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Maternity Nurses' Performance Regarding Non-invasive Fetal Wellbeing Measures: Educational Intervention

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Abstract:
Background: *The primary golden aim of fetal monitoring is reducing the incidence of fetal death, perinatal morbidity and maternal distress, improving maternity nurse performance regarding fetal wellbeing is extremely important.* ***The aim*** *of the present study was to evaluate effect of educational intervention on maternity nurses' performance regarding non-invasive fetal wellbeing measures .* ***Design:*** *Aquasi-experimental design was utilized to fulfil the aim of the study.* ***Sample:*** *A convenient sample of a total 64 maternity nurses were included in the present study.* ***Setting:*** *The present study was conducted at fetal wellbeing assessment unit at obstetrics & gynaecological department affiliated in Benha university hospital.* ***Data*** *were collected through an interviewing questionnaire sheet, knowledge assessment sheet, and fetal wellbeing procedures practice checklist.* ***Results*** *of the study indicated that mean score of knowledge and practice of the studied maternity nurses were highly improved at post intervention phase as compared with pre intervention phase, knowledge mean score improved from (23.92) to(62.04) and practice mean score improved from(32.15) to (83.00).A highly positive association was illustrated between studied nurses educational qualification and their knowledge and practice mean score (p<0.001**).****The present study concluded*** *that educational intervention had a positive effect on improving knowledge and practice of maternity nurses regarding fetal wellbeing measures .* ***Recommendations:*** *The study recommended that continuous education of both new and current staff maternity nurses about Non-invasive fetal wellbeing measures. Further research, replication of the study on large representative probability sample is highly recommended to achieve more generalization of the results.*

Keywords: *Maternity nurse, performance, Non-invasive, Fetal wellbeing measures, educational intervention .*

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I. Introduction

Non-invasive fetal wellbeing is extremely critical during pregnancy and during labor to reduce the occurrence of fetal and maternal distress in high risk pregnancies. There are many approaches to identify and quantify the real-time feto-maternal well-being by measuring physiological parameters viz. fetal movement, fetal temperature, fetal respiration rate, fetal kick count, fetal heart rate, ultrasound, biophysical profile, maternal ECG acquired from both chest and abdomen region, uterine contraction, blood SpO2 concentration, amniotic fluid pH **[1] .**

Early information about fetal well-being is among the fundamental goals of fetal monitoring both during pregnancy and labor. The quantification of fetal distress patterns helps the maternity to decide for a chronic or acute fetal state. Chronic state means abnormalities in fetal nutrition uptake leading to improper neural development and restricted fetal growth also referred as Intrauterine Growth Restriction (IUGR). Acute state such as Asphyxia of fetus can further lead to severe hypoxic ischemic organ damage in fetus followed by severe life-long pathologies **[2].**

Intra Uterine Growth Retardation(IUGR) occurs when fetus is deficient of necessary nutrition's or because of infections. IUGR can also occur due to reduction of fetomaternal respiratory exchange. Abnormalities in fetal heart rate, fetal movement and fetal kick count patterns also indicate fetal well-being **[3].**

Fetal monitoring means an indirect way to measure fetal wellbeing and proper fetal oxygenation and as such it is an integral part of the concept of "the fetus as a patient". Antepartum fetal surveillance technique allows detection of high-risk pregnancy before damage occurs. It is used to evaluate the wellbeing of the fetus at risk of adverse prenatal outcome associated with uteroplacenta impairment and is recommended for pregnancies that are at risk for hypoxia and stillbirth through providing early determination and intervention for fetal compromise **[4].**

Fetal wellbeing assessment is determined by both invasive and noninvasive measures, the safety of non-invasiveness measures are seen as a great advantage by pregnant women **[5],** as it cause less anxiety than a

risky invasive measures **[6].** Studies amongst high-risk women undergoing confirmative invasive testing showed that their high levels of anxiety faded away after obtaining a normal result **[7].**

Currently the main focus of maternal and fetus health is towards the evaluation of fetal health that is to assess the fetal well being. Because majority 80% of fetal death occur in the antepartum period due to various causes which include chronic fetal hypoxia, intrauterine growth retardation, maternal complications, diabetes mellitus, hypertension, infection and fetal congenital malformation **. [8]**

Since fetal well-being is a common indication for the necessity of Caesarian delivery, it is important to obtain highly accurate status of fetal well-being, which assist the physician in early diagnosis of dangerous situations and also prevent false fetal distress detection, which might result in unnecessary operative actions **[9].**

Assessment of maternal and fetal well-being is the focus of prenatal care. Nursing responsibilities include heavy emphasis on teaching throughout the pregnancy. At each prenatal visit, it is the role of the nurse to screen the woman, monitor vital signs, perform other assessments as delegated by the primary care provider (PCP), answer questions and provide appropriate teaching. A nurse and trusted health care provider play a large role in teaching women about the importance of early and continued prenatal care**. [10].**

The maternity nurses play a crucial role in fetal monitoring and early detection of high risk fetus. Also are responsible for protecting the safety of the mother and the fetus throughout the testing period. In addition should assist in preparation of mother, and explain the step of each procedure in order to relieve stress and anxiety of pregnant mothers. Also should discuss findings with pregnant mothers and help her in taking the suitable decision **[11].**

Significance of the study :

The major cause of perinatal mortality is inadequate monitoring and care during pregnancy and labour by the skilled health professional. According to **[12],** perinatal deaths has decreased from 4.6 million in 1990 to 3.3 million in 2010. %). It is identified that 99% of the perinatal mortality occurs in the developing country. The maternity health service plays a vital role in reducing the perinatal mortality rate. Nurses are those professionals who spend a lot of time with the mother during labour, hence nurses need to be competent enough to perform and interpret the tracings correctly and timely in order to promote the measures in reducing the fetal death. For this adequate level of knowledge and high interpretative skills should be necessary for each nurse. so the present study aims to evaluate effect of educational intervention on maternity nurses' performance regarding non-invasive fetal wellbeing measures.

Aim of the study:-

Aim of the present study is to evaluate the effect of educational intervention on maternity nurses' performance regarding Non-invasive fetal wellbeing measures.

This aim was achieved through the following objectives:

1-Assessment knowledge and practice of maternity nurses regarding Non-invasive fetal wellbeing measures.

2- Designing and implementing an educational intervention regarding Non-invasive fetal wellbeing measures.

3-Evaluate the outcome of an educational program on performance of maternity nurses regarding Non-invasive fetal wellbeing measures.

Research hypothesis:

An educational intervention will improve maternity nurses' knowledge and Practices regarding Non-invasive fetal wellbeing measures.

II. Materials and Method:

Materials

Design: A quasi-experimental study design was used (pre/post-test design), single group is studied.

Setting: The study was conducted at Fetal Wellbeing Assessment Unit at Obstetrics & Gynecological Department in Benha University Hospital affiliated at Benha city in Qalioubia Governorate .This setting was particularly chosen because flow rate of pregnant women and normal delivery turnover is satisfactory for the study in addition to the availability of Cardiotocography (CTG) machine which used to assess fetal wellbeing and uterine contractions.

Subjects: a total 64 maternity nurses working at obstetric & gynecological department at Benha university hospital were recruited at the present study .

Tools: Two main tools were used for data collection:-

1.A structured interview questionnaire sheet:

It was written in an Arabic language in the form of close and open ended questions and consisted of two parts:

1. Personnel and socio demographic data such as(age, educational level, educational qualification, years of experience….etc.).

2. Assessment of maternity nurses' knowledge regarding Non-invasive fetal wellbeing: It consisted of two sections ;

- Section (1) knowledge about fetal wellbeing , it consisted of (6) items (Mean of fetal wellbeing, importance of fetal wellbeing assessment, types of fetal wellbeing assessment measures, types of fetal wellbeing measures that done at first trimester, types of fetal wellbeing measures that done at second trimester, of fetal wellbeing measures that done at third trimester).
- Section (2) knowledge about different Non-invasive fetal wellbeing measures, it consisted of (11) items (Biophysical profile, Fetal heart sound assessment, Fetal movement, ultrasound, Oxytocin challenging test, Fetal amniocentesis, Umbilical blood sampling, Non-stress test , Contraction stress test, Chorionic villus sampling).

Scoring : Each questions was assigned a score of (2) given when the answer was completely correct , a score (1) was given when the answer was incorrect. The total score of each section was calculated by summation of the scores of its items. The total score for the knowledge of a participant was calculated by the addition of the total score of all sections. The mean and standard deviation was calculated. As well

As maternity nurse' total knowledge score was classified as the following:

Satisfactory ≥ 60 % of total knowledge score ranged from (22-36marks).

Unsatisfactory < 60% of total knowledge score ranged from (1-21 marks)

II. Observational checklist

It was adopted from **[13].** It was concerned with assessing the maternity nurses' practice regarding Non-invasive fetal wellbeing measures. It divided into (8) procedures which consisted of (54 items) that identify the steps of different Non-invasive fetal wellbeing measures. It include Assessment fetal heart sound, contain (7 steps),Assessment of fetal movement include (6 steps), Biophysical fetal profile (BPP) include (5 steps), Fetal acoustic stimulation test include (7 steps), Ultrasound include (6 items),Non stress test (NST) include (6 steps), Oxytocin challenge test include (7 steps),and Contraction stress test (CST) include (10 steps).

Scoring: Each item was scored as (1) for not done, and (2) for done.

Then summing up the scores of the items in each procedure and the overall scores gave practice score. The mean and standard deviation was calculated. As well as nurse' total practice score was classified as the following :

- Competent practice ≥75% of total practice score(71-108 marks).
- Incompetent practice < 75 % (1-70 marks).

II . Method:-

The study was executed according to the following steps:

- **Approval:**

An official permission was obtained from the hospital authorities in the identified setting to collect the necessary data and implement the program.

- **A Pilot study:**

After the development of tools, a pilot study was carried out on 10% of the studied subjects (6) maternity nurses who were excluded from the main study sample.

The purposes of the pilot study were to:

- Ascertain the clarity and the applicability of the tools
- Ascertain the relevance and content validity of the tools.
- Estimate the time needed to complete the sheet.
- Detect any problem peculiar to the statements such as sequence and clarity that might interfere with the process of data collection . The necessary changes were undertaken.

Results of the pilot study:

After conducting the pilot study , it was found that:

- The tools were clear and applicable; however, few words were modified .
- Tools were relevant and valid.
- No problem that interferes with the process of data collection was detected.
- Following this pilot study the tools were made ready for use.

- **Validity:**

Tools 1 , 11 were developed and used by the reseachers after extensive of current and relevant literature, also translated into Arabic and were submitted on both Arabic and English language and examined by panel of five experts in the field of the study at faculty of medicine and nursing, benha university to be tested for its translation and its content validity also to determine whether the included items clearly and adequately cover the

domain of content addressed, The percentage of consensus among experts regarding the structured interviewing questionnaire was 94% and the pre-post-test was 87%. Accordingly, necessary modifications were done .

- **Reliability :**

Tools 1 , 11 were tested for its reliability by the same sample of maternity nurses on two occasions and then compares the scores The Cronbach's coefficient alpha of knowledge questionnaire was 0.853.

- **Ethical Considerations:**

- Approvals of maternity nurses were obtained before data collection and after explaining the purpose of the study .
- Anonymity was assured as the filled questionnaire sheets were given a code number (not by names).
- The maternity nurses were ensured that questionnaire sheet will be used only for the purpose of the study and will be discarded at the end of the study.
- The study maneuvers do not entail any harmful effects on participation.
- The maternity nurses who participated in the study were informed about having the right to withdraw at any time without giving any reason.

Educational intervention was constructed in different four phases:

To fulfill the aim of the study, the following phases were adopted. Interviewing and assessment phase, designing of the program phase, implementation of the program phase and evaluation of program phase. After receiving the approval from ethical committee at faculty of medicine, Benha University at the end of April 2017 These phases were started to carry out by the researchers from the beginning of May, 2017 and completed at the end of November, 2017 covering six months. The researcher visited the previously mentioned setting three days/week, (Saturday, Tuesday, Thursday), from 9.00 Am to 2.00 Pm.

1- Pre implementation phase (Initial assessment)

A- Performance checklist :

It was filled by the researcher using observation checklist for Non-invasive fetal wellbeing measures to assess maternity nurses' practice pre implementing training program , Checklist used two times (per -post test), The maternity nurses were unaware that they were being observed , Each observation sheet was filled immediately while observing the maternity nurse when performing procedure. It was performed during morning shift at fetal wellbeing assessment unit, The average time needed for the completion of each observational checklist took about(10 – 15) minutes.

B- Questionnaire sheet :

This phase encompassed interviewing to collect socio-demographic characteristics, baseline data about maternity nurses' knowledge regarding Non-invasive fetal wellbeing measures, it was used two times (pre- post test), after completing observation checklist for all maternity nurses The interviewing questionnaire (pre test) administered to each maternity nurse individually using the personal interview method and asked to respond to interview questionnaire , it was directed in simple Arabic language and answers were recorded immediately . At the beginning of interview the researcher greeted the maternity nurse, introduced herself to each maternity nurse included in the study, explained the purpose of the study and provided the maternity nurse with all information about the study (purpose, duration, and activities) and take oral consent. It was carried out at fetal wellbeing assessment unit during their morning shift, selecting the morning shift as there are a high rate of maternity nurses and avoid shortage of staff nursing during evening shifts where rate of maternity nurses is limited, Average time for the completion of each maternity nurse interview was around (15-20 minutes), This period of pre-tests (knowledge and practice) took one month .

Non-invasive fetal wellbeing guidelines:

Non-invasive fetal wellbeing guidelines was developed by the researcher in simple Arabic language based on the opinion of experts, the result of the maternity nurses, performance, the related literature and available structure guidelines. Teaching materials was be prepared as audio-visual materials, video simulations of Non-invasive fetal wellbeing measures and handouts, After that, the theoretical and practical parts of the teaching guideline were discussed and demonstrated through a group discussion sessions, six session used for each group.

2- Planning phase:

Development of this guideline was based on the questionnaire sheet and the conclusion& recommendations of relevant studies. The teaching guideline was developed guided by reviewing the most recent related literature. The maternity nurses learning needs were identified and classified into knowledge and

performance. Detected needs, requirements and performance deficiencies were translated to aim and objectives of teaching guideline. Objectives were categorized to general and specific objectives.

The general objective of the teaching guidelines was to improve maternity nurses' knowledge, and performance related Non-invasive fetal wellbeing measures.

The specific objectives were as the following; at the end of the teaching guidelines the maternity nurse should able to:

- Define Non-invasive fetal wellbeing measures.
- List importance of Non-invasive fetal wellbeing measures
- Differentiate between different types fetal wellbeing measures.
- Demonstrate nursing performance of each type of Non-invasive fetal wellbeing measures.

3- Implementation phase (intervention):

A- Nurses were divided into small group (6-7 nurses / session) each group perceived the program content using the same teaching strategies and handout.

B- The total number of sessions were six sessions for each group. It divided as following : A total two sessions for theoretical part (2 hours including discussion) and four sessions for the practical part (4 hours). The total number of groups was (10 groups) and total time for achieving the teaching guideline was (6 hours) for each group under the study.

C- Each session lasted for less than one hour.

D- Explanation of the guidelines using power point presentation, discussion, demonstration and redemonstrations were also conducted during each session.

E- Implementation of Non-invasive fetal wellbeing measures teaching guidelines content which included six sessions that divided into two types of sessions : educational and training sessions.

Educational sessions: were carried out two sessions. They Included the following;

- One session was given to cover knowledge about; the general and specific objectives of guidelines, Definition of Non-invasive fetal wellbeing measures, importance of Non-invasive fetal wellbeing measures.
- One session was given to cover knowledge about different types of Non-invasive fetal wellbeing measures .

Training sessions: were carried out in (4) sessions, to cover practical part of Non-invasive of fetal wellbeing measures as: Fetal heart sound Assessment , Assessment of fetal movement, Biophysical profile, Ultrasound, fetal acoustic stimulation test, Non stress test, Contraction stress test and Oxytocin challenge test .

F- During each knowledge session the researcher used simple , brief and clear words. At the end of each session, a brief summary was given by the researcher , emphasized the most important points included in each session.

G- Before the start of each session, maternity nurses were asked questions related to the topics discussed in the previous session to ensure that they remember the instruction given and to reinforce the knowledge, Missed or unclear points were re-emphasized by researcher, small presents were offered by researcher as incentive for correct answer.

H- Non-invasive fetal wellbeing measures teaching guidelines booklet was given to each maternity nurse in the study group to grasp her attention, motivate her, help for reviewing at home and support teaching and practicing.

I- Each maternity nurse in the study group was seen continuously by researcher to be sure that the instructions were followed correctly. Correction, reinstruction and re-demonstration were offered.

4- Evaluation phase:

- During this phase, the effect of educational program was evaluated by using the same format of tools which used before the program implementation.
- Evaluation of maternity nurses' knowledge using tool **1** through interview with maternity nurses after implementation Non-invasive fetal wellbeing measures guideline sessions, (post-test).
- Evaluation of maternity nurses' performance was observed by the researcher using tool **11**, (post-test).
- Comparison of each maternity nurse' findings with the preceding one to evaluate the impact of implementing Non-invasive fetal wellbeing measures guideline on maternity nurses' performance.

- **Statistical design:**

- Analysis of data was carried out by the researcher, Data was verified prior to computerized entry and categorized, coded, computerized, tabulated using IBM SPSS (statistical package for social science) statistical software version (22).
- Qualitative data were described using numbers and percent. Quantitative data were described using minimum and maximum. Mean and standard deviation(Mean ±SD) .
- Comparison between different groups regarding categorical variables was tested using Chi-square test. When more than 20% of the cells have expected count less than 5, correction for chi-square **(X^2)** was conducted using Fisher's exact test.

- For normally distributed data , comparison between two independent Population were done using independent (t) test while, more than two population were analyzed F-test to be used.
- Pearson's Correlation Coefficient (r) was also used to evaluate association between studied variables.
- A significant level value was considered when $p < 0.05$ and A highly significant level value was considered when $p < 0.01$.
- No statistical significance difference when $p>0.5$.

- **Limitation of the study :**

- Lack of local researches that study the current research

III. Results

Table (1) Distribution of studied nurses in relation to their Socio-demographic characteristics.

Variable	Frequency	%
Age in years		
20-	34	53.1
30-	22	34.4
40-50	8	12.5
Mean ±SD	32.45±4.032	
Educational qualification		
Secondary nursing education	38	59.4
Technical nursing education	24	37.5
Bachelor of nursing	2	3.1
Years of experience		
Less than 5 years	25	39.1
5-9	10	15.6
10-14	14	21.9
15-20	15	23.4
Mean ±SD	11.47±3.24	
Training course regarding fetal wellbeing		
No	62	96.9
Yes	2	3.1

Table (1): Reveals that more than half of the studied maternity nurses were aged (20-30) years .The highest percentage (59.4%) of them had a secondary nursing education .Moreover 39.1% of them had less than five years of experience. In addition the majority (96.9%) of them hadn't training courses regarding Non-invasive fetal wellbeing measures.

Table (2) Distribution of studied nurses in relation to their knowledge about Non-invasive fetal wellbeing measures.

Knowledge	Pre-intervention				Post-intervention				Chi square test	P value
	Incorrect		Correct		Incorrect		Correct			
	NO	%	NO	%	NO	%	NO	%		
Meaning of fetal well being	29	45.3	35	54.7	12	18.8	52	81.3	10.37	<0.001 **
Importance of fetal wellbeing assessment	35	54.7	29	45.3	20	31.3	44	68.8	7.17	<0.001 **
Types of Non-invasive fetal wellbeing assessment measures	47	73.4	17	26.6	15	23.4	49	76.6	32.03	<0.001 **
Types of Non-invasive feta well-being measures that done at the first trimester	51	79.7	13	20.3	19	29.7	45	70.3	32.28	<0.001 **
Types of Non-invasive feta well-being measures that done at the second trimester	48	75.0	16	25.0	20	31.3	44	68.8	24.59	<0.001 **
Types of Non-invasive feta well-being measures that done at the third trimester	37	57.8	27	42.2	8	12.5	56	87.5	28.82	<0.001 **

A statistical significant difference ($P \leq 0.05$) A highly statistical significant difference ($P \leq 0.001$)

Table (2): Shows that, there was a highly statistically significant difference between mean scores of knowledge related to Non-invasive fetal wellbeing measures between the pre and post intervention phases ($p<0.001$).

Table (3) Distribution of studied nurses in relation to their knowledge about different types of Non-invasive fetal well-being measures.

Knowledge about	Pre-intervention				Post-intervention				Chi square test	P value
	Incorrect		Correct		Incorrect		Correct			
	NO	%	NO	%	NO	%	NO	%		
Fetal heart sound assessment	43	67.2	21	32.8	9	14.1	55	85.9	37.44	<0.001**
Fetal movement.	23	35.9	41	64.1	8	12.5	56	87.5	9.57	<0.001**
Ultrasound.	40	62.5	24	37.5	15	23.4	49	76.6	19.92	<0.001**
Biophysical profile	45	70.3	19	29.7	10	15.6	54	84.4	39.05	<0.001**
Fetal acoustic stimulation test.	51	79.7	13	20.3	12	18.8	52	81.3	47.54	<0.001**
Fetal amniocentesis.	44	68.8	20	31.3	13	20.3	51	79.7	30.39	<0.001**
Umbilical blood sampling.	30	46.9	34	53.1	13	20.3	51	79.7	10.12	<0.001**
Non stress test.	47	73.4	17	26.6	13	20.3	51	79.7	36.26	<0.001**
Chorionic villus sampling.	48	75.0	16	25.0	20	31.3	44	68.8	24.59	<0.001**
Contraction stress test.	49	76.6	15	23.4	15	23.4	49	76.6	36.12	<0.001**
Oxytocin challenging test.	58	90.6	6	9.4	9	14.1	55	85.9	75.19	<0.001**

A statistical significant difference ($P \leq 0.05$) A highly statistical significant difference ($P \leq 0.001$)

Table (3): Indicates that, there was a highly statistically significant difference between mean scores of knowledge related to different types of Non-invasive fetal wellbeing measures between the pre and post intervention phases ($p<0.001$).

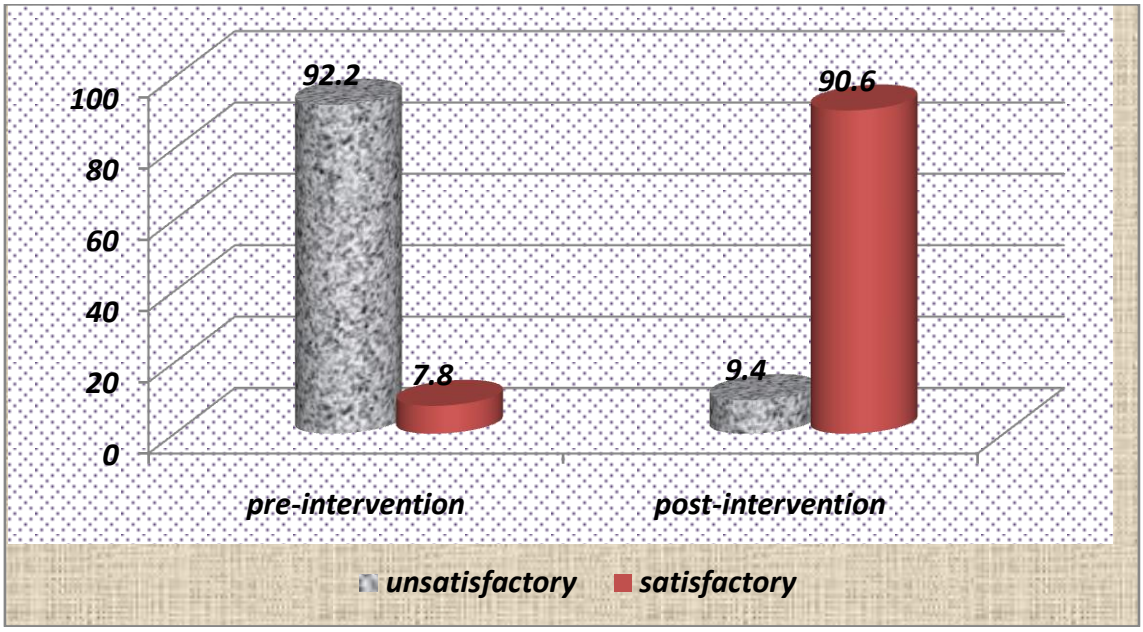

Figure (1): percentage distribution of total knowledge score of nurses under the study regarding Non-invasive fetal wellbeing measures.

Table (4) Distribution of mean score of studied nurses practice regarding Non-invasive fetal wellbeing measures.

Practice items	Pre-intervention Mean ±SD	Post-intervention Mean ±SD	Paired t test	P value
Fetal heart sound assessment	6.56±1.651	9.000±1.00791	-9.567	.000
Assessment of fetal movement.	6.1094±1.55448	8.7813±1.14737	-11.993	.000
Ultrasound	6.984±1.37428	9.0156±1.01563	-10.982	.000
Biophysical profile.	6.1406±1.16656	9.03±1.140	-13.749	.000
Fetal acoustic stimulation test	6.6875±1.30779	8.8125±.88864	-10.142	.000

Non stress test	6.9375±1.50000	8.5000±1.18187	-6.303	.000
Contraction stress test.	13.4219±2.42215	17.4688±2.38360	-9.454	.000
Oxytocin challenge test	9.2031±1.61520	12.3906±1.47591	-11.932	.000
Total practice score	**62.09±6.82765**	**83.00±5.31843**	**21.18**	**.000**

A statistical significant difference ($P \leq 0.05$) A highly statistical significant difference ($P \leq 0.001$)

Table (4): Illustrates that, there was a highly statistically significant difference between mean scores of practice related to different types of Non-invasive fetal wellbeing measures between the pre and post intervention phases ($p<0.001$).

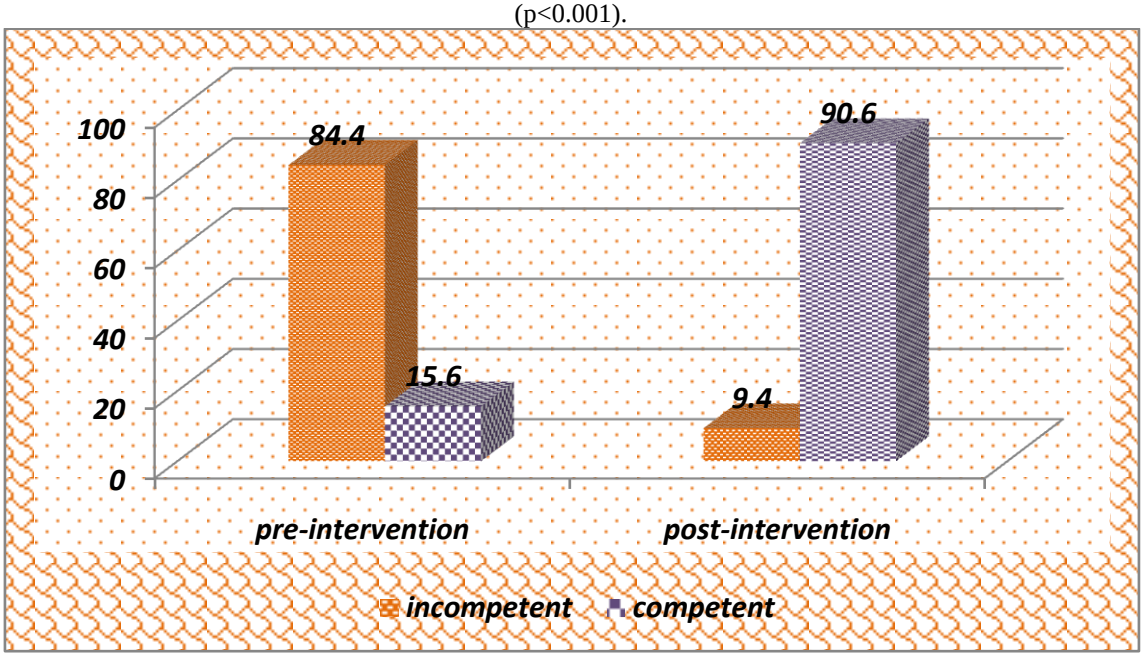

Figure (2): Percentage distribution of total practice score of nurses under the study regarding Non-invasive fetal wellbeing measures.

Table (5) Distribution of studied participants total knowledge score in relation to their socio-demographic characteristics.

socio-demographic characteristics	Total knowledge mean score							
	Pre-intervention				Post-intervention			
	Mean ±SD	F test	independent t test	P value	Mean ±SD	F test	(independent t test)	P value
Age in years		0.682		>0.05		0.308	-	>0.05
20-	23.9412±3.13				32.3529±1.967			
30-	24.3636±4.53				31.8636±2.799			
40-50	22.6250±2.38				32.1250±1.885			
Educational qualification		63.62	-	<0.001**		25.45	-	<0.001**
Secondary nursing education	21.7368±1.79				30.9474±2.104			
Technical nursing education	26.5417±2.48				33.7500±.6756			
Bachelor of nursing	34.0000±1.41				36.0000±.0000			
Years of experience		1.17	-	>0.05		1.16	-	>0.05
Less than 5 years	24.1600±2.85				32.6400±1.551			
5-9	24.3000±4.80				31.9000±2.846			
10-14	24.7857±4.75				31.2857±3.023			
15-20	2.4667±2.231				32.3333±1.951			
Training course		-	0.174	>0.05		-	0.415	>0.05
Yes	24.0000±.000				31.5000±2.121			
No	23.9194±3.64				32.1774±2.272			

A statistical significant difference ($P \leq 0.05$) A highly statistical significant difference ($P \leq 0.001$)

Table (5): Reveals that, there was a highly statistically significance difference between total knowledge scores of maternity nurses and their educational qualification as, the highest mean score was observed among nurses ,who had a bachelor of nursing at post intervention phase ($p<0.001$). In addition there was no statistically significance difference between the scores of knowledge in relation to their age, years of experience, and attendance of training courses regarding Non-invasive fetal wellbeing at both pre and post intervention phases.

Table (6) Distribution of studied participants total practice score in relation to their socio-demographic characteristics

socio-demographic characteristics	Total practice mean score							
	Pre-intervention				Post-intervention			
	Mean ±SD	F test	independent t test	P value	Mean ±SD	F test	(independent t test)	P value
Age in years		2.32	-	>0.05		0.587	-	>0.05
20-	63.7353±6.65				83.5000±5.298			
30-	60.0000±6.87				82.0000±5.597			
40-50	60.5000±6.25				83.6250±4.838			
Educational qualification		86.07	-	<0.001**		35.42	-	<0.001**
Secondary nursing education	57.3947±3.28				79.8421±4.559			
Technical nursing education	68.1667±4.00				87.3333±1.551			
Bachelor of nursing	77.0000±.000				91.0000±.0000			
Years of experience		2.74	-	<0.05*		1.20	-	>0.05
Less than 5 years	64.6400±6.69				84.1200±4.361			
5-9	62.1000±6.47				82.5000±7.306			
10-14	61.0000±7.31				80.8571±6.383			
15-20	58.6667±5.56				83.4667±3.907			
Training course		-	0.012	>0.05		-	1.56	>0.05
Yes	62.0484±6.90				80.5000±2.121			
No	62.0000±5.65				83.0806±5.378			

A statistical significant difference ($P \leq 0.05$) A highly statistical significant difference ($P \leq 0.001$)

Table (6): Reveals that, there was a highly statistically significance difference between total practice scores of maternity nurses and their educational qualification as, the highest mean score was observed among nurses ,who had a bachelor of nursing at post intervention phase ($p<0.001$). In addition there was no statistically significance difference between the scores of practice in relation to their age, and attendance of training courses regarding Non-invasive fetal wellbeing at both pre and post intervention phases.

Table (7): Correlation between total knowledge and practice score of the studied participants at pre and post intervention phases.

Variables	Knowledge pre-intervention		Knowledge-post intervention	
	r	P value	r	P value
Practice pre-intervention	.596**	.000	-	-
Practice post-intervention	-	-	.806**	.000

**. Correlation is significant at the 0.01 level (2-tailed).

Table (7): shows the correlation between studied nurses' knowledge and practice scores at different phases of intervention, it was observed that there was a highly positive association between their knowledge and practice scores at pre and post intervention phase.

IV. Discussion

Non-invasive fetal wellbeing measures are a challenging procedure for people working in the obstetric field, in order to check if the fetus is and remains in a wellbeing state. The present study was conducted to evaluate the effect of educational intervention on maternity nurses' performance (knowledge and practice) regarding Non-invasive fetal wellbeing measures. The present study supported the stated hypothesis that educational intervention improved the maternity nurses' knowledge and practice regarding Non-invasive fetal

wellbeing measures. The present study result revealed that the majority of the studied nurses had unsatisfactory knowledge before the implementation of the educational intervention. These findings are agreed with **[14]** in India in the study conducted at K.Velayudhan Memorial (K. V. M) Hospital to evaluate "effect of Planned Teaching Programme On cardiotocography among Midwives" ,result revealed that the majority of the studied midwives had inadequate knowledge regarding fetal wellbeing measures .

The present study revealed that ,there were a high statistical significance difference pre and post intervention regarding studied nurses knowledge about noninvasive fetal wellbeing measures. This result is in agreement with **[15]** who stated that there is a high statistical significance between both study & control groups regarding all nurse –midwives' knowledge in post test after the implementation of the educational intervention with high statistical significant. This result agreement with **[16]** who reported that the training intervention highly improved of nurses knowledge regarding fetal investigations. As more than three-quarters of maternity nurses gave complete answers after the training intervention .In addition the present study findings were supported by a study conducted to assess knowledge regarding the interpretation of cardio-tocography and its correlated factors among studied midwifery in Hospital Putrajaya and Hospital Serdang **[17].**The result indicated that there was improvement in knowledge and interpretation mean score and ,there was a significant difference in the level of knowledge and interpretation of cardio-tocography <0.001.

Concerning Fetal movement counting, the result of present study revealed that There were a high statistical significance difference of studied nurses practices pre and post intervention regarding practices during fetal heart sound assessment and a high statistical significance difference of studied nurses knowledge related practice about fetal movement pre and post intervention. This may be due to most of mothers during pregnancy had ignorance of prenatal education & counseling, inadequate services and low socioeconomic status.

The result of present study revealed that There were a high statistical significance difference of studied nurses in relation to their reported practice about ultrasound pre and post intervention. This result agrees with **[18]** who determine the agreement between maternal perception of fetal movements and visualization by ultrasound. They showed a significant correlation between maternal perception (x) and ultrasound (y) $p < 0.001$. The agreement between ultrasound and maternal perception of fetal movement is good, allowing the use of fetal movement counting in the assessment of fetal wellbeing.

The result of present study revealed that There were a high statistical significance difference of studied nurses in relation to their reported practice about biophysical profile pre and post intervention. This result is in agreement with **[19]** who stated that almost all the staff nurse did not have answer about biophysical fetal profile in pretest where this findings support the study of **[20]** in Bangalore Karnataka, who investigate the nurse have in adequate knowledge in the area wise analysis. It observed the maximum 54.23% mean percentage was in area of clinical methods of fetal wellbeing and the minimum 45.48% was in area of biophysical methods of fetal wellbeing assessment. The researcher's point of view in the current study that the majority of staff nurse participants gained more knowledge about biophysical fetal profile in posttest. The knowledge about biophysical fetal profile increased significantly. The session show significant remarkable effect of the result. **Also** educational intervention has agreat effect not only on the staff nurse knowledge but also on their performance in nursing care where, the staff nurse gain real-world experience.

There are other studies by **[21]** evaluated fetal biophysical profile as an effective technique for the assessment of fetal condition and to improve fetal outcome by early detection of fetal hypoxia. He showed that the patients having poor BPS, delivered babies with low Apgar score. However, despite the complaints of decreased fetal movements and clinically smallish babies, most of the patients had normal BPS and babies delivered with good Apgar score. It means BPS effectively detected those patients who really needed early intervention and thus avoiding unnecessary inductions and cesarean sections with related morbidity. The fetal BPP appears to be an effective technique for assessment of fetal condition **[22] .**

The results indicates that there was no significant difference among studied participants total knowledge and practice score and their age, years of experience and attendance of training courses ($p>0.05$).on the other hand there was a highly statistical significant difference between their educational qualification and their total knowledge and practice score. ($p<0.001$). This result is in agreement with **[17]** who represented that there was no significant association between the level of knowledge and skill with selected demographic variables among nurses. Also **[23]** explored the perceptions of new nursing graduates regarding clinical judgments and the education the investigator looked at the experiences nurses considered helpful in learning to make clinical judgments and their beliefs about their role in these decisions.

In contrast with this finding **[24]** how conducted a cross-sectional study to determine the level of knowledge on the interpretation of cardiotocography (CTG) amongst midwifery nurses who are working at obstetric wards and labour & delivery units in selected hospitals in Malaysia .Findings revealed that inadequate knowledge of respondents regarding interpretation and diagnosis of different graph in CTG and there were significant association between age ($p=0.01$), education level ($p=0.05$) and knowledge on CTGs interpretation. Additionally **[25]** reported that there is a significant relationship between knowledge on interpretation of CTG

and respondents age, educational level and work experience. Also, **[26]** reported that the youngest ages were found with most knowledge for the reason that they are recently skilled and knowledge of high risk factor is relatively new to apply practices. Additionally **[27]** stated that there was significant between the nurses who employment in the hospital for a long period and their experience in hospital and improvement in the practice and knowledge. Stated that they midwives confident in their abilities to read and interpret fetal monitor tracings(CTG) after 2-3 years of experience **[24]** reported that obstetric units have become larger with patients being knowledgeable and demanding also, established team works at maternity words require that midwives are experiences practices and security in their role. **[28]** reported that the area of responsibility for midwives includes a great deal of collaboration with doctors and assistant nurses resulting in joint decision- making. Also**[29]** found that training can improve knowledge of cardiotocography (CTG) leading to better quality care team training courses. Also**[30]** improve the maternity teams knowledge and practical skill resulting in greater structure in acute situations as well as security.

The result of present study revealed that There were a high positive correlation between total knowledge and practice score of studied nurses at pre and post intervention phase. Also **[17]** found that there was a weak negative correlation (r= -0.059) between knowledge and skill on cardiotocography among nurses in pretest whereas a weak positive correlation (r=0.323) in posttest. this showed that Cardiotocography Training Interventionme (CTP) improved the level of knowledge and skill among nurses.

These result indicated health knowledge were much stronger. The researcher's point of view suggests giving staff members opportunities to assume roles beyond primary responsibility, gain new skills and knowledge to work, access to session for learning new things encourage, feeling of achievement. It also increases motivation to further expand their skills. The educational session was effective in raising staff nurse awareness. The session shows a significant impact increase of the participants' level of knowledge which reinforce the continuing need for more education about methods fetal wellbeing assessment. It also increase motivation to further expand their skills, finally the session has a great effect because continuing education plays a significant role in equipping nurses to deal with the major changes currently making an impact on health care. Nurses today need knowledge and skills to perform and practice their job.

The researchers view that the staff nurse must be aware and have knowledge about methods of fetal wellbeing assessment because it is a corner stone in management of high risk pregnancy. Moreover, the result of the present study demonstrated that the staff nurse had better knowledge on posttest and there were highly statistical significant difference between pretest and posttest. This could be attributed to the fact that any training course increase nurses knowledge in turn changes their practice.

V. Conclusion

Based on the findings of the present study, it could be concluded that:

There was a significant improvement in total level of nurses' knowledge and practice regarding Non-invasive fetal wellbeing measures when comparing with pre and post program implementation , Moreover highly statistically significant difference on improvement nurses' practice in relation to improvement nurses' knowledge in pre and post implementation of program also there was highly statistically significant difference in total nurses' practice in relation to socio- demographic characteristics in post implementation program in to; age, educational level, experience and attendance of training course, Thus this study show that educational intervention regarding Non-invasive fetal wellbeing Measures was very effective in improving the level of knowledge and skill among nurses working in the maternity unit.

VI. Recommendations

Based on the findings of the current study , the following recommendations are suggested :

- Application of protocol on Non-invasive fetal wellbeing measures for maternity nurses written in Arabic language in Obstetrics &Gynecological department .
- Orientation programs should be provided for all newly maternity nurses about

Non-invasive fetal wellbeing measures.

- Continuous Appling Training course for maternity nurses to improve their performance regarding Non – invasive fetal well being measures .
- Maternity nurses should add to their routine obligations the regular reading of up to date references (periodicals , textbook, etc.,). and encouraged to attend scientific meetings and conferences to keep pace with the rapidly wealth of knowledge necessary for preventing fetal morbidity and improve quality of care regarding non-invasive fetal wellbeing measures .
- Periodic evaluation of knowledge and practices for maternity nurses working in Obstetrics &Gynecological department to assess what needs and appraisals regarding Non-invasive fetal wellbeing measures .

Further research:

- Replication of the study on large representative probability sample is highly recommended in different maternity hospitals to achieve more generalization of the results.

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