological nursing at faculty of nursing Benha university and 1 professor of obstetrics and gynecology at faculty of Medicine Benha university to

ensure its validity for comprehensiveness, accuracy and relevance.

Reliability of tools:-

Reliability of the tools was assessed by using Cronbach's alpha coefficient test which indicated that the four tools were moderate to high reliability. Cronbach's Alpha for knowledge regarding primary postpartum hemorrhage was 0.948, Cronbach's Alpha for observational checklists regarding primary postpartum hemorrhage was 0.814, Cronbach's Alpha for Creighton competency evaluation instrument was 0.835, Cronbach's Alpha for satisfaction and self-confidence in learning scale was 0.913.

Ethical considerations:

Ethical aspects were considered before starting the study as the following: Approval of the faculty ethics committee for scientific research was obtained for the fulfillment of the study, an oral informed consent was taken from intern nurse before data collection, the aim of the study was explained before applying the tools to gain intern nurses' cooperation, the study didn't have any physical, psychological risk on intern nurses, the data was collected and treated confidentially and each intern nurse was free to withdraw at any time of data collection without obligation.

Administrative design:

An official permission from Dean Faculty of Nursing, Benha University to allow the researcher to use clinical obstetrics skill lab and the classroom for the study. Also, The Head of Nursing Administration department at Faculty of Nursing, Benha University obtained approval after aim of the study was clarified. Assured complete confidentiality of the obtained information, and the study didn't affect in any work or training, official permission for data collection and implementation of the simulation training were obtained.

Pilot study:

Pilot study was conducted on 10% of the total sample (6 intern nurses) to test the clarity, objectivity, feasibility and applicability of the tools and to find out the possible obstacles and problems that might face the researcher and interfere with data collection. It also was helped to estimate the time needed for data collection. No modifications were done. Intern nurses who shared in the pilot study were included in the main study sample.

Field work:

Process of data collection was carried out throughout the period from beginning of October 2021 till the end of September 2022, covering twelve months. The researcher visited the previously mentioned setting two days/week according to intern nurses' day shifts from 10.00 Am to 5.00 Pm. This study was conducted through the following sequential phases:

Interviewing and assessment phase

At the beginning of the interview the researcher greeted the intern nurses, distributed pre-test of self-administrated questionnaire to collect intern nurses' general characteristics, knowledge regarding primary postpartum hemorrhage and self-confidence and satisfaction. Also, the intern nurses were asked to perform clinical skills while the competency was assessed by the researcher.

Planning phase

Based on the results obtained from pretest assessment of intern nurses and review of relevant literature, the researcher identified the actual needs for intern nurses accordingly, set goals and objectives. In addition, the researcher designed educational booklet in an Arabic language supported by figures about prevention and management of primary postpartum hemorrhage and simulation training.

Implementation phase

Implementation of the simulation training was carried out at the pre-mentioned settings. The intern nurses were divided randomly into eight subgroups, each group included 7 intern nurses. The overall sessions was conducted through six sessions for each group; classified into 2 theoretical sessions and the duration of each session was around 60 minutes followed by 4 practical training sessions and the duration of each session was ranged from 60-90 minutes included a separated break time of 10 minutes every 45 minutes and periods of discussion according to intern nurses' achievement and feedback.

Debriefing

Immediately, following the simulation, the researcher was conduct debriefing as a reflective activity. This was lasts about 30 minutes it includes constructive feedback, correction, clarifying, discussing the experience and learns from mistake. At the end of debriefing; the intern nurses were asked if there were any additional comments. Instructional CD was distributed about prevention and management of primary postpartum hemorrhage to each one.

Evaluation phase

After implementation of simulation training, the researcher used the same previous assessment tools (I (part 2), II, III, and IV) to evaluate the effect of simulation on intern nurses' competence and self-confidence in management of primary postpartum hemorrhage.

Statistical analysis:

Data was verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 25) was used followed by data analysis and tabulation. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). Also, tests of significance Chi - square test (X²) and Fisher Exact Test

(FET) were applied to test the study hypothesis. Pearson correlation coefficients (r) were used.

Results

Table (1): shows that 57.1% of studied intern nurses were in age group of 22< 23 years old with the mean age 22.48 ± 0.60 years. As far as, 85.7% 80.4% and 92.9% of studied intern nurses were female, single and lived in rural area, respectively. Moreover, all of studied intern nurses didn't attend any workshops about postpartum hemorrhage and didn't participate in previous simulation training. In addition, 83.9% of studied intern nurses hadn't any experience in obstetrics and gynecological department.

Figure (1): illustrates that 14.3% of the studied intern nurses had satisfactory knowledge regarding primary postpartum hemorrhage before simulation training. While, 91.1% of intern nurses had satisfactory knowledge regarding primary postpartum hemorrhage after simulation training ($p=0.000$).

Table (2): demonstrates that there was a highly statistically significant improvement in relation to all competency domains related to assessment, communication, clinical-judgment and patient safety after simulation training compared to before ($P \leq 0.001$).

Table (3): shows that there was a highly statistically significant difference in relation to all items of intern nurses' practices regarding primary postpartum hemorrhage before and after simulation training ($P \leq 0.001$).

Figure (2): illustrates that 37.5% of intern nurses had high level of satisfaction before simulation training. While, 91.1% of intern nurses had high level of satisfaction after simulation training ($p=0.000$).

Figure (3): illustrates 33.9% of intern nurses had high level of self-confidence before simulation training. While, 89.3% of

intern nurses had high level of self-confidence after simulation training ($p=0.000$).

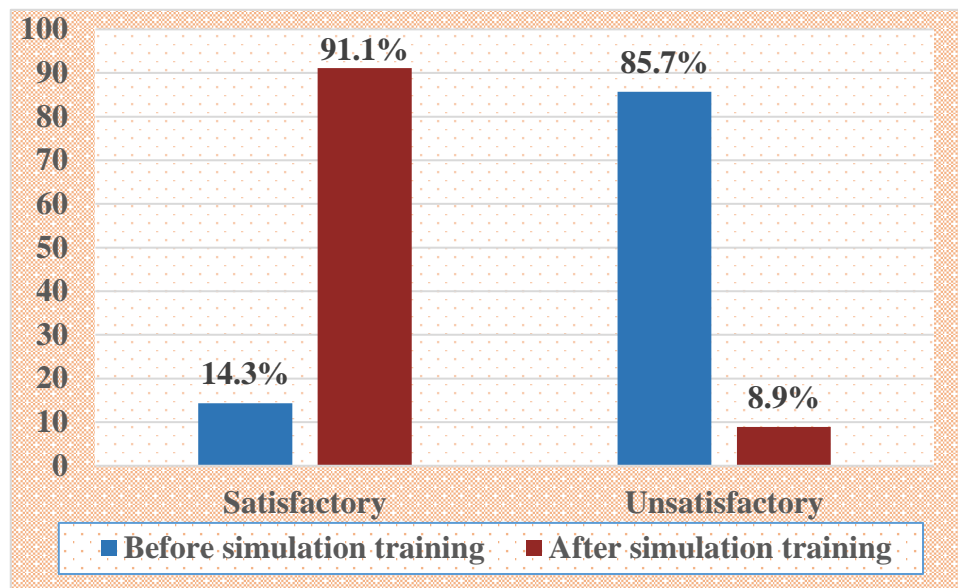
Table (4): shows that there was a statistically positive correlation between total knowledge score and total practices, competency, satisfaction and self-confidence scores before and after simulation training ($P \leq 0.001$ and $P \leq 0.05$).

Table (5): reveals that there was a statistically positive correlation between total competency score and total practices, satisfaction and self-confidence scores before and after simulation training ($P \leq 0.001$ and $P \leq 0.05$).

Table (1): Distribution of the studied intern nurses according to general characteristics (n=56)

General characteristics	n=56	
	No.	%
Age (years)		
22-	32	57.1
23-	21	37.5
≥ 24	3	5.4
Mean ± SD	22.48 ± 0.60	
Gender		
Male	8	14.3
Female	48	85.7
Marital status		
Single	45	80.4
Married	11	19.6
Residence		
Urban	4	7.1
Rural	52	92.9
Attendance any workshops about postpartum hemorrhage		
No	56	100.0
Participation in previous simulation training		
No	56	100.0
Experience in obstetrics and gynecological department		
Yes	9	16.1
No	47	83.9

Figure (1): Distribution of the studied intern nurses according to level of total knowledge regarding primary postpartum hemorrhage before and after simulation training (n=56).



$X^2=66.225$ P- value=0.000

Table (2): Distribution of the studied intern nurses according to competency domains before and after simulation training (n=56)

Phase Competency domains	Before simulation training n= 56				After simulation training n= 56				X ²	P - value
	Competent		Incompetent		Competent		Incompetent			
	No.	%	No.	%	No.	%	No.	%		
Assessment	15	26.8	41	73.2	49	87.5	7	12.5	42.146	0.000**
Communication	13	23.2	43	76.8	47	83.9	9	16.1	41.192	0.000**
Clinical-judgment	11	19.6	45	80.4	48	85.7	8	14.3	46.419	0.000**
Patient safety	5	8.9	51	91.1	46	82.1	10	17.9	57.612	0.000**

** A highly statistically significant difference (P ≤ 0.001)

X²=Chi - square test

Table (3): Distribution of the studied intern nurses according to practices regarding primary postpartum hemorrhage before and after simulation training (n=56)

Phase Procedures	Before simulation training n= 56				After simulation training n= 56				X ²	P - value
	Competent		Incompetent		Competent		Incompetent			
	No.	%	No.	%	No.	%	No.	%		
Urinary catheterization	9	16.1	47	83.9	42	75.0	14	25.0	36.865	0.000**
Uterine massage	7	12.5	49	87.5	48	85.7	8	14.3	57.161	0.000**
Perineal care	6	10.7	50	89.3	44	78.6	12	21.4	49.461	0.000**
Blood transfusion	5	8.9	51	91.1	40	71.4	16	28.6	42.943	0.000**

** A highly statistically significant difference (P ≤ 0.001)

X²=Chi - square test

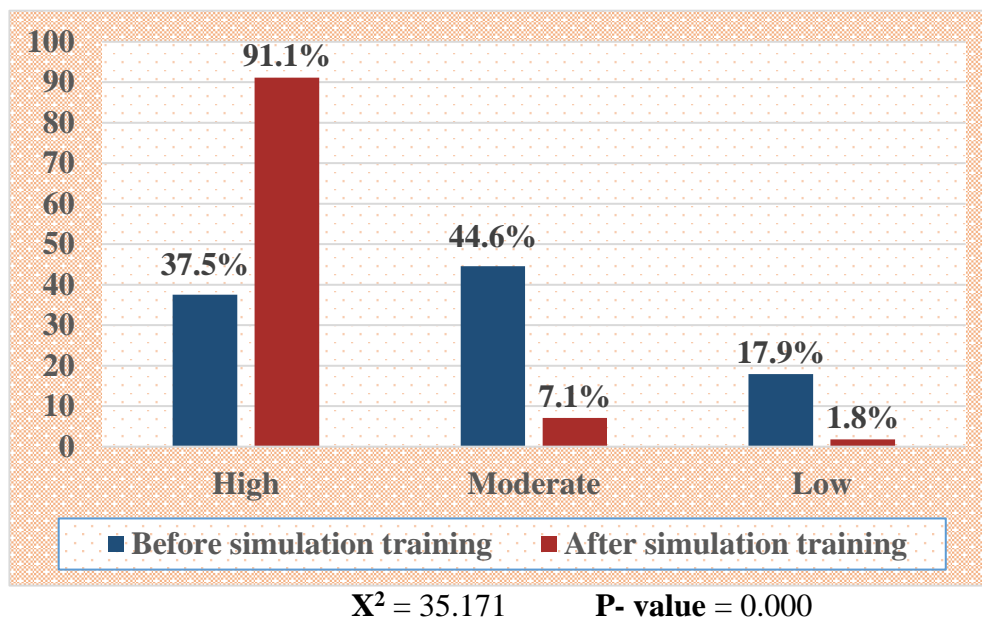


Figure (2): Distribution of the studied intern nurses according to level of satisfaction in learning before and after simulation training (n=56)

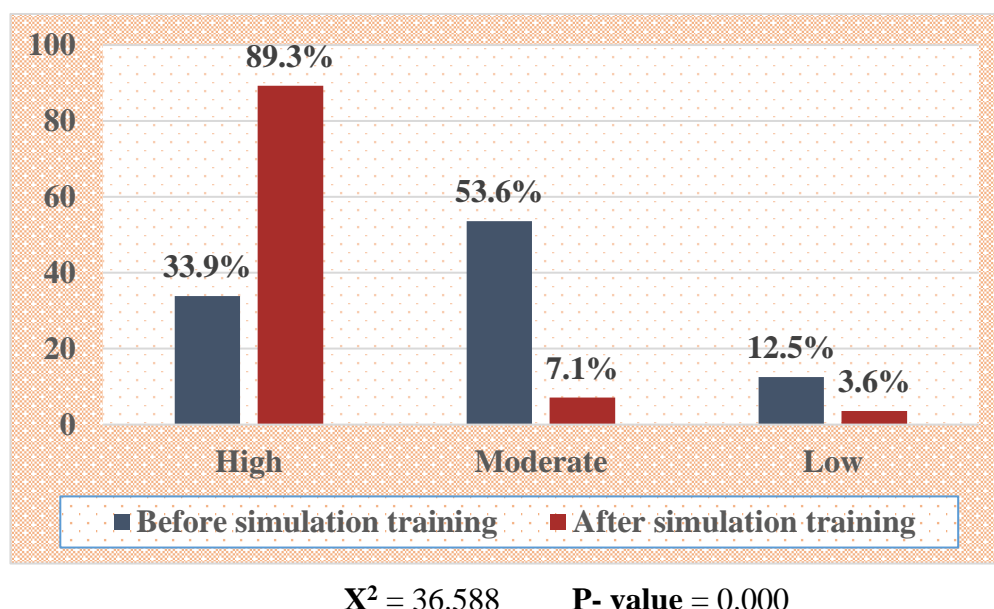


Figure (3): Distribution of the studied intern nurses according to level of self-confidence in learning before and after simulation training (n=56)

Table (4): Correlation coefficient between total knowledge, competency, practices, satisfaction and self-confidence scores of the studied intern nurses before and after simulation training (n=56)

Variables	Total knowledge score			
	Before simulation training n= 56		After simulation training n= 56	
	r	p	r	p
Total practices score	0.518	0.000**	0.711	0.000**
Total competency score	0.295	0.027*	0.894	0.000**
Total satisfaction score	0.530	0.000**	0.548	0.000**
Total self-confidence score	0.461	0.000**	0.592	0.000**

Table (5): Correlation coefficient between total competency, practices, satisfaction and self-confidence scores of the studied intern nurses before and after simulation training (n=56)

Variables	Total competency score			
	Before simulation training n= 56		After simulation training n= 56	
	r	p	r	p
Total practices score	0.637	0.000**	0.852	0.000**
Total satisfaction score	0.273	0.042*	0.390	0.000**
Total self-confidence score	0.679	0.000**	0.903	0.000**

* A statistical significant difference ($P \leq 0.05$)

**A highly statistical significant difference ($P \leq 0.001$)

Discussion

Simulation training is an effective method of training intern nurses in the management of obstetric emergency without risk of harming the women. Simulation training considered a good strategy in teaching which provide an opportunity to apply the newly learned skills and receive real-time feedback in a supportive environment. Increasing frequency of exposure to high-risk medical scenarios in simulated environments allow for developing habits of best competent practices for handling emergencies and fostering intern nurses' self-confidence (*Baayd et al., 2023 ;Angelina et al., 2021*).

According to general characteristics of the studied sample, the results of the current study showed that more than half of studied intern nurses were in age group of 22< 23 years old with the mean age 22.48 ± 0.60 years, the most of studied intern nurses were female and more than three quarters of studied intern nurses were single. Additionally, the most of studied intern nurses lived in rural area, all of studied intern nurses didn't attend any workshops about postpartum hemorrhage and didn't participate in previous simulation training. Moreover, the most of studied intern nurses hadn't any experience in obstetrics and gynecological department.

Concerning knowledge of the studied sample regarding primary postpartum hemorrhage, the results of the current study revealed that more than one tenth of the studied intern nurses had satisfactory knowledge before simulation training. This result may be due to the most of intern nurses are interested in the curriculums to pass the academic tests with lack of knowledge retention in addition to deficiency of refreshing programs.

This result is supported by *Metwally et al., (2021)* and clarified that majority of studied maternity nurses 96.0% had unsatisfactory knowledge about primary postpartum hemorrhage pre competency nursing intervention.

In relation to the level of total studied intern nurses' knowledge scores regarding primary postpartum hemorrhage after simulation training, the results of the current study demonstrated that the majority of intern nurses had satisfactory knowledge. This satisfactory level of knowledge acquired by intern nurses may be due to the positive effect of simulation training with theoretical learning sessions. Distribution of Arabic booklet play a crucial role in attaining and retaining knowledge.

The result of the current study is supported by a study carried out in London by

Chou et al., (2022) and reported that there was an improvement in clinical knowledge following the simulation of scenarios.

Concerning competency domains before and after simulation training, the results of the current study displayed that there was a highly statistically significant improvement in relation to all competency domains related to assessment, communication, clinical-judgment and patient safety after simulation training compared to before. This result may be due to the intern nurses participate in simulated environment, gaining experience, refining knowledge, skills and developing core competency; making reliable clinical judgment, provides opportunities for feedback, repetitive practice until proficiency is achieved.

These results are consistent with *Goldsworthy et al., (2022)* in Canada and revealed that there was a statistically significant increases in perceived skills competence across all the competencies (all p-values < .001).

Regarding practices of the studied intern nurses regarding primary postpartum hemorrhage before and after simulation training; the finding of the current study proved that there was a highly statistically significant difference in relation to all items of intern nurses' practices regarding primary postpartum hemorrhage before and after simulation training. This result may be due to that the good level of knowledge has positive effect on the level of practice.

This result is consistent with *Abd El-Salam et al., (2022)* and displayed that there was a statistically significant difference among the studied nurses' practices of primary postpartum hemorrhage management during the pre and post simulation phases ($p < 0.01$).

Concerning satisfaction and self-confidence in learning of the studied sample, the results of the current study illustrated that

more than one third of intern nurses had high level of satisfaction before simulation training, while the majority of intern nurses had high level of satisfaction after simulation training. This result may be due to that the simulation training was a safe learning environment where intern nurses can master competencies which foster the intern nurses' self-confidence and in turn improve satisfaction.

Concerning self-confidence of the studied intern nurses regarding primary postpartum hemorrhage before and after simulation training; there was a highly statistically significant difference in relation to all items of self-confidence in learning before and after simulation training. This result may be due to the intern nurses have enjoyed the simulation training.

The finding of the current study revealed that there was a statistically positive correlation between total knowledge score and total practices, competency, satisfaction and self-confidence scores before and after simulation training.

This result is in accordance with *Hashem et al., (2022)* and demonstrated a highly significant positive correlation between total knowledge, practice and self-confidence scores among the studied intern nursing students pre, immediately and one month post simulation training program ($p < 0.001$).

The findings of the current study revealed that there was a statistically positive correlation between total competency score and total practices, satisfaction and self-confidence scores before and after simulation training. This result may be due to the fact that application of competency domains was associated with increasing competency level that helped the intern nurses to master the performance of clinical skills.

Conclusion

Based on the results of the current study, it was concluded that; Intern nurses would have higher competent level of practices, satisfaction and self-confidence after simulation training than before. Additionally, there was a highly statistically significant improvement in relation to all competency domains related to assessment, communication, clinical-judgment and patient safety after simulation training than before. Moreover, there was a highly statistically significant improvement in relation to all items of intern nurses' knowledge and practices regarding primary postpartum hemorrhage after simulation training than before. Also, there was a highly statistically significant improvement in relation to all items of satisfaction and self-confidence in learning after simulation training than before. Therefore, the study hypotheses were supported and the study aim was achieved.

Recommendations

- Implementing of periodical simulation training programs for intern nurses to enhance competent skills for achieving advanced nursing care regarding prevention and management of primary postpartum hemorrhage.
- Integration of simulation training into the clinical training component of the maternal nursing curriculum based on competent level.

Further studies need to be performed:

- Provide pre-service and in-service training programs using simulation for newly appointed nurses to improve the competency level.
- Further research is crucial to conduct a similar study on larger sample size in different settings for generalization of the findings.

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