Contents lists available at www.innovativejournal.in

INTERNATIONAL JOURNAL OF NURSING DIDACTICS

Homepage: http://innovativejournal.in/index.php/ijnd

ISSN: 2231-5454

Effect of implementing simulation obstetric triage training on nurses' knowledge and practices

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DOI: https://doi.org/10.15520/ijnd.v10i02.2805

Abstract: Background: Obstetric triage is a screening platform for primarily evaluation of maternal and fetal conditions. However, in many settings, it used to manage pregnancy complications as well as emergent obstetric conditions ***Aim:*** This study aimed to investigate the effect of implementing simulation obstetric triage training on nurses' knowledge and practices. Design: A quasi-experimental pre/post-test design (one group) was used to conduct this study. ***Setting:*** The present study was conducted at labor and delivery emergency unit in the Mansoura University Hospital, General Hospital and Health Insurance Hospital, Mansoura, Egypt. ***Sample:*** A convenient sample of seventy nurses who worked at pervious mentioned setting from first of July to the end of October 2019. **Tools**: Data were collected through three tools ***I:*** Self-Administered Structured Schedule to assess general characteristics of the nurses and nurses' knowledge regarding obstetric triage. ***II:*** Observational check list to observe nurses' practices during implementation of obstetric triage. ***III:*** Nurses' satisfaction with the simulation obstetric triage training ***Results:*** There was an improvement in the total obstetric nurses' knowledge regarding obstetric triage from (14.3%) pre implementation of the simulation training compared to (81.4%) post implementation. Also, there was an improvement in the total obstetric nurses' practices regarding obstetric triage from (2.9 %) pre-implementation compared to (91.4%) post-implementation with highly statistically significant differences. ***Conclusion:*** The study hypotheses were accepted. There were highly statistically significant improvements in the nurses' knowledge and practices scores post implementation of the simulation obstetric triage training than before, indicating that obstetric simulation training was an effective tool for improving obstetric nurses' knowledge and practices regarding obstetric triage. ***Recommendation:*** Periodical conducting of training programs regarding obstetric triage for obstetric nurses in labor and delivery emergency unit.

Keywords: Nurses' Knowledge and Practices, Obstetric Triage, Simulation Training.

INTRODUCTION

Triage refers to the nursing assessment of patients for the purpose of sorting them according to their urgent needs for receiving medical care ***(Merriam-Webster, 2011).According to* Association of Women's Health, Obstetric and Neonatal *Nurses* (*AWHONN), (2016)*** Obstetric Triage (OT) is defined as a systematic maternal and fetal assessment performed to a pregnant woman seeking for medical care to determine priority of medical needs which require immediate action in order to ensure that both mother and baby remain in a stable physical condition. Obstetric triage can be performed by the obstetric nurse at Labor and Delivery room or in a separate emergency room as pregnant women needs may be pregnancy or non-pregnancy related ***(Hoffman, 2012).***

Many benefits of obstetric triage are documented as improving the provided care, decrease the potential liability for error, perform standardized assessment and obtain appropriate management according to a systemic process of planning and evaluation ***(Goodman et al., 2018).*** Also obstetric triage when properly implemented can reduce length of hospital stay and lower the cost related to unnecessary interventions. Also, it increases care plan documentation from 51% to 96%. Based on international guidelines recommendations, triage assessment should begin within 10 minutes of a first come to hospital irrespective of woman's risk, then stratify care based on risk assessment to prevent developing complications (***Rojas-Suarez et al., 2017).***

As the global health community world seeks to achieve the Sustainable Development Goals (SDG). It is evident that reducing the worldwide maternal ratio to less than 70 per 100.000 live births will require significantly improved systems of health care delivery ***(Goodman et al., 2017).***In Egypt, obstetric care is focused on providing skilled care during pregnancy and child birth and encouraging institutional delivery. However 15% of the women can develop obstetric complications that require transfer to Comprehensive Emergency Obstetric Care (CEMOC). The most common obstetric emergencies are prolonged or obstructed delivery, intrapartum hemorrhage and intrapartum hypertensive disorders ***(Knight et al., 2013).***

In developing countries, the third delay which leads to maternal mortality is related to lack of emergency obstetric care providence ***(Forshaw et al., 2016)***.Obstetric complications can neither be predicted nor be prevented but can be managed by on time provision of emergency life-saving services. Obstetric emergencies may lead to converting a path for the woman's life to turn her from normal being to a near-miss condition which means to either have a life threatening condition or even maternal death. Also for the obstetrician, if improperly manage the emergent and urgent conditions due to lack of providence the obstetric services, this can lead to converting a path to his profession ***(Sarfraz & Hamid, 2014).***

Many obstetrical practices can lead to poor obstetric outcomes due to lack of standardization of knowledge and

practices regarding obstetric triage. Misdiagnosis of urgent and emergent obstetric conditions, triage evaluation errors, failure to administer appropriate drug therapy, failure to detect the labor phase, failure to detect ruptured membranes or failure to rule out antepartum hemorrhage are the most common poor obstetrical outcomes ***(Muraskas et al., 2012).***

According to **(ACOG, 2016)** recommendations, obstetric triage should be applied at obstetric units for pregnant women and using the maternal fetal triage index (MFTI). Maternal fetal index triage is a strong tool that provides a standardized approach to obstetric triage. The MFTI is a five-level obstetric acuity tool for nurses to use when they triage a woman presenting for care to a birth unit in order to prioritize the woman's urgency for provider evaluation. The five-tires are: "1 stat" requires immediate lifesaving intervention for a woman or her fetus such as in a case of antepartum hemorrhage; "2 urgent" includes severe pain which is not related to contraction or presence of high risk clinical condition; "3 prompt" includes pregnant women at or over 34 weeks of gestation in active phase labor; "4 non-urgent" includes pregnant women at term gestation in early labor; and "5 scheduled" or requested includes pregnant women presenting for scheduled procedures or routine prenatal care ***(Ruhl et al., 2015).***

In addition MFIT addresses key patient safety issues in a systematic approach, working to prevent untimely maternal-fetal death and improve maternal and fetal outcomes. So, this is an important key role for nursing responsibilities. Obstetric triage consists of two decisions; the first one relate to the obstetric triage assessment and allocation of the triage category and pregnant woman deposition while the secondary obstetric triage decisions relate to the initiation of nursing interventions in order to pregnant woman categorization ***(Evans et al., 2015***).

The obstetric nurses' knowledge and practices can improve the obstetric triage efficacy and efficiency, if properly conducted. Simulation training is one of the important training methods especially for the health related professional team. Simulation training is the use of educational activity to produce an experience without going through the real clinical situations that utilizes simulation aides such as role play, virtual patient, and virtual lab to replicate clinical scenarios. When simulation training performed in clinical education, it provides opportunities to offer support and guidance to the learners, prevents unsafe and dangerous situations, provides an effective feedback and enables control over the sequence of tasks ***(So, Chen, Wong& Chan, 2019).***

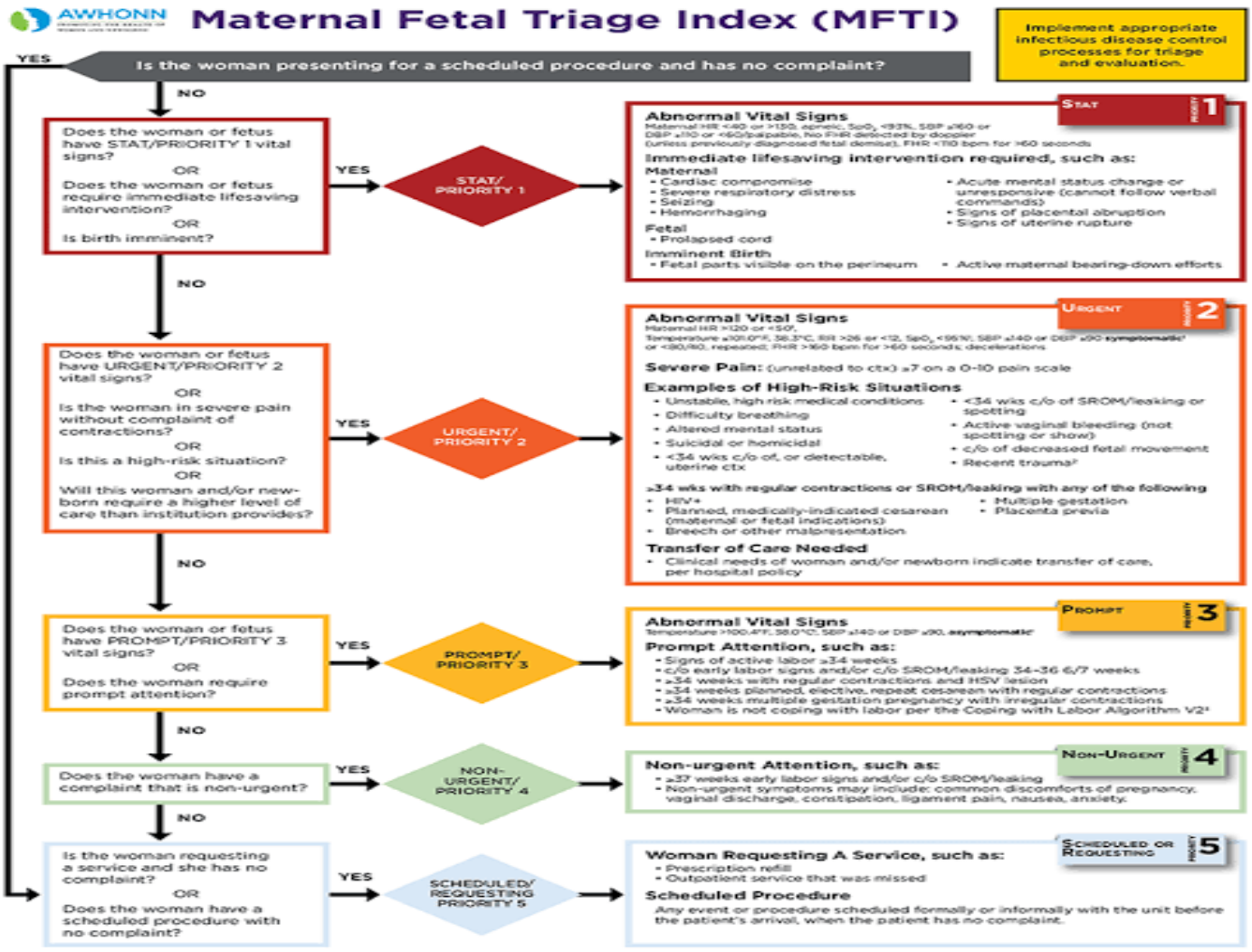

Figure 1. Maternal Fetal Triage Index. Adopted from Ruhl, C., Scheich, B, Onokpise, B., Bingham, D., (2015). Content validity testing of the maternal fetal triage index. J Obstet Gynecol Neonatal Nurs; 44:701–9

Significance of the study:

In developing countries such as in Egypt, until now there is no standardized tool for prioritization and assessment of the pregnant women. In our hospitals, triage is structured for emergency hospital, but not well structured in obstetric department; although the obstetric emergency unit is existing. Sorting pregnant women's needs by OT as urgent or emergent pregnancy and non-pregnancy related needs is a key element for improving the pregnant woman's and fetus's safety and decreasing the medical errors which depend on how much the obstetrical nurse knowledgeable and trained on the timely basis assessment, nurses' communication, planning and implementation of the immediate action intervention. The ongoing improvement of obstetric nurse's knowledge and practices regarding up to date in prenatal care is a corner stone to reach health service with a high quality. So, this experimental study was conducted in attempt to enhance nurses' knowledge and practices regarding obstetric triage because it is one of the most important management and decision-making concepts in obstetric ward.

Aim of the study:

Investigate the effect of implementing simulation obstetric triage training on nurses' knowledge and practices.

Hypothesis of the study:

H_1: Nurses who attain simulation obstetric triage training exhibit higher knowledge scores regarding obstetric triage post implementation than before.

H_2: Nurses who attain simulation obstetric triage training exhibit higher practices scores regarding obstetric triage post implementation than before.

Operational Definitions:

Obstetric triage*:* Systematic maternal and fetal assessment performed by emergency obstetric nurse when a pregnant woman presents for care at Labor and Delivery Emergency Unit to determine priority for full evaluation and delivery of properly on time care.

Simulation training: It is an educational training method for nurses' education and practices through using role play as a simulation method to provide the opportunity to the obstetric nurses to learn and practice varying degrees of clinical skills in a controlled setting in hospital and respond to high-risk, yet low frequency scenarios related to obstetric triage.

SUBJECTS & METHOD

Study Design:

A quasi-experimental pre/post-test design (one group) was used to achieve the aim of this study.

Study Setting:

The study was conducted at Labor and Delivery Emergency Unit at Mansoura University Hospital, General Hospital and Health Insurance Hospital, Mansoura, Egypt.

Sampling:

A convenient sample technique of 70 nurses working at the previous mentioned settings throughout the period from the beginning of July 2019 to the end of October 2019.This experimental study aimed to investigate the effect of implementing simulation obstetric triage training on nurses' knowledge and practices. Based on data from a previous Egyptian experimental study assessed the effect of nurses application of structure obstetrics triage guideline on pregnant women outcomes(**Abd-El- Razik &Gamal, 2018**), considering level of significance = 5%, Power = 80%, Type of test = two-sided Formula of calculating sample size is $n = [2(Z_{\alpha/2} + Z_{\beta})^2 \times p (1-p)]/(p1 - p2)^2$Where n = sample size required in each group, p = pooled proportion (proportion of event in group 1 + proportion of event in group 2)/2, p1-p2 = difference in proportion of events in two groups $Z_{\alpha/2}$: This depends on level of significance, for 5% this is 1.96, Z_{β}: This depends on power, for 80% this is 0.84, $n = [2(1.96 + 0.84)^2 \times 0.63 (1-0.63)]/(0.23)^2$=69.01. Based on above formula the sample size required is 70.

Tools of Data Collection:

Tool I: Self-Administered Structured Schedule. It was developed by the researchers after reviewing the related literature ***(AWHONN's, 2016).*** It consisted of two parts; the first part to assess the general characteristics of the nurses such as age, qualification, years of experience, current working job responsibility etc...).The second part was to assess the obstetric nurses' knowledge regarding obstetric triage. It consisted of eleven open ended questions regarding obstetric triage definition, its mean goal, understanding and application of triage colors, awareness of obstetric triage scales, pregnant woman categorization, etc…

Tool II: Observational Check List. It was developed by the researchers after reviewing the related literature; observational checklist was used to assess the obstetric nurses' practice during implementation of obstetric triage. It consisted of 20 questions including triage communication, triage assessment, triage categories based on MFIT and documentation of triage assessment findings.

Scoring system for nurses' knowledge and practices regarding obstetric triage:

Scoring for nurses' knowledge: Each questions had a score of three; either score of (2) for complete correct answer, score of (1) for partially correct answer or score of (zero) for incorrect or do not know answer. The total score was 22.

For nurses' practices: Each item of the nurses' practices had a score of three either (2) for completely done practice, (1) for incompletely done practice and (zero) for not done practice.

Total nurses' knowledge and practices scores were classified into two categories as following:

- If the score <75% of the total score indicated inadequate knowledge or unsatisfactory practices. While if the score of ≥ 75% of the total score indicated adequate knowledge or satisfactory practices.

Tool III: Obstetric Nurses' Satisfaction Questionnaire:

Obstetric nurses' satisfaction questionnaire was developed by the researchers to assess the nurse's satisfaction regarding the simulation obstetric triage training, it consisted of ten items, three items related to satisfaction with the researchers' performance, three items related to satisfaction with the training scenarios, two items related to satisfaction with the training exercises, two items related to satisfaction with the educational posters. Three point likert

scale used to evaluate the nurses' responses, score (0) for un-satisfied response, score (1) for uncertain response and (2) for satisfied response.

***Validity & Reliability of Research Tools**:*

Content validity of the tool was established by reviewing a jury of five experts; three experts in the obstetric nursing field and two expertises in the obstetric medicine. Pre-testing of the tools revealed that the tools were clear, feasible and there was no ambiguity in the language. The components of the questionnaire tested by SPSS software version 21. Reliability were tested by Cronbach's alpha test, it was 0.72 for nurses' knowledge regarding obstetric triage (tool I), 0.74 for nurses' practices regarding obstetric triage (tool II) and 0.81 for obstetric nurses' satisfaction with the simulated obstetric triage training (tool III) which means good reliability of the developed tools.

Ethical Considerations:

The researchers obtained the official permission from the directors of Mansoura University Hospital, General Hospital and Health Insurance Hospital, Mansoura, Egypt. Also, acceptance letters were obtained from the head of Labor, Delivery and Emergency Units at the previous settings to conduct the research after clarifying the objectives and its main purpose. A written consent was obtained before starting the data collection from each nurse voluntary.

***Pilot Study**:*

The researchers tested the study tools applicability and clarity by a pilot study which conducted on (10%) seven obstetric nurses from the three hospitals as well as the researchers estimated the time needed to fill the questionnaires by the nurses and checklist observation by the researchers. Nurses involved in the pilot were excluded from the study. The pilot study revealed the feasibility, effectiveness and appropriateness of the study instruments and estimated the time required for completion of each study tool and the time required to the practical sessions. The pilot study was not included at the study sample.

Research process:

The study was carried out from the beginning of July 2019 to the end of October 2019. Four phases were followed to implement the simulation obstetric triage training; firstly the baseline assessment, secondly; planning, thirdly; implementation of the simulation obstetric triage training, and finally; the evaluation phase.

Baseline assessment: After obtaining the permission letters from the directors of the previous setting, the researchers introduced themselves to the obstetric nurses worked at Labor and Delivery Emergency Units and illustrated the aim of the study and a written consent was taken from each nurse. The researchers distributed themselves alternatively at the previous mentioned setting in two shifts; the morning and the afternoon shift to collect the baseline assessment data including the nurses' general characteristics and nurses' knowledge regarding obstetric triage (tool I) while, the nurses' practices during performing the obstetric triage was observed (Tool II).

Planning phase: The simulated theoretical and practical training prepared to be given through three sessions which provided in Arabic and English languages to suit the different educational levels of nurses. The theoretical background and the practical training were prepared to cover definition of obstetric triage, its mean goal, pregnant woman categorization by using obstetric triage colors according to the level of severity based on (MFTI) while the simulation practical training started with the simulated case scenarios which prepared to be acted by the researchers as role plays for examples for certain obstetrical urgent and emergent conditions. Three scenarios were prepared for each hospital identically; the first scenario was a state of a pregnant woman at term complaining from sever vaginal bleeding presented to the labor and emergency unit; the second scenario was a state of a pregnant woman presented to the labor unit, her fetus gestational age was 40 weeks complaining from lower abdominal pain but when vaginally examined, the cervix was not dilated; the third scenario was a state of a pregnant woman presented to the hospital complaining from vaginal discharge at 36 weeks of gestation. The three scenarios were clinical examples for three severity level of obstetric triage. In addition, three simulation training exercises were prepared to be given for the nurses after the end of each session to be a home work for nurses to be answered then corrected with the researchers at the start of the next simulated training session.

Implementation phase:

At the beginning the baseline assessment, data were collected using the structured interview schedule (tool I) to collect the obstetric nurses' general characteristics and knowledge regarding obstetric triage. Then each obstetric nurse was observed by the researchers during performing obstetric triage to fill in the observational checklist (tool II) to assess the nurses' practices regarding obstetric triage.

The researchers visited each previous mentioned setting in two shifts (morning and afternoon), three days/week alternatively for twelve weeks for conducting the simulation training. The training encompassed three structured sessions and was implemented according to nurses' job load, shifts and intellectual and physical willingness. Each group consisted of 15 nurses. The duration of each session lasted from 30-45 minutes.

1st session: At the beginning of the first session, an orientation to the simulation training and its aim took place. It covered the theoretical background including definition of obstetric triage, awareness of triage scales, its mean goal, understanding and application of triage colors, pregnant woman categorization, assigning category based on MFTI, triage communication, awareness of time limits in emergent and urgent category and how to utilize obstetric triage. The first simulated training scenario was acted as a role play between the researchers. One researcher acted as the pregnant woman and the other one acted as the obstetric nurse receiving the pregnant woman and perform the obstetric triage according to MFTI. At the end of the session, the printed colored posters were distributed to the obstetric nurses to be a guide for solving the simulated training exercise which given as a homework training.

2nd session: At the start of the second session, the previous theoretical content were revised with the obstetric nurses and the simulated training exercise was solved by the

researchers to confirm the correct answer for the training obstetric nurses, then the second simulated training scenario was acted by the researchers as the same way as the first scenario. Also the second simulated training exercise was given at the end of the session.

3rd session: At the start of the third session, the previous training exercise was solved by the researchers to confirm the correct answer for the training obstetric nurses. The third simulated training scenario was acted by the researchers as the same way as the previous two scenarios. All obstetric nurses' questions were answered by the researchers.

Evaluation phase*:* After the end of the third session, the researchers reassessed the obstetric nurses' knowledge regarding obstetric triage by distributing the same pretest tool (tool I), the researchers observe each obstetric nurse during performing the obstetric triage and fill in the researchers' observational checklist (tool II), In addition the obstetric nurses were assessed for their satisfaction with the simulated training by using (tool III).

Limitation of the study:

Occasionally, the sessions were extended due to the workload, shortage of nursing staff and interruption.

RESULTS

Table 1. Shows that slightly less than one-third (32.9%) of nurses their age ranged from 25 to 30 years, slightly less than three- fifths (58.6%) of them had diploma educational level and slightly more than one- third (34.3%) of them had from 6 to 8 years of experience. In addition, majority (84.3%) of nurses didn't attend any educational or practical training about obstetric triage.

Table 1. General characteristics of the obstetric nurses (n= 70)

General characteristics	No.	%
Age (years)		
less than 20	19	27.1
20 - less than 25	13	18.6
25- less than 30	23	32.9
30- less than 35	9	12.9
≥ 35	6	8.6
Level of education		
Diploma	41	58.6
Bachelor	12	17.1
Higher	17	24.3
Years of experience		
<2	19	27.1
3 – 5	9	12.9
6 – 8	24	34.3
>8	18	25.7
Attending educational or practical training about obstetric triage		
No	59	84.3
Yes	11	15.7

Table 2. Presents that there were highly statistically significant improvements in all items of nurses' knowledge regarding obstetric triage post-implementation of the simulation training compared to pre-implementation (P<0.001). It is obvious that more than three-quarters (78.6%) of nurses post -implementation of the simulation training compared to (18.6%) pre- implementation had correct knowledge regarding MFIT level, slightly less than three-quarters (74.3%) of nurses post-implementation of the simulation training compared to only (15.7%) pre implementation had correct knowledge regarding how to utilize obstetric triage. Additionally, slightly less than three-quarters (71.4%) of nurses post-implementation of the simulation training compared to (25.7%&24.3% respectively) pre-implementation had correct knowledge regarding the mean goal of obstetric triage and definition of obstetric triage.

Table 2. Comparison of nurses' knowledge regarding obstetric triage pre and post- simulation training (n=70)

Nurses' knowledge regarding obstetric triage	Pre- simulation training			Post- simulation training				
	Incorrect	Partially correct	Correct	Incorrect	Partially correct	Correct	Chi square test	
	%			%			X2	p
1. Obstetric triage definition	50.0	25.7	24.3	7.1	21.4	71.4	39.026	**<0.001
2. MFIT level	65.7	15.7	18.6	4.3	17.1	78.6	63.719	**<0.001
3. Mean goal of obstetric triage	47.1	27.1	25.7	4.3	24.3	71.4	40.170	**<0.001
4. Obstetric triage scales awareness	44.3	32.9	22.9	10.0	28.6	61.4	27.723	**<0.001
5. Obstetric triage colors meaning	57.1	20.0	22.9	11.4	28.6	60.0	34.047	**<0.001
6. Pregnant women categorization	57.1	20.0	22.9	4.3	30.0	65.7	47.753	**<0.001
7. Categories based on MFIT scale	54.3	27.1	18.6	8.6	48.6	42.9	34.239	**<0.001
8. Awareness of time limits in emergent category	58.6	27.1	14.3	7.1	25.7	67.1	52.218	**<0.001
9. Awareness of time limits in less urgent situation	50.0	37.1	12.9	5.7	41.4	52.9	41.848	**<0.001
10. Triage communication	60.0	22.9	17.1	12.9	31.4	55.7	36.594	**<0.001
11. Utilization of the obstetric triage	52.9	31.4	15.7	2.9	22.9	74.3	59.040	**<0.001

****<0.001 Highly statistical significant differences**

Table 3. Illustrates that there were highly statistically significant improvements in all items of nurses' practice regarding obstetric triage post-implementation of the simulation training compared to pre-implementation (P<0.001). It is clear that more than three-quarters (77.1%) of nurses post-implementation of the simulation training compared to only (2.9 %) pre- implementation who categorized pregnant woman completely based on MFTI and slightly more than three-quarters (75.7%) of nurses post-implementation of the simulation training compared to only (2.9 %) pre-implementation who documented triage assessment findings. Also, (74.3%) of nurses post-implementation of the simulation training communicated effectively during triage and prioritized of care according to triage assessment compared to (4.3% & 2.9% respectively) pre- implementation.

Table 3. Comparison of nurses' practices regarding obstetric triage pre and post-simulation training (n=70)

Nurses' practices regarding obstetric triage	pre- simulation training			post - simulation training			Chi square test	
	Not done	Incompletely done	Completely done	Not done	Incompletely done	Completely done	X^2	p
	%	%	%	%	%	%		
1. Effective obstetric triage communication	74.3	21.4	4.3	2.9	22.9	74.3	89.983	**<0.001
2. Obstetric triage assessment	68.6	25.7	5.7	0.0	28.6	71.4	87.290	**<0.001
3. Prioritization of care according to obstetric triage assessment	77.1	20.0	2.9	2.9	22.9	74.3	94.715	**<0.001
4. Obstetric triage categories of pregnant woman based on MFTI	81.4	15.7	2.9	0.0	22.9	77.1	106.212	**<0.001
5. Documentation of obstetric triage assessment findings	78.6	18.6	2.9	0.0	24.3	75.7	102.824	**<0.001

****<0.001 Highly statistical significant difference**

Table 4. It is obvious that there was an improvement in the total obstetric nurses' knowledge regarding obstetric triage from (14.3%) pre-implementation of the simulated training compared to (81.4%) post-implementation. Also, there was an improvement in the total obstetric nurses' practices regarding obstetric triage from (2.9 %) pre-implementation of the simulation training compared to (91.4%) post-implementation with highly statistically significant differences.

Table 4. Comparison of nurses' total knowledge and practices scores regarding obstetric triage pre and post simulation training (n=70)

Total obstetric triage knowledge and practices' Scores	Knowledge pre- simulation training		Knowledge post- simulation training		Chi square test	
	No.	%	No.	%	X2	p
Total nurses' knowledge score						
In adequate (<75%)	60	85.7	13	18.6	63.230	**<0.001
Adequate (≥75%)	10	14.3	57	81.4		
Total nurses' practices score	**Practices pre- simulation training**		**Practices post- simulation training**			
Unsatisfactory (<75%)	68	97.1	6	8.6	110.188	**<0.001
Satisfactory (≥75%)	2	2.9	64	91.4		

****<0.001 Highly statistical significant differences**

Table 5. Presents that only 13 nurses out of 70 trained nurses had inadequate knowledge post implementation of the simulation obstetric triage training. Table 5. Shows that majority (92.3%) of the nurses who had inadequate knowledge had diploma degree of nursing. Also, slightly more than three- fifths (61.5%) of them were less than 20 years old and had less than two years of experience. Moreover, there were statistically significant differences between the nurses' knowledge score and age, level of education and years of experiences $p < 0.05$.

Table 5. Association between the nurses' total knowledge score and the socio-demographic characteristics post implementation of the simulation training (n= 70)

socio-demographic characteristics of the nurses	Total nurses' knowledge post intervention					
	Inadequate knowledge (n=13)		Adequate knowledge (n=57)		Chi square test	
	No.	%	No.	%	X^2	p
Age (years)						
less than 20	8	61.5	11	19.3	10.932	*0.027
20 - less than 25	2	15.4	11	19.3		
25- less than 30	3	23.1	20	35.1		
30- less than 35	0	0.0	9	15.8		
≥ 35	0	0.0	6	10.5		
Level of education						
Diploma	12	92.3	29	50.9	7.811	*0.020
Bachelor	1	7.7	11	19.3		
Higher	0	0.0	17	29.8		
Years of experience						
<2	8	61.5	11	19.3	11.453	*0.010
2 – 5	1	7.7	8	14.0		
6 – 8	4	30.8	20	35.1		
>8	0	0.0	18	31.6		

***<0.05 Statistical significant differences**

Table 6. Presents that only 6 nurses out of 70 trained nurses who had unsatisfactory practices post implementation of the simulation obstetric triage training. Table 6. Shows that all (100%) of the nurses who had unsatisfactory practices regarding obstetric triage had diploma degree of nursing, majority (83.3%) of them aged less than 20 years old and had less than 2 years' of experience. Moreover, there were statistically significant differences between the nurses' practice score and age and years of experiences $p < 0.05$.

Table 6. Association between nurses' practice score and the socio-demographic characteristics post implementation of the simulation training (n=70)

	Total nurses' practice post intervention					
Socio-demographic characteristics	Unsatisfactory practices (n=6)		Satisfactory practices (n=64)		Chi square test	
	No.	%	No.	%	X^2	p
Age (years)						
less than 20	5	83.3	14	21.9	10.782	*0.029
20 - less than 25	0	0.0	13	20.3		
25- less than 30	1	16.7	22	34.4		
30- less than 35	0	0.0	9	14.1		
≥ 35	0	0.0	6	9.4		
Level of education						
Diploma	6	100.0	35	54.7	4.642	*0.098
Bachelor	0	0.0	12	18.8		
Higher	0	0.0	17	26.6		
Years of experience						
<2	5	83.3	14	21.9	10.759	*0.013
3 – 5	0	0.0	9	14.1		
6 – 8	1	16.7	23	35.9		
>8	0	0.0	18	28.1		

***<0.05 Statistical significant difference**

Table 7. Presents that majority of the nurses (81.4%) were satisfied with realism of scenarios and more than three-quarters (78.6%) of them satisfied with the duration of the training scenarios and with the feedback given after training exercises. Also, more than three-quarters (75.7%& 77.1 respectively) of the nurses were satisfied with communication process with the researchers and the theoretical background covered by the researcher. In addition, slightly less than three-quarters (74.3%) of the nurses were satisfied with the training scenarios structure and the training exercise.

Table 7. Nurses' satisfaction regarding simulation obstetric triage training (n= 70)

Satisfaction items	Unsatisfied		Uncertain		Satisfied	
	No	%	No	%	No	%
Satisfaction with the researchers' performance						
1. Communicate effectively with the participants	2	2.9	15	21.4	53	75.7
2. Cover theoretical background	0	0.0	16	22.9	54	77.1
Satisfaction with the training scenarios						
3. Structured well	2	2.9	16	22.9	52	74.3
4. Realism of scenarios	2	2.9	11	15.7	57	81.4
5. Had adequate duration	2	2.9	13	18.6	55	78.6
Satisfaction with training exercises						
6. Easy to practice	2	2.9	16	22.9	52	74.3
7. Followed by a feedback	3	4.3	12	17.1	55	78.6
Satisfaction with the educational posters						
8. Structured well	8	11.4	20	28.6	42	60.0
9. Attractive colored	3	4.3	17	24.3	50	71.4
10. Communicate effectively with the participants	7	10.0	20	28.6	43	61.4

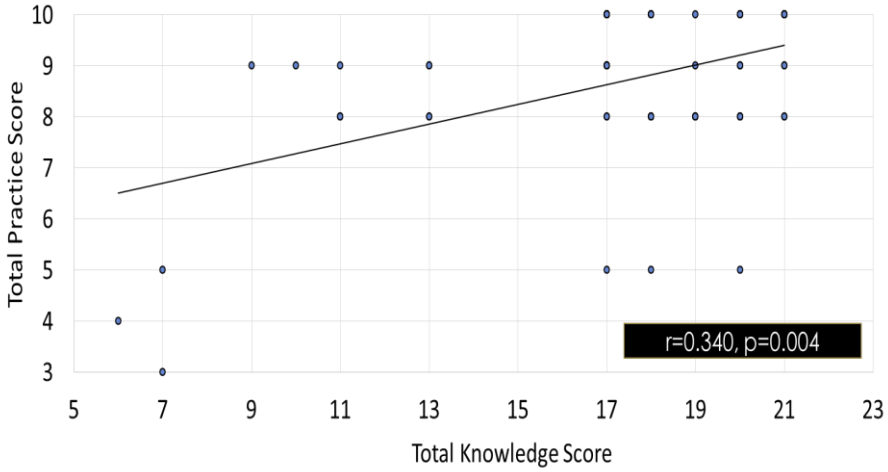

Figure 1. Correlation between total knowledge score and total practice score post simulation obstetric triage training

Figure1. Shows that there was positive correlation with statistical significant difference between the nurses' total knowledge and total practices scores regarding obstetric triage post implementation of the simulation obstetric triage (r=0.340&p=0.004).

DISCUSSION

Although the structure of obstetrical triage units is visible at many health care facilities, still overcrowdings, prolonged waiting times and limited resources are the most relevant problems facing the obstetric triage units. Beside lack of standardization and lack of updating the nurses' knowledge and practices regarding obstetric triage ***(Robert et al., 2016).***The aim of the present study was to investigate the effect of simulation obstetric triage training on nurses' knowledge and practices.

In relation to nurses' knowledge post implementation of the simulation obstetric triage training. The present study finding revealed that there were highly statistical significant improvements in all items of obstetric nurses' knowledge regarding obstetric triage post implementation of the simulation obstetric triage training than before. These study findings supported the first research hypothesis"H_1: Nurses who attain simulation obstetric triage training exhibit higher knowledge scores regarding obstetric triage post implementation than before". The present study finding may attributed to the successful theoretical and practical training simulation sessions which given by the researchers. The present study finding revealed that more than three-quarters of nurses post -implementation of the simulation training had correct knowledge regarding MFTI level. This study finding was in parallel to a study conducted by ***Hoffman, (2012)*** who reported the same outcome after implementing a study to increase the nurses' knowledge of triaging pregnant women through the use of simulation.

At the same context, a prospective quasi-experimental study at Prince Hussein Bin Abdullah (Amman, Jordan) which aimed to assess the effect of nurse's application of structure obstetrics triage guideline on pregnant women's outcomes among fifty nurses. They reported that there was improvement in the nurses' knowledge regarding MFIT post intervention than before implementation with statistical significance differences for all knowledge items about triage ***Abd-El- Razik and Gamal (2018)***. Also, another supported study conducted by ***Quaile, (2018)*** to increase the nurses' knowledge and assure the timeliness of care by implementing obstetric triage educational sessions. The researcher revealed that there was an improvement in the nursing knowledge for majority of trained nurses regarding obstetric triage after implementation of the obstetric triage educational sessions than before. Moreover, ***Faheim et al.,***

(2019) revealed that there was a significant improvement in the nurses' knowledge regarding obstetric triage with significantly statistical difference after implementation of the triage educational program than before.

Accordingly, the present study first hypothesis was accepted.

In relation to nurses' practices post implementation of simulation obstetric triage training. The present study findings revealed that there were highly statistically significant improvements in all items of nurses' practices regarding obstetric triage and utilization of maternal fetal index triage scale post-implementation of simulation training compared to pre-implementation. These study findings supported the second research hypothesis "H_2: Nurses who attain simulation obstetric triage training exhibit higher practices scores regarding obstetric triage post implementation than before".

The present study findings are consistent with ***Birch et al., (2007)*** who studied the obstetric skills training and evaluate methods of teaching. They reported that simulation of obstetrical emergencies was an effective tool to improve the nurses' and obstetricians' practices regarding MFTI. Additionally, the present study findings was in accordance with another experimental study conducted in Iran aimed to determine the effect of triage training on the performance of triage nurses and emergency medical staff. They concluded that training triage has impacted on the performance of triage nurses and the staff of medical emergencies. Also another supportive study conducted by ***Abd-El- Razik & Gamal (2018);Ebrahimi et al., (2016)***they supported that training professional staff improve their practices regarding triage post training than before**.**

Accordingly, the present study second hypothesis was accepted.

Regards association between knowledge and practice scores post-implementation of the simulation obstetric triage training and the nurses' years of experience, the present study findings revealed that, there were statistical significant association between adequacy score of knowledge and satisfactory score of practices and years of experience. These study findings may be due to the various opportunities to nurses worked from 6 to 8 years to deal with more cases than those nurses with less than 2 years of experience at work. In accordance with ***Al-Metyazidy et al., (2019)*** who reported that there were statistically significant differences among the studied nurses between total knowledge', practices' mean scores and the total working experiences in a study in Tanta, Egypt. In same line a study conducted in Ghana by ***Afaya et al., (2017) Manoharan et al., (2018)*** revealed that the working years was associated with the improved triage knowledge score among the studied nurses. But our study findings were not in accordance with two studies conducted by ***Moirangthem, (2019) and Sherafat et al., (2019)*** as the first one found no significant association between work experience and acquired triage knowledge score and the second one found no significant relationship between work experience and acquired triage practices score respectively.

The present study also found that, there was a significant association between nurse's total score of knowledge post implementation and educational level. This study finding was in agreement with an Egyptian study conducted in Tanta by ***Al-Metyazidy et al., (2019)*** who confirmed that there were statistically significant differences among the studied nurses between total knowledge, total practices mean scores and educational qualifications. Also, ***Asgari et al., (2018)*** confirmed that educational level has significant association with nurses' triage practice.

Moreover, the present study finding confirmed a positive correlation between total triage knowledge scores and total triage practices scores. This means that nurses' knowledge reflected on nurses' performance related to the use of effective simulation obstetric triage training scenarios. This study finding was consistent with ***Abd-El- Razik and Gamal (2018)*** who reported the same findings as proper utilization of obstetric triage had a positive significant correlation with total knowledge score. As similar, a study was done by ***Al-Metyazidy et al., (2019)*** clarified **a** positive and a significant statistical correlation noticed between the nurses' total knowledge and practices scores where r= 0.559.

Concerning the nurses' satisfaction regarding the simulation obstetric triage training among working nurses in labor, delivery and emergency units at different setting, the present study findings illustrated that majority of them were satisfied with the researchers' performance, the simulation training scenarios and the training exercises. This may be due to the effectiveness of the structure of the theoretical and training simulation training.

Finally, improvement of nurses' knowledge and practices regarding obstetric triage are important and serious elements which reflected upon rank the women according to triage category that effect on decrease the maternal and neonatal mortality and morbidity rate.

CONCLUSION

Depending on present study findings, the study hypotheses were accepted. There were highly statistically significant improvement in the nurses' knowledge and practices scores post implementation of the simulation obstetric triage training than before, indicating that obstetric simulation training was an effective tool for improving obstetric nurses' knowledge and practices regarding obstetric triage.

RECOMMENDATIONS

1. Periodical conducting of sustainable training programs regarding obstetric triage for obstetric nurses in labor and delivery rooms and emergency units.
2. Incorporate the obstetric triage and its scales at undergraduate curriculum of faculties of nursing.

ACKNOWLEDGMENTS

Researchers offer their appreciation and gratitude to all nursing staff contributed in the study for their cooperation during the research process and all thanks to the health team for their invaluable assistance during the study.

CONFLICTS OF INTEREST DISCLOSURE

The authors have no conflict of interest to declare.

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