

Effect of Electronic Fetal Monitoring Educational Program on Knowledge and Interpretations of Internship Nursing Students

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Abstract: Electronic fetal monitoring (EFM) is obstetric technology helps to record any changes in fetal heart rate (FHR) and uterine activity. Insufficient knowledge and interpretations regarding EFM will lead to incorrect decision making. So, regular educational and training about EFM to all maternity nurse is important. This study aimed to determine effect of educational program about EFM on knowledge and interpretations of internship students, faculty of Nursing, Assiut University, Egypt. **Methods:** A pre and posttest quasi experimental design, sample that contained 180 internship nursing students. Questionnaire was the tool applied to gather data that included three parts; part one was personal data, part two theoretical questions to assess knowledge, and questions to evaluate interpretations of EFM was the third part. **Results:** The mean of total score in pretest is 25.1%, while the main of score in posttest is 78.8%. **Conclusions:** educational program on EFM carries a vital value for enhancing internship students' knowledge and interpretations. This leads finally to improve maternal and fetal outcomes. **Recommendations:** Regular educational program should be encouraged and workshops about interpretations of EFM traces for all maternity nurses and internship students.

Keywords: Electronic fetal mentioning, educational program, internship students.

1. INTRODUCTION

Electronic Fetal Monitoring is a type of ante and intra partum test used to illustrate a view of beat to beat fetal heart rate, in relation to mother's contractions (Jennifer, 2011). It is very important process to assess the fetal status during labor. It will be most useful when all health care personnel provide a care to women in labor and used consistent language to describe the fetal heart rate patterns and other information related to fetal monitor (Claire et al, 2013).

There are two types of electronic Monitoring can be done either external or internal, with external method the sensors (toco and cardio) placed on the mother's abdomen (Robert et al 2013). The other method is internally, in which an electrode connect to the fetal head to monitor FHR. And a sensor is putted in the uterine cavity to assess uterine contraction pressure. Electronic fetal heart monitoring is repeatedly used to determine how well the fetus is doing with contracted uterus and for detecting signs of fetal distress (Dwight et al 2016).

Typical fetal monitor strip contained two rows of graphs; the upper graph charting the fetal heart rate (in beats per minute) and the lower graph charting the mother's contractions (in mm of Hg) (Jennifer Davies, 2015). The normal fetal heart rate is ranging from 120 and 160 beats per minute. The small up and down fluctuations in the fetal heart rate are called variability (Resnik, 2013).

When interpreting a fetal heart tracing it should be considered that types of decelerations are three, early, late, and variable deceleration. Early deceleration described when the nadir of deceleration occurring at the peak of the contraction. It almost appears as a mirror image of the contractions. This type of deceleration is normal and common, occurring secondary to head compression during uterine contraction. Late deceleration is a decrease in FHR that begins at the

middle of a contraction and remains below baseline until after the contraction is complete. The FHR improves only after the contraction has ended. uteroplacental insufficiency is the most common cause of late deceleration (**Stuart& Lisa 2016**)

Common type of deceleration is variable decelerations that occur with up to 80% of fetuses. This type of deceleration occurs at any time during contractions; it may take a variety of shapes V-shaped or W-shaped. It most commonly caused by cord compression. Fetal heart rate interpretation may be reassuring which associated with good fetal outcome or non-reassuring or ominous which show persistent late decelerations with loss of beat-to-beat variability or prolonged bradycardia (**Stuart& Lisa 2016**)

During fetal monitoring, a nurse will observe the strip for continuity and adequacy for interpretation. After finishing the trace the nurse should interprets the strip to identify the baseline fetal heart rate and presence of variability, determine whether there are accelerations or decelerations from the baseline, identify patterns of uterine contraction, and join accelerations and decelerations with the uterine activity. This will give ability to the nurse to determine whether the fetal heart rate trace is reassuring or nonreassuring (**Maternity Guidelines Group, 2015**)

A formula for remembering interventions in the presence of a non-reassuring fetal heart pattern. is "LOCK.". As every latter carries a meaning. "L" Place the patient in the left lateral recumbent position, "O" Provide oxygen supplementation, "C" Correct contributing factors and "K" Keep reassessing fetal heart rate and intervene when indicated (**Miller DA, 2012**)

The use of medical devices is an important element of a healthcare professional's role. Medical devices users should attain regular education and training to ensure that they are competent in using devices. Regular training will assist the practitioner to deliver a safer patient experience and will help to ensure that incidents are kept to an absolute minimum (**Darren, 2012**).

Continuous EFM only provides a printed recording of the FHR pattern. The interpretation of the FHR record is subject to human error. Education and training enhance ability to evaluate the FHR. Medical institution should ensure that staff who have a responsibility for connecting and interpreting the results of EFM should receive periodic training with assessment to assure that their skills are still up-to-date. Training also helps to understand the scientific rationale behind the use of EFM and know the advantages and limitations of EFM (**Darren, 2012**).

A recently published paper concluded that the main reason for the poor outcomes lies in the generally poor standard of CTG interpretation and the contribution of human factor as well. Therefore, more intense training on CTG interpretation should be performed. The numbers of studies that specifically attempt to examine knowledge on CTG are relatively few in number. Thus, it is evident that there is a need to build on the data about nurses', knowledge on CTG interpretation in hospital to receive a comprehensive decision regarding its improvement (**Parhizkar, 2012**).

So, this study was undertook to map existing knowledge of internship students as a future responsible nurse about CTG interpretation and to assess the effect of training into improve their knowledge.

Significant of the study

The widespread, increased use of electronic fetal monitoring (EFM) prompted the Task Force in 1989 to examine the evidence regarding the effectiveness of this procedure in the prevention of intrapartum asphyxia and its consequences (**Donald & Sabaratnam, 2011**).

While the benefits of fetal monitoring are apparent, there are also risks. Proper evaluation and interpretation of data gathered can provide means for assessing the unborn fetus, identifying potential problems and providing stabilization for the patient and fetus, especially in the transport environment. On the downside, data can be misinterpreted by untrained clinicians, unnecessary interventions such as cesarean sections may be expedited and the information can be used against a healthcare team in legal proceedings (**Maternity Guidelines Group, 2015**)

As the nurse responsible for observation of woman while on external fetal monitoring, the investigator interest to improve the internship nursing student knowledge and interpretation of fetal traces and identify the effect of educational program about EFM on their knowledge and interpretation of fetal traces.

Aim of the study:

This study aimed to determine effect of educational program about EFM on knowledge and interpretations of internship students at faculty of nursing, Assiut University, Egypt

2. SUBJECTS AND METHODS

Study design was pre and posttest quasi experimental design. It was conducted at faculty of nursing, Assiut University, Egypt. Regarding sample size equation, sample of this study was 180 internship nursing students.

Tools of the study

Questionnaire was designed by researchers and reviewed from a team of three experts in medical and nursing obstetrical and gynecological field to test the validity and reliability of the questionnaire before using it. This questionnaire consisted of three parts to collect data.

First part included personal data as place of living during studying, marital status, residence, previous educational certification.

Second part included ten theoretical multiple choice ended questions that directed to the internship nursing students to assess their knowledge about EFM.

The third part included four pictures of traces; each one had eight questions on the trace directed to internship nursing students about it to assess their ability to interpret the trace except picture to a trace number three which had six questions only. This means that the internship nursing students had requested to answer ten questions about EFM knowledge and thirty questions about interpretations of traces regarding EFM, the type of questions used in second and third part were multiple choice questions.

The four traces described as **Picture (1)**: contained a trace of negative C.S.T with reassuring FHR 140 b/m, moderate variability, had three regular uterine contractions, and no deceleration. **Picture (2)**: contained a trace of positive C.S.T with non-reassuring FHR 120 b/m, minimal variability, had four regular uterine contractions, and late deceleration. **Picture (3)**: contained a trace with non-reassuring FHR 145 b/m, absent variability, had one occasional uterine contraction, and no deceleration. **Picture (4)**: contained a trace of non-reactive N.S.T with non-reassuring FHR 135 b/m, absent variability, and no deceleration or acceleration.

Scoring system:

Each question in knowledge and interpretation which answered with correct answer scored by one grade but any other answer scored by zero grade in pre and posttest. More than 60% of total score acceptable and less than 60% is considered weak knowledge.

Procedure

The present study was carried out in three phases' pre intervention, intervention and post intervention.

In pre intervention phase an official permission was obtained from the point of Faculty of nursing at Assiut University. The researchers interviewed with every internship nursing students separately to explain the nature of study and obtained written consent before inclusion in the study.

Intervention phase the researchers distributed the total number of the students (180) to a small groups each one group contained 15- 20 student. This means that all students group accounted 10 groups. The investigators interviewed with each group separately and the following was done with each one; firstly a pretest was done to the internship students to assess their knowledge and interpretation about EFM. Then educational program was applied by the investigators in the form of a lecture at faculty of nursing's class using data show and the lecture content was given to student involved in the study, And included also education of the students how to interpret the trace and take a decision about its result. The lecture was given in four hours that include theoretical part plus training on how to interpret traces.

Content of the lecture given to the internship students included definition, objectives, methods of EFM, component of paper, pattern of FHR, periodic and episodic FHR characteristics. It also illustrates all types of EFM and how to interpret each type, and important terminology related to EFM.

Post intervention after one month the investigators interviewed again with the same groups of students who received educational program to perform posttest to them.

3. RESULTS

Table 1: Distribution of internship students according to personal characteristics

personal characteristics		
	No	(%)
1) Place of living during studding/years		
• Home	109	60.6
• University city	30	16.7
• External place	41	22.8
2) Marital status		
• Single	154	85.6
• Married	26	14.4
3) Residence		
• Urban areas	75	41.7
• Rural areas	105	58.3
4) Previous educational certification		
• Secondary school	135	75
• Nursing institute	45	25

Table 2: Distribution of internship students according to knowledge about EFM in pre and posttest:

Questions	pretest		posttest		P-value
	No	%	No	%	
1) Examples of Periodic Changes in FHR are the following <u>except</u>					0.000*
• Don't know	96	53.3	20	11.1	
• Acceleration	14	7.8	137	76.1	
• Late decelerations	70	38.9	23	12.8	
2) Interpretations of the N.S.T are the following					0.000*
• Don't know	77	42.8	23	12.8	
• Reactive and nonreactive	61	33.9	134	74.4	
• Negative and positive	42	23.3	23	12.8	
3) Indication of contraction stress test all of the following <u>except</u>					0.000*
• Don't know	73	40.6	16	8.9	
• Previous cesarean section birth	38	21.1	153	85.0	
• Olighydraminios or PROM or post maturity	69	38.3	11	6.1	
4) Methods of fetal monitoring					0.001*
• Don't know	37	20.6	15	8.3	
• External & internal	118	65.6	147	81.7	
• Internal only or external only	25	13.9	18	10.0	
5) Most dangerous type of deceleration according to cause					0.000*
• Don't know	82	45.6	20	11.1	
• Late deceleration	31	17.2	123	68.3	
• Early or variable deceleration	67	37.2	37	20.6	

6) Most common cause for variable deceleration are					
• Don't know	90	50.0	35	19.4	0.000*
• Cord compression	37	20.6	125	69.4	
• Head compression or uteroplacental insufficiency	53	29.4	20	11.1	
7) Deceleration of the FHR that lasting more than 2 minutes but less than 10 minutes are					
• Don't know	94	52.2	30	16.7	0.000*
• prolonged deceleration	28	15.6	120	66.7	
• late or early or variable deceleration	58	32.2	30	16.7	
8)FHR baseline is tachycardia when					
• Don't know	53	29.4	23	12.8	0.000*
• More than 160	79	43.9	140	77.8	
• More than 150 or more than 170	48	26.7	17	9.4	
9)Variable is minimal when					
• Don't know	124	68.9	32	17.8	0.000*
• Amplitude range detectable but 5 b/m or fewer	21	11.7	131	72.8	
• Amplitude range undetectable or range 6-25 b/m	35	19.4	17	9.4	
10)In Fetal Monitor Paper Tracing lower graph records					
• Don't know	55	30.6	12	6.7	0.000*
• Contraction	96	53.3	161	89.4	
• Fetal movement or FHR	29	16.1	7	3.9	

Table 3: Distribution of internship students according to interpretation of trace in picture (1) about EFM in pre and posttest:

Questions	picture (1)				P-value
	pretest		posttest		
	No	%	No	%	
1) What is the baseline of the FHT?					0.000*
• Don't know					
• Correct answer	72	40.0	13	7.2	
• Wrong answer	51	28.3	136	75.6	
	57	31.7	31	17.2	
2) Describe the variability.					0.000
• Don't know	93	51.7	23	12.8	
• Correct answer	41	22.8	139	77.2	
• Wrong answer	46	25.6	18	10.0	
3) Are there accelerations present?					0.000
• Don't know					
• Correct answer	80	44.4	9	5.0	
• Wrong answer	75	41.7	163	90.6	
	25	13.9	8	4.4	
4) Are there decelerations present?					0.000
• Don't know					
• Correct answer	90	50.0	14	7.8	
• Wrong answer	39	21.7	136	75.6	
	51	28.3	30	16.7	
5) Are contractions present?					0.000
• Don't know	67	37.2	6	3.3	
• Correct answer	93	51.7	163	90.6	
• Wrong answer	20	11.1	11	6.1	
6) Is this FHT reassuring?					0.000
• Don't know	139	77.2	29	16.1	
• Correct answer	24	13.3	130	72.2	
• Wrong answer	17	9.4	21	11.7	

7) Type of trace					
• Don't know	120	66.7	39	21.7	0.000
• Correct answer	36	20	121	67.2	
• Wrong answer	24	13.3	20	11.1	
8) Result of trace					
• Don't know	119	66.1	24	13.3	0.000
• Correct answer	28	15.6	139	77.2	
• Wrong answer	33	18.3	17	9.4	

FHT= fetal heart trace

Table 4: Distribution of internship students according to interpretation of trace in picture (2) about EFM in pre and posttest:

Questions	picture (2)				P-value
	pretest		posttest		
	No	%	No	%	
1) What is the baseline of the FHT?					0.000*
• Don't know					
• Correct answer	92	51.1	23	12.8	
• Wrong answer	35	19.4	136	75.6	
	53	29.4	21	11.7	
2) Describe the variability.					0.000*
• Don't know	96	53.3	17	9.4	
• Correct answer	22	12.2	122	67.8	
• Wrong answer	62	34.4	41	22.8	
3) Are there accelerations present?					0.000*
• Don't know					
• Correct answer	113	62.8	19	10.6	
• Wrong answer	36	20.0	147	81.7	
	31	17.2	14	7.8	
4) Are there decelerations present?					0.000*
• Don't know					
• Correct answer	105	58.3	15	8.3	
• Wrong answer	6	3.3	134	74.4	
	69	38.3	31	17.2	
5) Are contractions present?					0.000*
• Don't know	68	37.8	13	7.2	
• Correct answer	83	46.1	146	81.1	
• Wrong answer	29	16.1	21	11.7	
6) Is this FHT reassuring?					0.000*
• Don't know	146	81.1	36	20.0	
• Correct answer	26	14.4	131	72.8	
• Wrong answer	8	4.4	13	7.2	
7) Type of trace					0.000*
• Don't know	135	75.0	6	3.3	
• Correct answer	6	3.3	159	88.3	
• Wrong answer	39	21.7	15	8.3	
8) Result of trace					0.000*
• Don't know	117	65.0	11	6.1	
• Correct answer	28	15.6	144	80	
• Wrong answer	35	19.4	25	13.9	

FHT= fetal heart trace

Table 5: Distribution of internship students according to interpretation of trace in picture (3) about EFM in pre and posttest:

Questions	pretest		posttest		P-value
	No	%	No	%	
1) What is the baseline of the FHT? <ul style="list-style-type: none"> • Don't know • 145 • 130 or 160 	93	51.7	27	15.0	0.000*
	42	23.3	140	77.8	
	45	25.0	13	7.2	
2) Describe the variability. <ul style="list-style-type: none"> • Don't know • Absent. • Minimal or moderate or marked 	121	67.2	23	12.8	0.000*
	34	18.9	140	77.8	
	25	13.9	17	9.4	
3) Are there accelerations present? <ul style="list-style-type: none"> • Don't know • No • Yes 	119	66.1	18	10.0	0.000*
	44	24.4	147	81.7	
	17	9.4	15	8.3	
4) Are there decelerations present? <ul style="list-style-type: none"> • Don't know • None • Variable or late or early or prolonged 	114	63.3	14	7.8	0.000*
	34	18.9	156	86.7	
	32	17.8	10	5.6	
5) Are contractions present? <ul style="list-style-type: none"> • Don't know • Occasional • None or regular or hyperstimulation 	58	32.2	2	1.1	0.000*
	100	55.6	168	93.3	
	22	12.2	10	5.6	
6) Is this FHT reassuring? <ul style="list-style-type: none"> • Don't know • This tracing is nonreassuring and requires intervention • Yes. It is reassuring 	126	70.0	40	22.2	0.000*
	39	21.7	122	67.8	
	15	8.3	18	10.0	

FHT= fetal heart trace

Table 6: Distribution of internship students according to interpretation of trace in picture (4) about EFM in pre and posttest:

Questions	pretest		posttest		P-value
	No	%	No	%	
1) What is the baseline of the FHT? <ul style="list-style-type: none"> • Don't know • 135 • 120 or 150 	110	61.1	15	8.3	0.000*
	50	27.8	145	80.6	
	20	11.1	20	11.1	
2) Describe the variability. <ul style="list-style-type: none"> • Don't know • Absent. • Minimal or moderate or marked 	103	57.2	17	9.4	0.000*
	38	21.1	143	79.5	
	39	21.7	20	11.1	
3) Are there accelerations present? <ul style="list-style-type: none"> • Don't know • No • Yes 	107	59.4	7	3.9	0.000*
	51	28.3	164	91.1	
	22	12.2	9	5.0	
4) Are there decelerations present? <ul style="list-style-type: none"> • Don't know • None • Variable or late or early or prolonged 	116	64.4	10	5.6	0.000*
	34	18.9	152	84.4	
	30	16.7	18	10.0	

5) Are contractions present? <ul style="list-style-type: none"> • Don't know • None • Occasional or regular or hyperstimulation 	57	31.7	6	3.3	0.000*
	95	52.8	166	92.2	
	28	15.6	8	4.4	
6) Is this FHT reassuring? <ul style="list-style-type: none"> • Don't know • This tracing is nonreassuring and requires intervention • Yes. It is reassuring 	141	78.3	35	19.4	0.000*
	31	17.2	129	71.7	
	8	4.4	16	8.9	
7) Type of trace <ul style="list-style-type: none"> • Don't know • N.S.T • C.S.T 	111	61.7	24	13.3	0.000*
	49	27.2	138	76.7	
	20	11.1	18	10.0	
8) Result of trace <ul style="list-style-type: none"> • Don't know • Non-reactive N.S.T • Reactive N.S.T or positive C.S.T or negative C.S.T 	120	66.7	23	12.8	0.000*
	32	17.8	133	73.9	
	28	15.6	24	13.3	

FHT= fetal heart trace

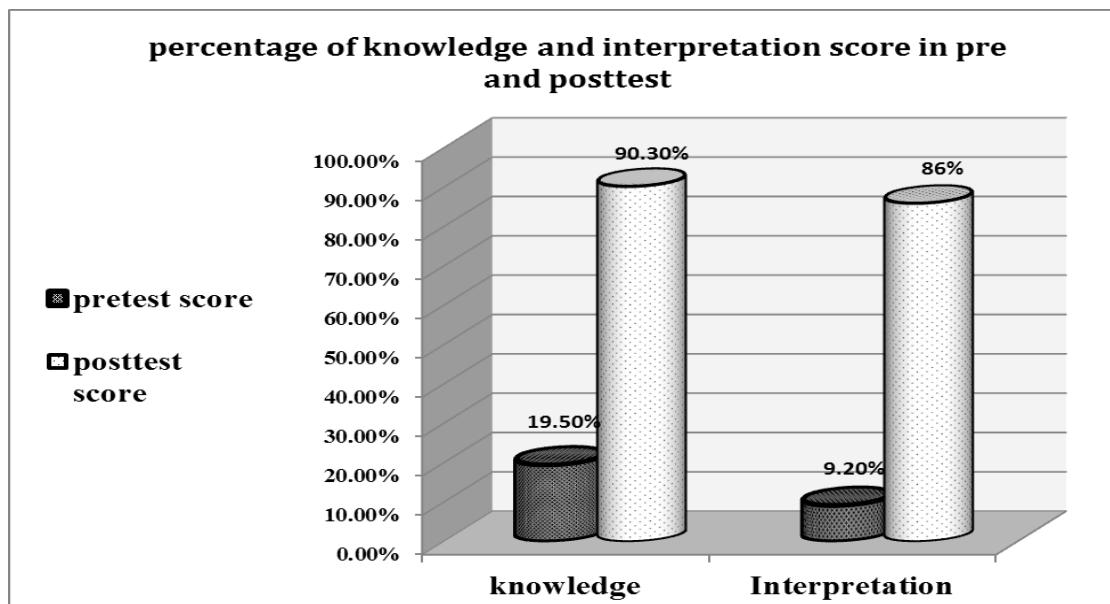


Figure (1): Mean of total internship students' scores in pre and posttest:

According to personal characteristics **table 1** illustrates that more than half of students lived in their homes while studying 60.6% and lived in rural areas 58.3%, the majority of them were single 85.6% and had a secondary educational as a previous certification 75%.

According to internship students' knowledge about EFM in pre and posttest, that is shown in **table (2)**. It included ten questions directed to internship students, questions involve (examples of Periodic Changes in FHR are the following except), (interpretations of the N.S.T are the following), and Indication of contraction stress test all of the following except.

The fourth question regarding EFM knowledge ask about method of fetal monitoring, the fifth question (most dangerous type of deceleration according to cause), and most common cause for variable deceleration in question number six. The seventh question (deceleration of the FHR that lasting more than 2 minutes but less than 10 minutes are).

The question number eight (FHR baseline is tachycardia when), the ninth question (Variable is minimal when), and the tenth and last question regarding EFM knowledge (in Fetal Monitor Paper Tracing lower graph records). The table shows that the percentages of correct answer in posttest are higher than pretest with significant differences between both tests p-value 0.000 and 0.001.

Another tool used in questionnaire to assess the interpretation of EFM traces. In this part, four pictures of traces used to evaluate the internship students ability to interpret EFM traces. And each picture had some questions about picture and the internship students were asked to answer these questions before introducing lecture to them and one month after.

Table (3) represents questions concerning picture number 1 (negative contraction stress test). It contained eight questions to interpret the trace as, base line, variability, presence of deceleration, acceleration, and contraction, If the trace reassuring or not, type and finally results of trace. Concerning all previous questions this table reveals that there are significant differences between pre and posttest p-value 0.000.

Table (4) illustrates picture number 2 (positive contraction stress test). And included the same questions in table three with the same consequences, it is shown that the higher percentages of correct answers in all questions in posttest than in pretest with significant differences between them p-value 0.000.

Table 5 states questions directed to the internship students on picture number 3 (non reassuring trace with occasional contraction). The involved questions are base line, variability, presence of deceleration, acceleration, and contraction, If the trace reassuring or not. It is illustrated that there are significant differences between pre and posttest p-value 0.000.

According to **table 6** that represent some questions on picture number 4 directed to the internship students to answer these questions that is the same questions on picture number 1&2 with the same sequences. The results reveal that there are significant differences between pre and posttest p-value 0.000.

Regarding **figure (1)**, it is illustrated that the mean score of internship students in questions directed to measure their knowledge is 19.5% in pretest, while the main of score in posttest is 90.3%. Also the mean score of questions directed to measure their interpretation to traces is 9.2% in pretest, while the main of score in posttest is 86%.

4. DISCUSSION

Maternity nurses feel disappointment when faced with new technology and situation if they not take their opportunity to enhance their knowledge and skills to meet mothers' need (**Tomey, 2009**). Hypoxia is a morbidity that the fetus face and occur in 2- 10% of cases (**Forster et al, 2006**). Using EFM help in reducing fetal hypoxia (**Anath et al, 2013**). One of widely fetal surveillance used is Electronic fetal monitoring (**Thellesen, 2017**).

Internship students had previously received some information about EFM theoretically and practically in the third year of faculty. Although previously learning is very important to learners, reeducation is also has a great events to them to recall and update theoretical and practical information (**Pehrson et al 2011**). So, the present study aimed to determine effect of educational program about EFM on knowledge and interpretations of internship students.

The min study results reflect a positive effect of the training program about knowledge and interpretation about EFM, which reflect that training for internship student has an important value.

According to personal data, the present study showed that more than half of students lived in their homes while studying and lived in rural areas, the majority of them were single and had a secondary educational as a previous certification. On the same line **Sajidah and Iqbal (2015)**, who performed their study in Maternity Hospitals at Baghdad city to show the effectiveness of an education program concerning cardiocography on nurse- midwife's knowledge, reported that nearly two thirds had a secondary school as a previous education (38.5% for study and 66% for control group) (**Sajidah& Iqbal 2015**).

On the other hand, **Matthew et al, 2015**, who apply their study to perform a national assessment on teaching residents EFM In this study 73% of sample lived in urban area, dissimilar appeared because difference of location between both studies (**Matthew et al, 2015**).

The current study revealed that the mean of total score in pretest is 25.1%, while the main of score in posttest is 78.8%. The study finding also reflect a statistical deference in student's interpretation of EFM between pre and post test results.

This finding reflect the effective tanning program in improvement of student's knowledge, this improvement in student's knowledge lead to improvement in student's ability to interpretation the CTG results.

This finding was similar to **(Carbonno & Sabria 2016)**, they reported in their multicenter randomized study which conducted to assess of an e-learning tanning program for cardiotographic analysis, that there was a significant improvement in the result

This opinion was also parallel with **Bruno and Imène, 2016**, who finished a multicenter randomized study to assess an e-learning training program for CTG analysis and found that the mean scores of the first test were similar in control and study groups (32.4 ± 5.2 out of 50 and 32.5 ± 4.6 , $p = 0.989$). After implementation of e-learning, the results were significantly higher in the study group than in control group (mean 37.1 ± 5.5 vs. 32.6 ± 5.7 , respectively; $p = 0.0026$) **(Bruno and Imène, 2016)**.

As well as CTG physiology knowledge increased, this enhanced ability to interpret EFM **(Amy J., 2010)**. So to interpret traces correctly theoretical knowledge is very important beside practical knowledge and training. This study illustrated that there was significant difference regarding knowledge between pre and posttest. Almost of p-values for knowledge were 0.000.

In the same way Sajidah and Iqbal 2015 detect significant difference between control and study group regarding knowledge at a posttest p- value was 0.000. Examples of variables used were CTG definition and component, importance of use, types, advantages, and maternal and fetal indications regarding CTG. It was also found that over all domain knowledge improvement for study group was 55% **(Sajidah and Iqbal, 2015)**.

In some cases obstetrician's delaying to perform timely cesarean delivery was caused by nurses' misinterpretation of EFM traces and the failure to convey a sense of urgency to the obstetrician. So, it is important to joint maternity nurse and obstetrician to EFM educational programs and ensure that all of them were competent to interpret EFM data **(Heidi, 2012)**.

The current study reflects an improvement of the internship student's knowledge and interpretation of CTG after access training program. This improvement may be due training in a group, This finding is agree with **(Carbone & Sabria-Kacci 2016)** which reported that the team training is an important component of training program, where the communication is a key factor in a safe management.

In the present study every internship student was given a four picture of traces and asked to answer some questions on the pictures as baseline, variability, presence of acceleration, deceleration, contraction, type of traces, and result of traces. Finding of this study revealed that there was significant difference between pre and posttest regarding all previous questions p- value was 0.000.

The lack o internship student's knowledge before attending program can be attributed to the fact that training course or nurses before joining their profession do not contain enough information about this issue, while students acquire some information during their study at the third academic year.

The present study results were in the same line **(Abd-El- Razake 2017)** who reported that nurses had increase in knowledge on post intervention than on pre intervention about EFM., **(El- Sayed & Saadoon 2018)** who were study the effect of training sessions about CTG on nurses knowledge and skills at labor and high risk unit, they also reported improvement in nurses knowledge about EFM

On the same line Erika et al, 2017, which performed to assess reliability in cardiotocography interpretation and found that there was significant difference between pre and posttest **(Erika et al, 2017)**. Also a study performed a cross sectional study in Malaysia to identify skill of midwifery nurses to interpret Cardiotocogram and report that the mean marks of CTG interpretation in different graphs as bradycardia, tachycardia, and deceleration graph was 69.3, 80. 71.1 respectively **(Saadat et al, 2012)**. This was nearly similar to percent of current study.

5. CONCLUSIONS & RECOMMENDATIONS

Educational program on EFM carries a vital value for enhancing internship students' knowledge and interpretations. This leads finally to improve maternal and fetal outcomes. We can recommended that , regular educational program should be encouraged for all maternity nurses and internship students. Written handout should be available to every internship students regarding EFM. Regular training workshops should be done to maternity nurses and internship students to improve their ability to interpret traces of EFM. A new research should be performed to identify effect of training workshops done to maternity nurses.

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