Effect of Comprehensive Nursing Care Protocol on Nurses' Performance regarding Ectopic Pregnancy

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Abstract

Background: Ectopic pregnancy is still one of the main causes of maternal morbidity and mortality as a result of tubal rupture, life-threatening internal hemorrhage and subsequent hemodynamic instability. Nurses have a pivotal role in the early identification, clinical management, and psychological support of women experiencing ectopic pregnancy. ***The study aimed*** to determine the effect of comprehensive nursing care protocol on nurses' performance regarding ectopic pregnancy. ***Subjects and method:*** **Design:** A quasi-experimental research design was used. **Setting:** The study was conducted at antenatal in-patient unit of Obstetric and Gynecological Department at Tanta University Hospitals. **Sample:** All nurses (50 nurses) in the previously mentioned study setting were included in the study. **Two tools** were used: **Tool (I):** Nurses' knowledge regarding ectopic pregnancy, consisting of two parts: **Part (1):** Socio-demographic characteristics of the studied nurses. **Part (2):** Nurses' knowledge regarding ectopic pregnancy. **Tool (II):** Nurses' practices regarding ectopic pregnancy observational checklists. ***Results****:* the vast majority of the studied nurses experienced a high level of knowledge and satisfactory practices regarding methotrexate administration, pre- and post-operative care in case of ectopic pregnancy immediate and one-month post-comprehensive nursing care protocol implementation in contrast to low and unsatisfactory practices pre-protocol implementation. ***Conclusion****:* The comprehensive nursing care protocol provided to the studied nurses achieved a significant enhancement in their performance regarding ectopic pregnancy and the research hypothesis has been ascertained. ***Recommendation:*** Adopt a nursing care protocol based on the evidence-based practice principles at obstetrics units for standardizing nursing practices regarding ectopic pregnancy management.

Key words: Nursing Care Protocol, Performance, Ectopic Pregnancy**.**

Introduction

Ectopic pregnancy (EP) is among the most serious complications encountered in early pregnancy **(Ayenew, 2022; Wang, Chen, Tao, & Luo, 2024).** Ectopic pregnancy is described as an abnormal pregnancy where the blastocyst is implanted and develops outside the uterine's endometrial lining, most commonly in the fallopian tube (tubal pregnancy). The World Health Organization (WHO) reported that the global incidence of EP represents around 1% to 2% of all clinically reported pregnancies **(Ali, Abdelsamad, & Ragab, 2024; Sivalingam et al., 2021).**

Ectopic pregnancy is still one of the main causes of maternal morbidity and mortality particularly in cases of delayed diagnosis because of tubal rupture, life-threatening internal hemorrhage and subsequent hemodynamic instability **(Ali et al., 2024; Kirk et al., 2022).** It constitutes approximately 6–10% of pregnancy-related deaths in developed countries and up to 20% in resource-limited settings **(Sivalingam et al., 2021; World Health Organization, 2023).**

Ectopic pregnancy is classified into several types depending on the site of implantation, including tubal, ovarian, abdominal, cervical, cesarean scar pregnancy, rudimentary horn, and heterotopic ectopic pregnancies. Each type of EP requires distinct diagnostic consideration and tailored intervention strategies to minimize maternal morbidity while preserving fertility when possible. (**Houser, Kandalaft, & Khati, 2022; Wang et al., 2024).**

Several mechanisms contribute to EP as tubal damage, whether due to pelvic infections, surgical scarring, or inflammation, which can impair both ciliary activity and muscular peristalsis, leading to delayed or arrested movement of the embryo. Also, altered tubal secretions and hormonal imbalances, particularly involving progesterone and estrogen, may permit premature adhesion and trophoblastic invasion outside the endometrium **(Shaw et al., 2021).**

Ectopic pregnancy is associated with a wide range of risk factors that can be modifiable and non-modifiable factors. Non-modifiable risk factors such as a history of previous EP, congenital anomalies of the fallopian tubes or septate or unicornuate uterus, and advanced age > 35 years **(Rogne, Liew, Hernáez, Brumpton & Magnus, 2022).**

On the other hand, modifiable risk factors comprise assisted reproductive technology (ART), pelvic inflammatory disease (PID), previous tubal surgeries, use of intrauterine devices (IUDs), and smoking **(Schreiber & Sonalkar, 2025; Liu et al., 2025).**

The clinical presentation of EP depends on the site of implantation and gestational age. "Amenorrhea (6-8 weeks), lower abdominal in one side or pelvic pain, and vaginal bleeding" are the classic triad in approximately 50% of EP cases **(Linnard-Palmer, & Coats, 2025).**

The most common complication of EP is internal hemorrhage, resulting

from rupture of the fallopian tube, which may rapidly progress to hypovolemic shock and maternal death if not promptly managed. Additionally, EP is associated with infertility caused by the fallopian tubes' damage or surgical removal (**Cunningham et al., 2022; Ren et al., 2023).**

The diagnosis of EP relies on the clinical assessment, which remains the cornerstone in the initial diagnosis of EP. A thorough history, physical & pelvic examination, laboratory tests as well as imaging techniques are utilized for EP diagnosis. Measurement of serum β-human chorionic gonadotropin quantitatively is the most widely used biochemical marker for EP **(Solomon, Jemal, Ahmed, Tesfaye, & Alemayehu, 2024).** Additionally, transvaginal ultrasound (TVUS), is considered the gold standard for non-invasive diagnosis. While the definitive diagnostic tool of EP is laparoscopy, when non-invasive methods are inconclusive. Additionally, Computed Tomography (CT) and Magnetic resonance imaging (MRI) are essential for verifying EP diagnosis. Hence, these multimodality imaging techniques facilitate accurate diagnosis and determine the type of EP management **(Hong, Park, Park, Lee, & Kim, 2024; Kirk et al., 2022; NHS, 2023).**

The management of EP is determined by several clinical parameters, including the woman's clinical and hemodynamic stability, serum β-hCG levels, ultrasound findings, as well as fertility desires. The main management approaches include expectant, medical, and surgical management **(Houser et al., 2022).**

The medical management of EP includes intramuscular Methotrexate (MTX) administration, which is a folic acid antagonist and the primary agent used in medical management for EP. It stops fast-dividing trophoblastic cells from synthesizing DNA. Candidates for MTX therapy should be hemodynamically stable, no signs of tubal rupture and meet specific laboratory and imaging criteria, including a β-hCG level generally <5,000 IU/L, a size of ectopic pregnancy of less than 4 cm, and absence of fetal cardiac activity. MTX can be administered in single-dose, two-dose, or multidose protocols depending on the woman's response and initial β-hCG levels **(Grynberg et al., 2020)**.

Surgical management is indicated when there is a tubal rupture, failed medical management, contraindications to MTX, or a desire for immediate resolution. The two common approaches for the management of EP via laparoscopic or laparotomic surgery are salpingostomy and salpingectomy **(Mullany, Minneci, Monjazeb, & C. Coiado, 2023).**

Nurses have a crucial role in the EP identification and management **(Choudhary et al., 2025).** Their role in MTX administration involves pre-procedure tasks, procedure tasks as don’t rub or massage the injection site to reduce irritation and post-procedure tasks as avoid pregnancy for three months after methotrexate

administration (**Ahmed et al., 2023; Dooley et al., 2025; Manglik, 2024).** While their preoperative care role in the case of surgical management includes: monitoring vital signs, assessing pain characteristics and bleeding, securing intravenous access for fluid resuscitation and blood transfusions, as well as obtaining written consent from the woman, and fasting preparation before the surgery **(Jiang, Jiang, Gao, Ye, & Kuang, 2025; Zhong, Zhao, & Zhu, 2021).** On the other hand, the nurses' post-operative role includes: performing post-operative assessment, giving prescribed IV fluids and blood transfusion if needed, and using non-pharmacological pain management techniques. Also, care of the operation site, provide emotional support about grieving for pregnancy loss, and referral if needed. As well as a follow-up visit in 7-10 days after surgery if there are no complications, and the importance of serial ß-hCG follow-up until it is undetectable (**Linnard-Palmer, & Coats, 2025; Shaw et al., 2021)**.

Significance of the study

The most frequent cause of pregnancy-related deaths during the first trimester is ectopic pregnancy (**Hendriks, Rosenberg & Prine, 2020; Zhong et al., 2021).** The vast majority of EP cases are initially misdiagnosed and can progress to life-threatening hemorrhage, resulting in maternal morbidity and mortality, especially among developing countries, where tubal rupture and hemodynamic instability are detected at a later date. As nurses contribute significantly in EP identification and management. Consequently, they must be equipped with the necessary knowledge and practical skills to respond timely and efficiently in order to preserve the lives of women with Ep **(Mohamed, Fayed, Abd El Meneam, & El-Sayed 2019; Punches, Johnson, Gillespie, Acquavita, & Felblinger, 2018).** Based on the current study's findings, work was the primary source of knowledge regarding EP that emphasizes the importance of conducting this study for nurses at their workplace to empower them with evidence-based training protocols for ensuring timely and high-quality care for women with ectopic pregnancies.

Aim of study:

The aim of this study was to: Determine the effect of comprehensive nursing care protocol on nurses' performance regarding ectopic pregnancy.

Research hypotheses: -

- Nurses′ knowledge is expected to be improved after implementation of comprehensive nursing care protocol regarding ectopic pregnancy.
- Nurses′ practices are expected to be improved after the implementation of comprehensive nursing care protocol regarding ectopic pregnancy.

Subjects and method:

Study Design:

This study employed a quasi-experimental research design. This research design aimed to identify the

effect of a particular intervention, programme, or event (a treatment).

Setting:

The study was carried out at antenatal in-patient unit of Obstetric and Gynecological Department at Tanta University Hospitals (Main Hospital) which is affiliated with the Ministry of Higher Education and Scientific Research. The department consists of outpatient clinics and inpatient units. The inpatient units consist of antenatal, labor, gynecological, and operating units, as well as an ultrasound and fetal medicine unit. The antenatal in-patient units comprise three rooms with a capacity of 52 beds.

Subjects: All nurses (50 nurses) who were employed in the aforementioned study setting were incorporated into this study.

Data collection Tools: To achieve the aim of the study, two tools were used.

Tool (I) Nurses' knowledge regarding ectopic pregnancy: the researcher developed this tool after reviewing the recent relevant literatures **(Hendriks et al., 2020; Jiang et al., 2025; Mohamed et al., 2019; Nofal, & Morsi, 2025; Zhong et al., 2021)**. It was divided into two parts as follows:

Part(1):Socio-demographic characteristics of the studied nurses: This part was utilized to collect nurses' basic data included; age, marital status, educational level, residence, experience years, and attendance of previous training program regarding EP.

Part (2): Nurses' knowledge regarding ectopic pregnancy: It was used to assess nurses' knowledge regarding EP.

The scoring system for nurses' knowledge regarding ectopic pregnancy was categorized as follows:

- Correct and complete answers were given a score of (2).
- Correct and incomplete answers were given a score of (1).
- Incorrect and/or don't know was given a score of (0).

The total knowledge score was calculated and converted to percent as follows:

- **High level of knowledge** 80% - 100% (32-40) from the total score.
- **Moderate level of knowledge** 60% - <80% (24-31) from the total score.
- **Low level of knowledge** <60% (0-23) from the total score.

Tool (II): Nurses' practices regarding ectopic pregnancy observational checklists: the researcher developed this tool after reviewing the relevant related literatures (**Ahmed et al., 2023; Gharib, El-Nagar & El-sayed, 2022; Bryant-Smith, As-Sanie, Lloyd, & Wong, 2021; Mohamed et al., 2019; Zhong et al., 2021)** to assess nurses' practices regarding EP. It was comprised of three procedures: Methotrexate administration procedure, preoperative care and postoperative care procedures in case of ectopic pregnancy.

The scoring system for nurses' practices was described as follows:

- Done correctly and completely was scored as (2).

- Done correctly but incompletely was scored as (1).
- Done incorrectly or not done was scored as (0).

The total score of practices was summed up and converted into percent score as follows:

- Satisfactory practice: 80% -100% from the total score.
- Unsatisfactory practice**:** < 80% from the total score.

Method:

The study was carried out according to the following steps: -

1. A formal letter clarifying the purpose of the study was obtained from the Faculty of Nursing, Tanta University and submitted to the responsible authorities of the selected setting for permission to carry out the study.

2. Ethical considerations:

- An approval of the Scientific Ethical Research Committee, Faculty of Nursing, was obtained (code 374/2/2024).
- All participants gave their informed consent after explaining the purpose of the study. They were informed about their freedom to leave the study at any time.
- The researcher ensured that the study's nature did not cause any suffering for the overall sample.
- Confidentiality and privacy were taken into consideration regarding data collection.

3. **Tool I and Tool II** were developed by the researcher after reviewing the recent related literature. **Tool I** was developed and translated into the Arabic language, and **Tool II** was developed in English. Then, the study tools were tested for face and content validity by a jury of 5 experts in obstetric and gynecological nursing field. The questionnaire's face validity was calculated based on experts' opinions, and it was 96%. The content validity index was 97% for nurses' knowledge questionnaire and 95% for nurses' practices regarding EP observational checklists with tools' total content validity index was 96%.

4. After the development of the tools, a **pilot study** was conducted before the actual data collection on 10% (5) of the studied nurses from the previously mentioned setting to test the clarity, feasibility, and applicability of the developed tools. After the implementation of the pilot study, no necessary modifications were made according to its results. So, data gathered from the pilot study were included in the current study sample.

5. The reliability of the study tools that tested by using Cronbach's Alpha test was (0.904 and 0.839, respectively) for the knowledge questionnaire and practices observational checklists tools, which indicates high reliability of the study tools.

6. The time frame for data collection was within seven months, from the beginning of June 2024 to the end of December 2024.

7. Comprehensive nursing care protocol was conducted via four phases (Assessment, planning, implementation, and evaluation) as follows:

Phase I: Assessment phase (Pre-test):

- During this phase, the researcher explained the purpose of the comprehensive nursing care protocol for the studied nurses and took their consent to participate in the study.
- Data was gathered by the researcher by using **Tool I part (1)** to collect nurses' socio-demographic data and **part (2)** to assess nurses' knowledge regarding EP.
- **Tool II** was used by the researcher to assess nurses' practices regarding EP (methotrexate administration, preoperative and postoperative care procedure tasks) before implementation of the comprehensive nursing care protocol.

Phase II: Planning phase: -

a. Preparation of the comprehensive nursing care protocol sessions:

- The total nurses' numbers (50 nurses) were divided into 7 groups (six groups involved 7 nurses and one group included 8 nurses).
- The comprehensive nursing care protocol included four sessions for each group (one session for the theoretical part and three sessions for the practical part); this was carried out in the previously mentioned study setting.
- The comprehensive nursing care protocol sessions were conducted at morning and afternoon shifts, over 4 days per week.
- Each session lasted from 30 to 45 minutes, including periods of discussion.
- A suitable model for demonstration and re-demonstration of all procedures was used during the practical sessions.

b. Setting the goal of the comprehensive nursing care protocol:

The comprehensive nursing care protocol's goal was to enhance nurses' performance (knowledge and practices) regarding ectopic pregnancy.

The objectives of the comprehensive nursing care protocol were to: After the comprehensive nursing care protocol implementation, the studied nurses were able to: -

- **Define** EP and **identify** the normal site of blastocyst implantation, places, risk factors, and causes of EP.
- **Determine** early warning symptoms and signs of EP and its onset.
- **Differentiate** between ectopic pregnancy and abortion.
- **Illustrate** complications of EP, symptoms of tubal rupture, investigations for diagnosis, and prevention of EP.
- **Demonstrate** management for women with EP.

c. Prepare the content of the comprehensive nursing care protocol:

- The researcher developed an educational colored booklet (including theoretical and practical parts regarding EP) in Arabic language based on the nurses′ needs (assessment phase of their knowledge and practices regarding EP).
- The booklet was given to each nurse to be adopted as a guide for self-learning and retention of information.
- Different methods of teaching were used, such as group discussion, lecture, role playing, posters, PowerPoint, demonstration, and re-demonstration by using model and video scenarios presentation.

Phase III: Implementation phase:

The comprehensive nursing care protocol was implemented in 4 sessions as follows:

The first session (theoretical):

- This session aimed to explain the purpose of the study and provided the studied nurses with knowledge regarding EP such as definition, normal site of blastocyst implantation, early warning symptoms and signs, differentiation between ectopic pregnancy and abortion, complications, symptoms of tubal rupture, investigations for diagnosis, prevention of EP, medical management, available medical management, mechanism of action of MTX, types of surgical management, non-pharmacological methods for pain relief and methods reduce risk of recurrence of EP.

The second practical session:

- This session aimed to provide the nurses with the proper and required practical skills regarding the MTX administration procedure.

A. Pre-procedure tasks comprised:

- **Preparation of the equipment,** which included: preparation of a disposable syringe, methotrexate prefilled syringe or vial of methotrexate, cotton swab, gloves, protective equipment "protective eyewear or safety glasses, mask and apron", soap & tissue paper, and record.
- **Preparation of the woman,** which included: identifying and greeting the woman, explaining the procedure to the woman, ensuring that the woman meets all selection criteria for MTX administration, and obtaining written informed consent from the woman.
- **Preparation of the environment,** which included ensuring a comfortable environment and providing privacy, providing adequate light and educational materials, about EP.
- **Preparation of the nurse,** which included: hand washing with antiseptic solution, wearing gloves and safety glasses, a mask, and an apron (Carryout infection control measures).

B. Procedure tasks included: -

- **MTX administration IM injection as follows:** disinfect the

injection site, remove needle protective sheath, gently stretch skin of injection site, insert needle at a 90-degree angle quickly, slowly inject MTX into the buttock muscle, quickly remove syringe and apply pressure to the injection site with the cotton swab, and do not rub or massage the injection site.

- **Health education after MTX administration** included**:** advise the woman to avoid taking herbal or vitamin supplements, avoid exposure to the sun in order to limit MTX dermatitis, and avoid pregnancy for three months after MTX administration.

C. Post-procedure tasks included**:** put the woman in a comfortable position, remove & clean the equipment, remove the gloves & hand washing, and document the findings. Instruct the woman that the Quantitative β-hCG is followed up on the fourth and seventh day whereas if there is a decrease in β-hCG about 15% or more, then the MTX administration is successful and if the decrease is less than 15%, a second dose of MTX 50 mg/m2 was given, as well as weekly measurements are investigated until the β-hCG is undetectable.

The third practical session:

This session aimed to provide the nurses with the proper and required practical skills regarding **pre-operative care for women with EP**. It included:

- Hand washing.
- Admission procedure and take a comprehensive history.
- Anti-shock measures in case of hypovolemic shock as assessing airway, breathing, and circulation, put the woman in a flat position, give oxygen by mask at 10-15 liters/minutes, insert an IV line, and maintain IV fluids.
- Ensuring that the environment is comfortable, providing adequate light, and privacy.
- Assessing the woman's psychological status and providing emotional support.
- Preoperative assessment as assessing the level of consciousness, vital signs, pain characteristics, and bleeding.
- Conduct preoperative screening tests, including obtaining a blood sample for hemoglobin, hematocrit, blood grouping, and serial ß-hCG.
- Instruct the woman to fast 8 hours prior to time of operation if planned.
- Mechanical bowel preparation.
- Helping the woman to take a shower before surgery, perform skin preparation for the abdominal site of surgery, and perform perineal care.
- Bladder preparations.
- Finally put the woman in a comfortable position, wash hands and documentation of the findings.

The fourth practical session:

This session aimed to provide the nurses with practical skills regarding **post-operative care for women with EP.** It included the following:

A. Post-operative assessment of:

- Level of consciousness.
- Vital signs.
- The presence of immediate nausea and number of vomiting episodes.
- Post-operative pain characteristics.
- The incision site.
- The IV line for patency and infiltration.
- The urinary catheter.

B. Postoperative Care included: -

- Put the woman in the lateral recovery position.
- Early IV fluid intake.
- Control nausea and vomiting if present.
- Measures to relief post-operative pain.
- Enhancement of early ambulation.
- Promoting gastrointestinal tract function and nutrition.
- Removal of the urinary catheter as early as possible.
- Care of the operation site.
- Psychological support and encourage the woman to express her feelings.
- Referral if needed.
- Postoperative education regarding care at home, post-laparoscopic education, and follow-up visits.
- Documentation of all findings.

Phase IV: Evaluation phase (Post-test):

- After implementing the comprehensive nursing care protocol sessions, the researcher used **Tool I part (2)** to evaluate the effect of the comprehensive nursing care protocol on nurses' knowledge regarding EP immediately and one month later after protocol implementation.
- Nurses' practices were also assessed using **Tool II (observational checklist)** immediately and one month later after implementation of the comprehensive nursing care protocol.
- Comparison was done for nurses' knowledge and practices regarding EP before, immediately, and one month later after protocol-implementation.

Statistical analysis:

- SPSS Statistical Package for Social Science, version 25 (IBM Corporation, Armonk, NY, USA) was used to code, enter, tabulate, and analyze the data that was gathered.
- The range, mean, and standard deviation were calculated for quantitative data which describes a categorical set of data by frequency, percentage, or proportion of each category, comparisons between two groups and more were done using the Chi-square test ($\chi 2$).
- The Z value of the Mann-Whitney test was used for comparison between means of two groups of non-parametric data of independent samples. Z value of Wilcoxon Signed Ranks Test was applied for comparison between means of three related groups (before, immediate after and one month after Comprehensive Nursing Care Protocol) of non-parametric data. For comparison between more than two means of non-parametric data, Freedman test ($\chi 2$ value) was calculated. Correlation between variables was evaluated using

Pearson's Correlation Coefficient (r).Significance was adopted at $p<0.05$ for the interpretation of results of tests.

Results

Table (1): Shows that nearly two fifths **(38.0%)** of the studied nurses aged 20–30 years old and more than half had Diplom in Nursing Technician and were from an urban area. In addition, slightly less than half of them had >15 years of experience, and none of the studied nurses attended any previous training program regarding EP.

Figure (1): Shows that four fifths of the studied nurses reported a low level of knowledge regarding EP before the comprehensive nursing care protocol implementation, whereas their knowledge improved to **96.0% and 86.0% respectively** immediate and one month post protocol-implementation.

Figure (2): Indicates that slightly more than three quarters **(76.0%)** of the studied nurses mentioned that work was the primary source of knowledge regarding EP, followed by mass media and study which were recalled by **(38.0% and 24.0% respectively)** as other sources of knowledge regarding EP.

Table (2): Reveals that the total practices mean score regarding MTX administration tasks was **(21.12±10.92)** before implementation of the comprehensive nursing care protocol, while it was significantly increased to **(46.64±5.29)** immediately and slightly decreased to **(44.36±10.81)** one month after protocol implementation. The difference was statistically significant ($\chi 2$=79.666, **p**= 0.0001*)

Table (3): Shows that the mean scores of admission procedure during pre-operative care in case of EP, applying anti-shock measures in case of hypovolemic shock and preoperative assessment were **(4.46±1.70, 3.36±4.60 and 2.36±2.46 respectively)** before implementation of the comprehensive nursing care protocol, while, they were significantly increased to **(7.28±1.28, 14.80±2.42 and 7.22±1.40 respectively)** immediately after and slightly decreased to **(7.12±1.32, 13.16±5.10 and 6.90±2.11 respectively)** one month after implementation of the comprehensive nursing care protocol. The difference was statistically significant (**p** = 0.0001*).

The table also clarified that the total practices mean score of pre-operative care procedure tasks was **(23.28±12.98)** before implementation of the comprehensive nursing care protocol, which increased to **(59.48±7.98 and 55.52±14.93 respectively)** immediately and one month after the comprehensive nursing care protocol implementation. The difference was statistically significant (χ^2 = 78.080, **p** = 0.0001*).

Table (4): Demonstrates that the total practices mean score of post-operative care procedure tasks in case EP was **(34.42±20.47)** before implementation of the comprehensive nursing care protocol, which increased to **(89.76±12.51)** immediate and slightly decreased to **(85.08±22.68)** one month after protocol implementation. The

difference was statistically significant (χ^2 = 80.928, **p** = 0.0001*).

Figure (3): the vast majority **(96% and 90% respectively)** of the studied nurses demonstrate satisfactory practices score level regarding MTX administration, pre-operative care and post-operative care in case of ectopic pregnancy immediate and one month after implementation of the comprehensive nursing care protocol in contrast to the majority **(88%)** of them who had unsatisfactory practices score level pre-implementation of the comprehensive nursing care protocol.

Figure (4), (5) and (6): Indicates that there was a strong positive correlation between the studied nurses' total knowledge scores and total practices scores regarding EP before, immediately one month after implementation of the comprehensive nursing care protocol **P**=0.0001*

Table (1): Socio-demographic characteristics of the studied nurses (n=50).

Socio-demographic characteristics	The studied nurses (n=50)	
	N	%
Age (years)		
20-30	**19**	**38.0**
>30-40	**14**	**28.0**
>40-55	**17**	**34.0**
Range	**22-55**	
Mean±SD	**35.76±9.74**	
Marital status		
Single	**5**	**10.0**
Married	**37**	**74.0**
Divorced	**3**	**6.0**
Widow	**5**	**10.0**
Educational Level		
Diplom in Nursing Technician	**26**	**52.0**
Technical Nursing Institute	**24**	**48.0**
Residence		
Urban	**27**	**54.0**
Rural	**23**	**46.0**
Years of experience		
<5	**8**	**16.0**
5-10	**14**	**28.0**
11-15	**4**	**8.0**
>15	**24**	**48.0**
Mean±SD	**13.44±5.46**	
Attendance of previous training program regarding ectopic pregnancy		
No	**50**	**100**

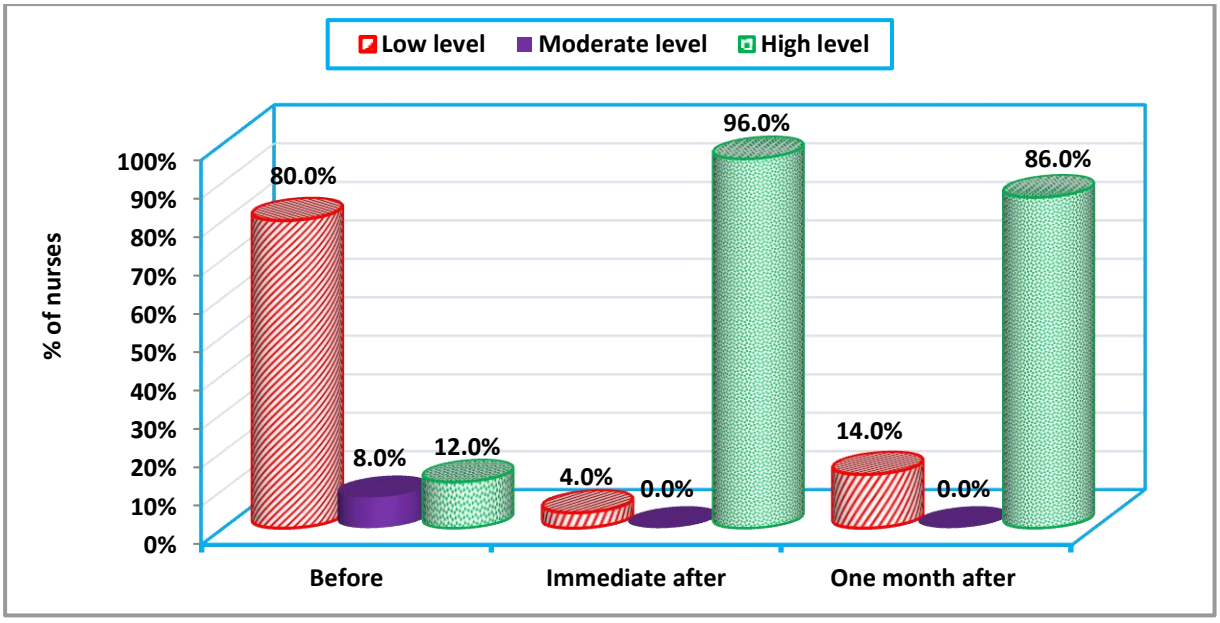

Figure (1): Total knowledge score level of the studied nurses regarding ectopic pregnancy before, immediate and one month after implementation of the comprehensive nursing care protocol (n=50)

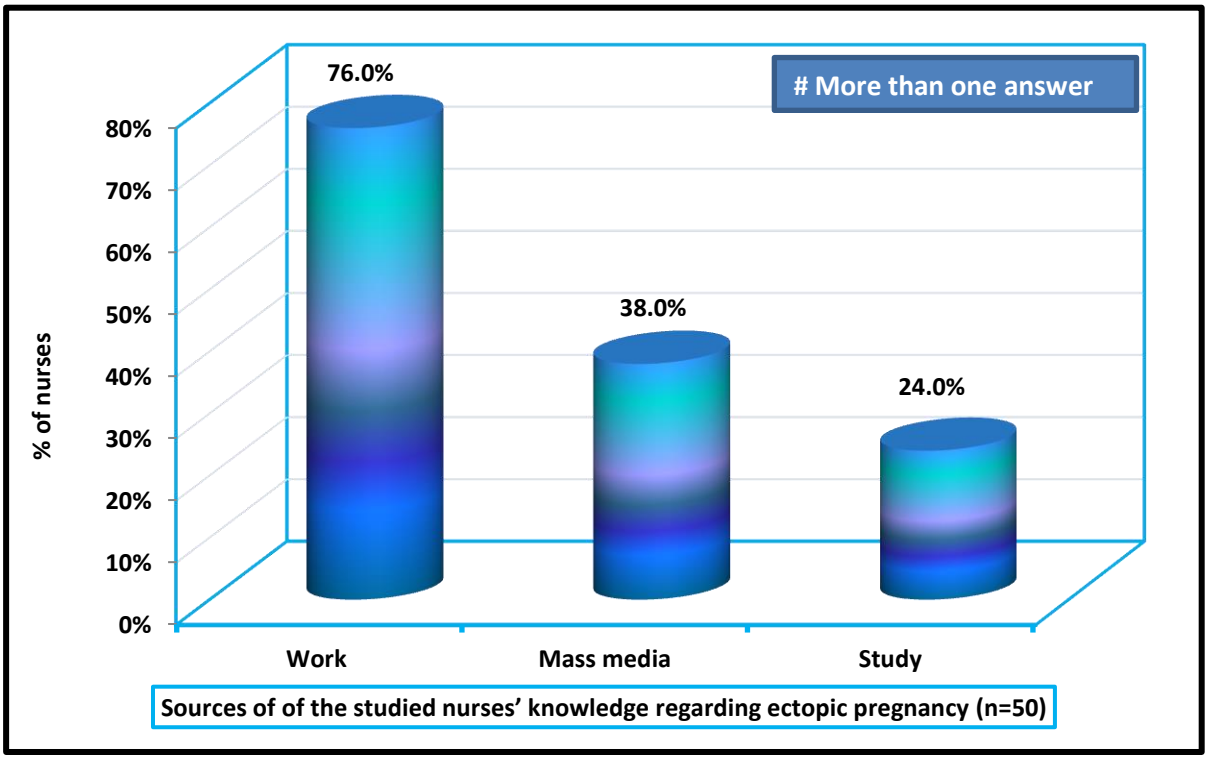

Figure (2): Sources of the studied nurses' knowledge regarding ectopic pregnancy (n=50)

Table (2): Total practices mean scores of the studied nurses regarding methotrexate administration in case of ectopic pregnancy before, immediate and one month after implementation of the comprehensive nursing care protocol (n=50)

Nurses' practices regarding methotrexate administration procedure tasks (Each item scored 0-2)	No. of questions (Score)	Practices mean scores of the studied nurses before, immediate and one month after implementation of the comprehensive nursing care protocol (n=50)			χ^2 value	P value
		Before	Immediate	One month after		
		Range Mean±SD	Range Mean±SD	Range Mean±SD		
I-Pre-Procedure Tasks						
I-Preparation of the equipments	1 (0-2)	0-2 0.82±0.72	0-2 1.74±0.53	0-2 1.84±0.42	61.232	0.0001*
II-Preparation of the woman	5 (0-10)	0-10 4.40±2.45	6-10 9.44±1.09	2-10 8.96±1.92	80.990	0.0001*
III-Preparation of the environment	3 (0-6)	0-6 2.12±1.95	0-6 5.56±1.16	0-6 4.92±1.95	67.684	0.0001*
IV-Preparation of the nurse	1 (0-2)	0-2 1.12±0.82	0-2 1.82±0.56	0-2 1.88±0.48	43.120	0.0001*
Pre-procedure practices mean score of methotrexate administration	10 (0-20)	2-20 8.46±4.38	9-20 18.56±4.38	5-20 17.60±4.17	78.228	0.0001*
II-Procedure Tasks						
A-Methotrexate administration IM injection	9 (0-18)	4-18 8.24±3.82	4-18 16.56±2.77	4-18 16.08±4.04	73.075	0.0001*
B-Health education after methotrexate administration	1 (0-2)	0-2 0.56±0.79	1-2 1.88±0.33	0-2 1.70±0.58	70.367	0.0001*
Procedure practices mean score of methotrexate administration	10 (0-20)	4-20 8.80±4.46	5-20 18.44±2.96	4-20 17.78±4.48	72.136	0.0001*
III-Post-Procedure Tasks	5 (0-10)	0-10 3.86±2.82	7-10 9.64±0.72	1-10 8.98±2.49	80.140	0.0001*
Total practices mean score regarding methotrexate administration tasks	25 (0-50)	7-47 21.12±10.92	22-50 46.64±5.29	14-50 44.36±10.81	79.666	0.0001*

*Statistically significant (P<0.05)

Table (3): Total practices mean scores of the studied nurses regarding pre-operative care in case of ectopic pregnancy before, immediate and one month after implementation of the comprehensive nursing care protocol (n=50)

Nurses' practices regarding pre-operative care procedure tasks (Each item was scored 0-2)	No. of questions (Score)	Practices mean scores of the studied nurses before, immediate and one month after implementation of the comprehensive nursing Care protocol (n=50)			χ^2 value	P Value
		Before	Immediate	One month after		
		Range Mean±SD	Range Mean±SD	Range Mean±SD		
I-Hand washing	1 (0-2)	0-2 0.92±1.01	0-2 1.96±0.28	0-2 1.76±0.66	43.144	0.0001*
II-Admission Procedure	4 (0-8)	0-8 4.46±1.70	3-8 7.28±1.28	4-8 7.12±1.32	65.671	0.0001*
III-Apply anti-shock measures in case of hypovolemic shock	8 (0-16)	0-16 3.36±4.60	6-16 14.80±2.42	0-16 13.16±5.10	85.426	0.0001*
IV- Environmental preparations	1 (0-2)	0-2 0.84±0.91	0-2 1.70±0.65	0-2 1.82±0.52	41.052	0.0001*
V-Preoperative psychological preparations (teaching and support)	2 (0-4)	0-4 1.16±1.61	0-4 3.76±0.87	0-4 3.20±1.56	60.936	0.0001*
VI-Preoperative assessment	4 (0-8)	0-8 2.36±2.46	0-8 7.22±1.40	0-8 6.90±2.11	76.143	0.0001*
VII-Routine preoperative screening tests	2 (0-4)	0-4 2.46±1.80	2-4 3.92±0.39	2-4 3.92±0.39	41.604	0.0001*
VIII-Preoperative fasting instructions	1 (0-2)	0-2 1.68±0.74	0-2 1.96±0.28	2 2.00±0.00	13.385	0.0001*
IX-Care of valuables and attire / grooming	1 (0-2)	0-2 1.08±1.01	0-2 1.92±0.39	0-2 1.84±0.55	34.225	0.0001*
X- Omission of mechanical bowel preparation before surgery.	1 (0-2)	0-2 1.20±0.99	0-2 1.92±0.39	0-2 1.76±0.66	23.379	0.0001*
XI-Skin preparations and cleansing	3 (0-6)	0-6 1.48±1.89	0-6 5.56±1.34	0-6 5.16±1.94	83.409	0.0001*
XII-Bladder preparations	1 (0-2)	0-2 0.80±0.99	0-2 1.92±0.39	0-2 1.72±0.70	46.053	0.0001*
XIII- Post procedure tasks	3 (0-6)	0-6 1.48±1.89	0-6 5.56±1.34	0-6 5.16±1.94	83.409	0.0001*
Total practices mean score of pre-operative care procedure tasks	32 (0-64)	11-60 23.28±12.98	21-64 59.48±7.98	14-64 55.52±14.93	78.080	0.0001*

*Statistically significant (P<0.05)

Table (4): Total practices mean scores of the studied nurses regarding post-operative care in case of ectopic pregnancy before, immediate and one month after implementation of the comprehensive nursing care protocol (n=50)

Nurses' practices regarding post-operative care procedure tasks (Each item was scored 0-2)	No. of questions (Score)	Practices mean scores of the studied nurses before, immediate and one month after implementation of the comprehensive nursing care protocol. (n=50)			χ^2 value	P value
		Before	Immediate	One month after		
		Range Mean±SD	Range Mean±SD	Range Mean±SD		
A-Postoperative Assessment	8 (0-16)	3-16 8.46±2.89	6-16 15.00±2.14	4-16 14.44±3.21	74.743	0.0001*
B-Postoperative Care						
I-Patient position.	1 (0-2)	0-2 1.32±0.96	0-2 1.78±0.61	0-2 1.80±0.61	11.907	0.003*
II- Early IV fluid intake.	1 (0-2)	0-2 0.92±1.01	0-2 1.88±0.48	0-2 1.96±0.28	50.730	0.0001*
III-Control nausea and vomiting if present.	4 (0-8)	0-8 2.00±2.52	0-8 6.96±1.90	0-8 6.64±2.54	72.826	0.0001*
IV-Measures to relief post-operative pain.	4 (0-8)	0-8 2.46±2.48	0-8 7.46±1.61	0-8 7.00±2.36	76.810	0.0001*
V-Enhancement of early ambulation.	1 (0-2)	0-2 1.04±0.97	0-2 1.84±0.55	0-2 1.84±0.55	35.271	0.0001*
VI-Promoting GIT function and nutrition.	2 (0-4)	0-4 2.54±1.75	2-4 3.92±0.39	2-4 3.96±0.28	43.940	0.0001*
VII-Removal of the urinary catheter as early as possible.	1 (0-2)	0-2 0.60±0.92	0-2 1.96±0.28	0-2 1.80±0.61	69.082	0.0001*
VIII-Care of the operation site.	13 (0-26)	0-26 5.96±8.75	0-26 24.60±4.18	0-26 22.96±7.71	76.385	0.0001*
IX-Psychological support.	3 (0-6)	0-6 1.88±2.19	0-6 5.64±1.32	0-6 5.36±1.69	76.073	0.0001*
X-Referral if needed.	1 (0-2)	0-2 0.16±0.55	0-2 1.92±0.39	0-2 1.48±0.89	86.343	0.0001*

Table (4): Continue.

Nurses' practices regarding post-operative care procedure tasks (Each item was scored 0-2)	No. of questions (Score)	Practices mean scores of the studied nurses before, immediate and one month after implementation of the comprehensive nursing care protocol. (n=50) (n=50)			χ^2 value	P value
		Before	Immediate after	One month after		
		Range Mean±SD	Range Mean±SD	Range Mean±SD		
XI-Postoperative education regarding:-						
a. A-Care at home.	3 (0-6)	0-6 1.50±1.92	1-6 5.26±1.32	0-6 5.14±1.68	69.432	0.0001*
b. B. Post laparoscope education.	1 (0-2)	0-2 0.40±0.81	0-2 1.88±0.48	0-2 1.64±0.78	69.179	0.0001*
c. C-Follow up visits.	2 (0-4)	0-4 1.08±1.43	0-4 3.88±0.63	0-4 3.52±1.18	87.785	0.0001*
Postoperative education tasks mean scores	6 (0-12)	0-12 2.98±3.51	3-12 11.02±1.96	0-12 10.30±3.31	71.655	0.0001*
XII-Before discharge	2 (0-4)	0-2 2.44±1.58	0-2 3.80±0.83	0-2 3.56±1.23	36.062	0.0001*
XIII-Documentation of the following: (vital signs, intake and output, medication given, condition of the operation site and its dressing, date of next visit)	1 (0-2)	0-2 1.48±0.68	1-2 1.98±0.14	1-2 1.98±0.14	41.023	0.0001*
Practices mean scores of Postoperative Care Steps	40 (0-80)	12-76 25.96±18.37	17-80 74.76±10.96	16-80 70.64±19.59	81.038	0.0001*
Total practices mean score of post-operative care procedure tasks	48 (0-96)	17-96 34.42±20.47	26-96 89.76±12.51	19-96 85.08±22.68	80.928	0.0001*

***Statistically significant (P<0.05)**

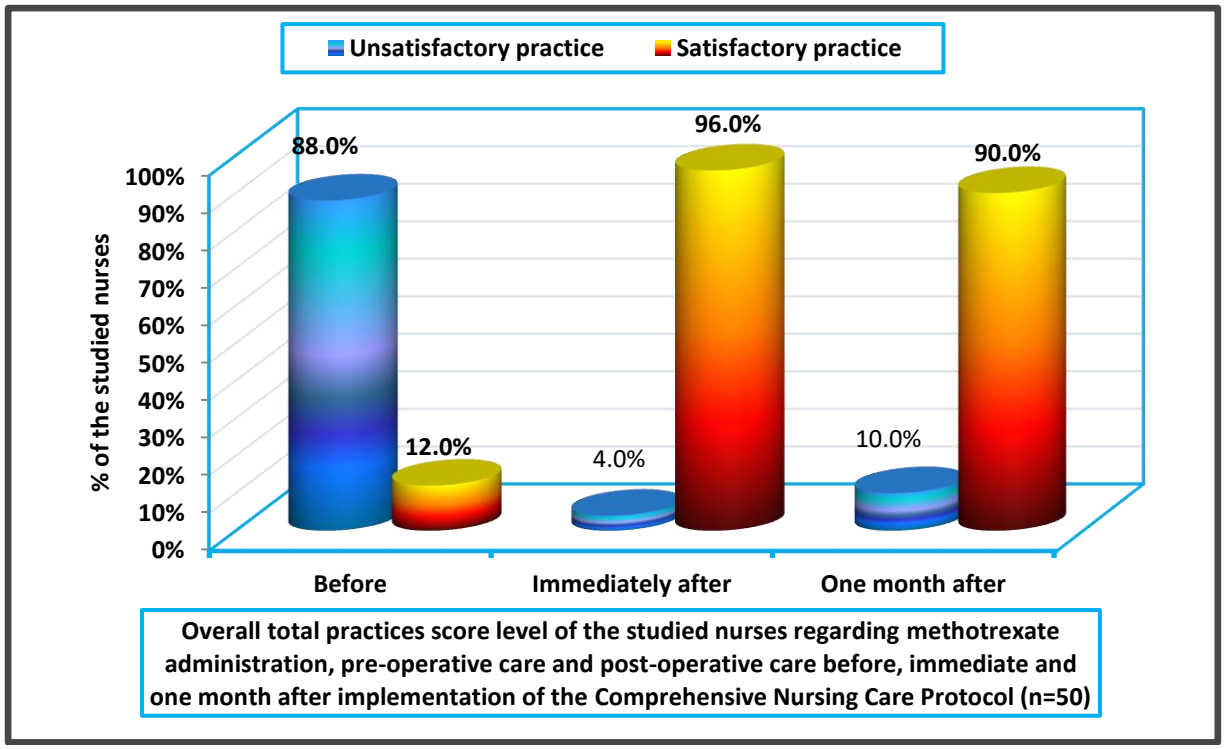

Figure (3): Overall total practices score level of the studied nurses regarding methotrexate administration, pre-operative care and post-operative care in case of ectopic pregnancy before, immediate and one month after implementation of the comprehensive nursing care protocol. (n=50)

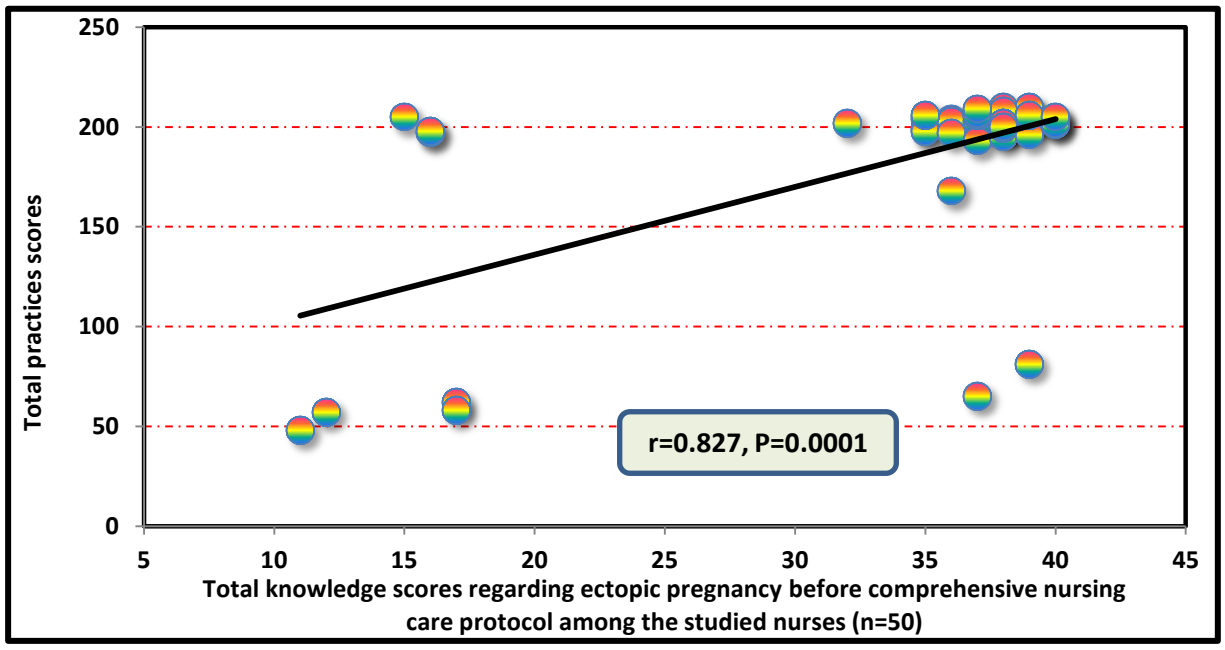

Figure (4): Correlation between the studied nurses' total knowledge scores and total practices scores regarding ectopic pregnancy before implementation of the comprehensive nursing care protocol

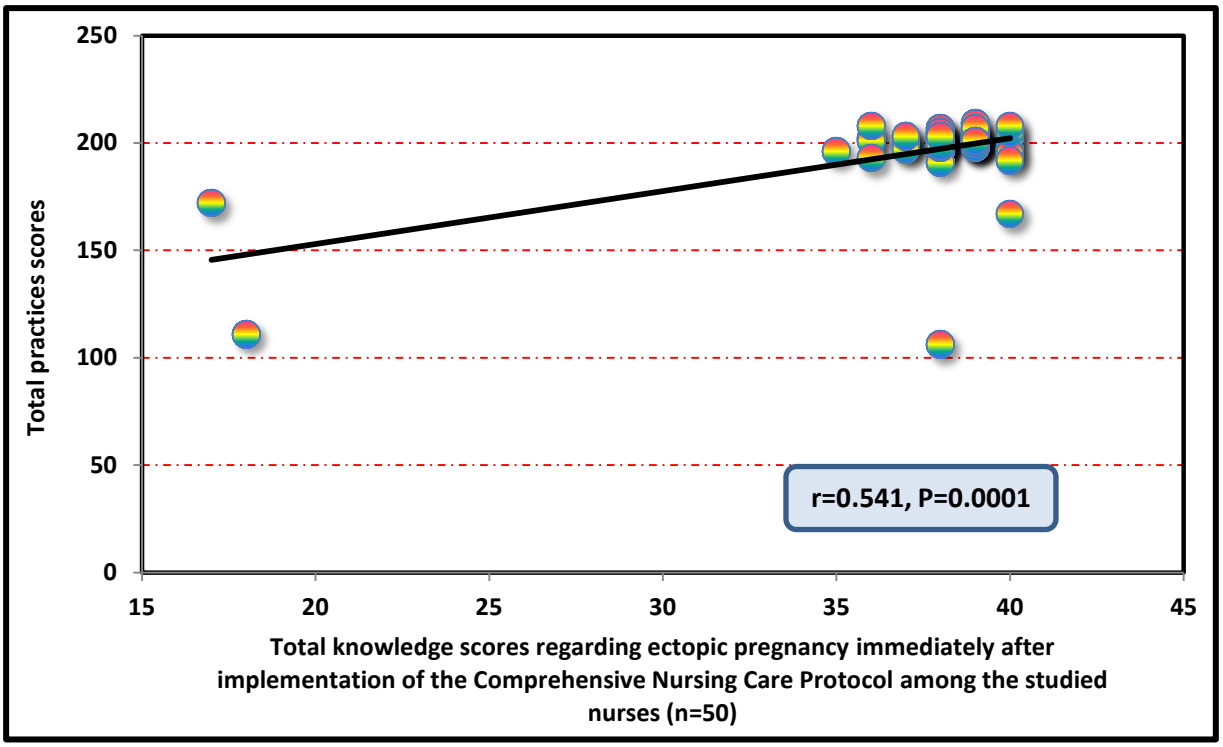

Figure (5): Correlation between the studied nurses' total knowledge scores and total practices scores regarding ectopic pregnancy immediately after implementation of the comprehensive nursing care protocol

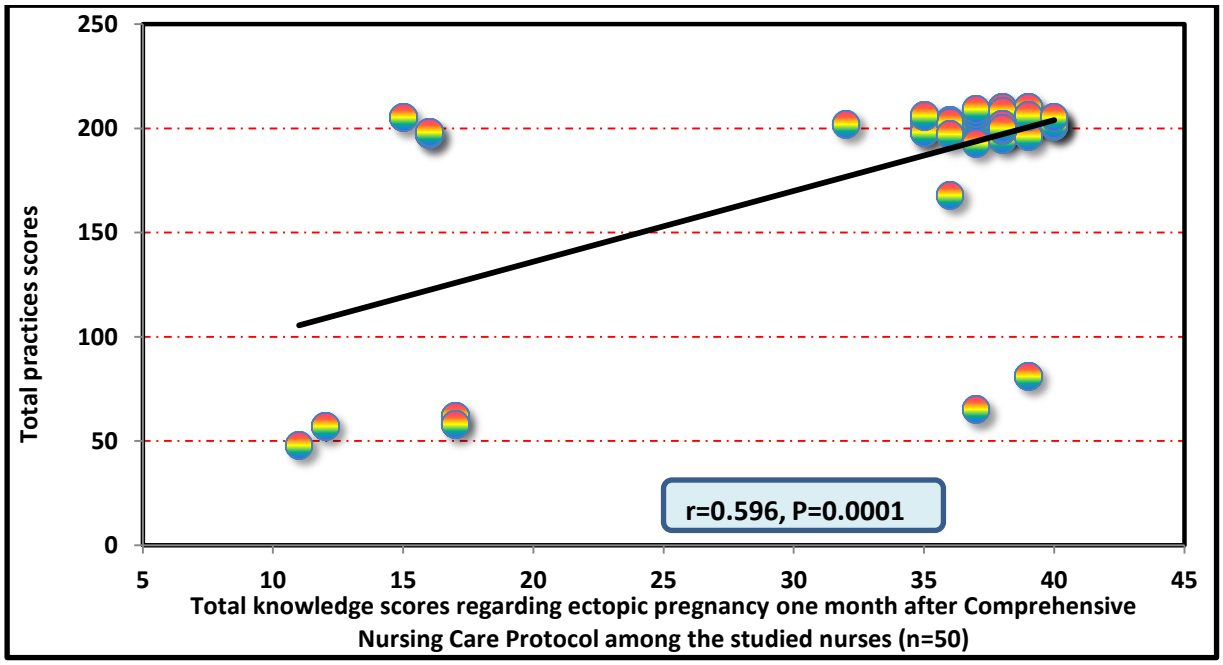

Figure (6): Correlation between the studied nurses' total knowledge scores and total practices scores regarding ectopic pregnancy one month after implementation of the comprehensive nursing care protocol

Discussion

Ectopic pregnancy is a critical obstetric emergency and a major cause of maternal mortality (**Obeagu et al., 2023; Thang, Anh, & Thanh, 2021).** Nurses have a vital role in the early recognition and management of women with EP. Their responsibilities encompass the accurate and thorough assessment of the pregnant woman, preparation for medical (MTX administration) or surgical management (including pre-operative and post-operative care), as well as providing emotional support **(Lashin, Alabiad & Abdelsalam, 2020).**

Concerning the studied nurses' socio-demographic characteristics, nearly two fifths of the nurses aged 20–30 years old and more than half had Diplom in Nursing Technician and were from an urban area. In addition, slightly less than half of them had >15 years of experience, and none of them participated in any training program regarding EP, which highlights a significant gap in continuing nursing education that needs to be addressed.

Improving nurses' knowledge concerning EP is a critical aspect for minimizing its preventable complications, influencing the speed and appropriateness of care provided, thereby reducing maternal morbidity and mortality and ensuring favorable maternal outcomes (Bouyer et al., 2022; Othman et al., 2021).

Concerning, the total knowledge score level of the studied nurses regarding EP before, immediate and one month after the comprehensive nursing care protocol implementation four fifths of the studied nurses reported low level of knowledge regarding EP pre-comprehensive nursing care protocol implementation, whereas the vast majority and the majority of them exhibited high level of knowledge immediate and one month post implementation of the comprehensive nursing care protocol respectively.

The current study's findings are compatible with **Naikar (2018),** who assessed the effectiveness of a structured educational programme on knowledge regarding hemorrhage in early pregnancy and its management among staff nurses in Bangalore, India and found that the overall knowledge score level in the pre-test was **(52.85%)** and enhanced to **(82.9 %)** in the post test.

Also, these study's findings strongly agree with **Mohamed et al., (2019),** who evaluated the effect of implementing nursing guidelines on nurses' performance in caring for women with EP. They found that nearly four-fifths of the nurses under study reported inadequate knowledge before programme, which improved to the majority of them who reported adequate knowledge after program. In the same line, these findings are consistent with **Sabatina, Shah, Gothard, & Ballas, (2019**) in his study that studied simulation-based training in ectopic pregnancy and salpingostom.

Moreover**, Zeinab et al., (2017)** who investigated the effect of an instructional package on nurses' performance regarding obstetrical emergencies reported that very low percentage of nurses had good level

of knowledge regarding obstetrical emergencies including EP before the instructional package implementation and that percentage increased to slightly more than four fifths immediately after implementation of the instructional package and slightly declined to more than two thirds at the package implementation follow-up phase.

Furthermore, the current study's results were also in alignment with **Abd-Elhady (2024),** who studied the effect of an educational programme on nurses' performance regarding obstetrical emergencies during pregnancy. They illustrated that there was a significant enhancement of all general knowledge items scores regarding obstetrical emergencies, including EP immediately as well as three months after the educational programme implementation, than before the program implementation.

In addition, **El Sharkawy et al., (2020)** who assessed the effect of a simulation-based educational programme on maternity nurses' performance regarding obstetrical emergencies during pregnancy, reported a highly statistically significant enhancement concerning all nurses' subtotal knowledge items regarding obstetrical emergencies, including EP immediately after the intervention and eight weeks after the program application, compared to pre-program application.

Yarnprasert & Khetpanya (2024) necessitate that nurses who are the closest caregivers to patients with EP need to have a very high knowledge level regarding this obstetric emergency management**.**

From the researcher's perspective, the low level of knowledge regarding EP among the studied nurses before the comprehensive nursing care protocol implementation in the current study could be justified as; none of the studied nurses attended any previous training program regarding EP and slightly more than half of them had Diplom in Nursing Technician as well as graduated a long time ago which in turn affect their retention of knowledge. Whereas, the knowledge improvement regarding EP after the nursing care protocol implementation may be attributed to the effect of the protocol and the distribution of a booklet to nurses to be used as an ongoing reference.

In regard to sources of the studied nurses' knowledge regarding EP, slightly more than three quarters of the studied nurses stated that their work was the primary knowledge source regarding EP, followed by mass media as another source of knowledge regarding EP. From the viewpoint of the researcher, these findings highlight the critical role of workplace-based learning in enhancing nurses' knowledge regarding EP. Conversely, this result contradicts with **Mohamed et al., (2019),** who found that less than half of the nurses in their study acquired their knowledge from mass media.

Since ectopic pregnancy remains a significant challenge in reproductive healthcare, with its potential for severe complications, enhancing nursing practices through continued professional training and educational programs is essential to maintain high levels of practice in caring for

women with EP. Investing in nurses' practices not only improves their care quality but also aligns with the global efforts to reduce complications from EPs **(Kalumba et al., 2023; Rathnayak and Karunarathna, 2025).** In the current study, the studied nurses' practices in case of EP were divided for educational and analytic purposes into their practices in case of methotrexate administration, and their pre-operative care and post-operative care roles in case of surgical management of EP.

Regarding ***the overall total practices score level of the studied nurses regarding methotrexate administration, pre-operative care and post-operative care in case of EP before, immediate and one month after the comprehensive nursing care protocol implementation,*** the majority of the studied nurses had unsatisfactory practices score level regarding MTX administration, pre-operative care and post-operative care before the nursing care protocol implementation in contrast to the vast majority of them who demonstrated satisfactory practices score level immediately and one month after implementation of the nursing care protocol.

These findings are matching with **Hepburn, Moore, Shade, and Rowland (2025)**, who studied the new situation-specific theoretical framework to guide ectopic pregnancy research in nursing. They demonstrated that nurses with higher knowledge scores consistently delivered more accurate, timely, and complete practices, especially in areas such as MTX administration, shock prevention, and pre-operative monitoring.

In addition, these findings are compatible with **El-Hadidy and Youssef (2020),** who assessed the effect of a structured protocol on nurses' knowledge and practices regarding obstetric emergencies. They highlighted that protocol-based training programs significantly improved the practices among nurses dealing with obstetric emergencies.

Once more, these results are in congruence with **Abd El-Hakam and Refaat (2017),** who developed a nursing management protocol for maternity nurses regarding emergency obstetric care. There was a significant enhancement in nurses' practices post-protocol application in contrast to pre-application of the nursing management protocol. While **Hussein and Helmy (2021)** assessed nurses' knowledge and practices regarding gynecological emergencies in the emergency departments concluded that knowledge gaps exist among nurses, which contributed significantly to errors in drug administration and poor operative care outcomes.

From researcher point of view, the unsatisfactory practices regarding MTX administration, pre-operative care and post-operative care in case of EP before implementation of the comprehensive nursing care protocol at the current study or before the implementation of the clinical guideline or the nursing management protocol in the other studies may be due to poor knowledge level, none attendance any previous training

program regarding EP, insufficient in-service training for newly employed nurses or absence of a system for ongoing supervision and evaluation of nursing practices. While the improvement after the implementation of different protocols may be due to the effect of these nursing care protocols, providing better supplies and facilities that foster a learning environment, the use of different audiovisual material, colored booklets, and PowerPoint presentations. However, one month later, the nurses' practice score level was somewhat reduced but still significant in the current study, which might be due to systemic challenges such as high workload, lack of supervision, and inconsistent reinforcement of training as well as education for nursing staff.

Ultimately, ***concerning the correlation between the studied nurses' total knowledge scores and total practices scores regarding EP before, immediately and one month after the comprehensive nursing care protocol implementation,*** it was found that there was a strong positive correlation between total knowledge' scores and total practices' scores before, immediately and one month after the comprehensive nursing care protocol implementation.

These results align with **Abdelrahman, Fathy, and Saleh (2021)** who explored the knowledge and practice of midwives regarding early detection of EP in primary healthcare settings, identified a moderate positive correlation between midwives' knowledge level and their practices in managing high-risk obstetric cases, emphasizing that theoretical grounding is a prerequisite for timely and accurate clinical responses.

Moreover, these findings are consistent with **Salem and Taha (2022)**, who assessed the correlation between knowledge and practices among nurses managing obstetric emergencies, emphasizing that knowledge predicts performance and finding a direct correlation between nurses' theoretical understanding and their compliance with obstetric emergency care protocols.

Finally, the implementation of a comprehensive nursing care protocol regarding EP proved to be a valuable tool that significantly enhanced the nursing care quality in EP management. **So,** based on the results of the current study, the research hypotheses have been ascertained after implementation of a comprehensive nursing care protocol regarding EP, which resulted in statistically significant enhancement of nurses' performance immediately and one month later compared to pre-protocol implementation.

Conclusion

Based on the findings of the current study, it can be concluded that:

- The comprehensive nursing care protocol provided to the studied nurses achieved significant enhancement in their performance regarding ectopic pregnancy, and the research hypothesis has been ascertained.

Recommendations

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

- Adopt a nursing care protocol based on the evidence-based practice principles at obstetrics units for standardizing nursing practices regarding ectopic pregnancy management.
- Periodic assessment of nurses' knowledge and practices to address their educational needs regarding the care provided in case of ectopic pregnancy.
- In-service training programs for all nurses, especially newly appointed ones, based on their educational needs assessment to improve their knowledge and practices regarding ectopic pregnancy.

Further studies are needed in this field to assess:

- The effect of a comprehensive nursing care protocol on maternal outcomes regarding ectopic pregnancy.
- The impact of an education program on women of reproductive age s' knowledge regarding the early symptoms of ectopic pregnancy.

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