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Evaluation of Universal Precaution Program of Infection Control on Nurses Knowledge at Gynecology Department in Egypt

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Abstract: **Nurses *in particular are often exposed to various infections during the course of carrying out their nursing activities.***

Purpose of study: To identify the effect of a training program regarding knowledge universal precaution measures for infection control on maternity nurses. Design: - Quasi experimental design. Sample : Random sample OF 100 nurses. Setting: The study was conducted at obstetric & gynecological departments of Menoufia University hospital and Shebin El-kom Teaching hospital. The instruments: Instrument was used throughout the program of study (I) interviewing questionnaire. (II) *Assessment of knowledge toward infection control and its measures*. *Results*: Data showed highly significant difference in nurse's knowledge of universal precaution of infection control in pre intervention and after intervention. The majority of nurse's showed improvement of their knowledge regarding universal precaution of infection program. Conclusion: The use of educational program is effective in improving maternity nurses' knowledge toward universal precaution of infection control. Recommendations Routine training for all HealthCare Workers is essential to infuse the knowledge of standard precaution and reinforce same in all health workers.

Keywords: **Infection Control- Universal Precautions– Nurses Knowledge.**

1. INTRODUCTION

Infection control standards become an integral part of the approval program for all medical settings in Egypt. (Eskander.,et al.2017) Infection control is a quality standard of patient's care and is essential for the wellbeing of the patients and the safety of both patients and staff to accomplish a reduction in infection rates, an infection control program has to be given (Assma, F.,et al,2016) Main functions of an infection prevention program include (a) obtaining and managingcritical data, including surveillance information for endemic infections and outbreaks;(b) developing and updating policies and procedures; (c) developing individualizedinterventions to prevent infections and antimicrobial resistance; and (d) educatingand training health care workers (HCWs), patients, visitors, and nonmedicalcaregivers.(Smith, Bennett, Bradley, et al 2018).

Universal precautions", (UP) as defined by CDC, are a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other blood borne pathogens when providing first aid or health care. Under universal precautions, blood and certain body fluids of all patients are considered potentially infectious for HIV, HBV and other blood borne pathogens **(CDC, 2016)**. They are the basic levels of infection control precautions

which are to be used, as a minimum, in the care of all patients, these include; performing hand washing, wearing personal protective equipment (e.g. gloves, gown, goggle.... etc), respiratory hygiene and cough etiquette, prevention of needle sticks and other sharps-related injuries, patient care equipment and instruments/devices, management of linens and waste disposal (CDC,2007).

Nursing education and an in-service training play an important role in improving nurses' knowledge and practices in infection prevention and control measures. So, it is important to, ensure nurses' compliance with these infection control measures, which successively leads to reducing the NIs rate (Fashafsheh, et al., 2015).).

Health care workers are at a high risk of needle stick injury (NSI) and blood borne pathogens (BBP) (Beltrami, **et al., 2000)**. According to a World Health Organization estimate, in year 2002, sharp injuries resulted in 16,000 hepatitis C virus (HCV), 66,000 hepatitis B virus (HBV) and 1000 human immunodeficiency virus (HIV) infections in health-care workers world-wide ***(Pruss-ustun , et al.,2005)***

Infection control standards become an integral part of the accreditation program for all therapeutic settings in Egypt ***(Eskander , et al.,2013).*** Infection control standard precautions include certain measures such as hand hygiene, sharps safety, staff health, use of personal protective equipment (PPE), equipment safety, waste management and environmental cleaning. Many infection control measures, such as appropriate hand hygiene and the correct application of basic precautions during invasive procedures are simple and of low-cost ***(Bouallègue , et al.,2013).***

Nursing education and an in-service training play an important role in improving nurses' knowledge and practices in infection prevention and control measures. So, it is important to, ensure nurses' compliance with these infection control measures, which successively leads to reducing the NIs rate ***(Fashafsheh, et al., 2015)***. However, evaluating the existing level of knowledge and practices represents a prerequisite for planning and developing any new educational program in nursing education. This is because such evaluation provides a useful database to guide the development and implementation of future educational programs on infection prevention and control with the aim of decreasing NIs ***(Dramowski, et al., 2016).***

Significant of the study:

The impact of healthcare-associated infections (HAIs) is significant. There are more than 2 billion people worldwide; having evidence of recent or past HBV infection and 350 million are chronic carriers. The World Health Organization (WHO) estimates that over 1.4 million people suffer from nosocomial infections at any one time. Industrialized nations report healthcare-associated infections in 5-10% of patients; whereas, in developing countries, healthcare-associated infections can exceed 25% (Allegranzi et al., 2017). Challenges in infection control and unsafe injections contribute to the 150 000 new persons infected annually with viral hepatitis in Egypt (WHO, 2015).It has been recognized as a problem affecting the quality of health care and a principal source of adverse healthcare outcomes. These infections have serious impact. Increased hospital stay days, increased costs of healthcare, economic hardship to patients and their families and even deaths, are among the many negative outcomes. This critical need accounts for undertrained personnel performing procedures without proper guidance, training and precautions .The knowledge gained through implementation of infection control guidelines will lead to better patient care and lowering of mortality rates among healthcare providers and patients. So, these studies support the need for ongoing infection control protocols and training for healthcare workers mainly nurses. So, the researcher was interested to conduct this study to investigate the effect of training program regarding practicing universal precaution measures for infection control among maternity nurses**.**

Purpose of the Study was to assess effect of a training program regarding practicing universal precaution measures for infection control among maternity nurses.

Research Hypothesis

The nurses will have good knowledge after implementing a training program than before.

The nurse's practice of universal precaution measures will improve after the implementing program than before.

Research Design: Quasi Experimental design (Pre intervention-Post intervention) used to achieve the purpose of the study.

Setting of the study: The study was conducted at obstetric & gynecological department in University hospital and Shebin El-kom Teaching hospital.

Sample type: simple random sample

Sample Size:-

The sample size is calculated using Kish's (1995) formula

The study population staff nurses who are working in both hospital mention before the working nursing staff in these care hospitals. Prevalence of knowledge as per previous studies was 80%.6 Taking this as P, 5% of allowable error and 10% as non-responders we calculated the final sample size of 100 staff nurses using the formula

n= {Z2 * P (1–P)}/e2 was calculated.

- Z– 1.96 for 95% CI.
- P– Expected true proportion.
- E– Desired precision (1/2 the width of CI).

Technique of sampling:-

All nurses that provide care to patient in obstetric &gynecological department who met inclusion criteria were included in study and like to participate in study. Random sample of study 100 nurses were admitted to present study. The participate collect them from two hospital by same equal number in three day every week Sunday , Monday and Thursday were present to area and set with the group and give session to nurses.

Inclusion criteria of the sample:

Nurses working in obstetric &gynecological department in both hospitals. Their age range from (20-<40). Different level of education.

Instruments of data collection

Tools were used in the current study to collect the necessary data.

Structured interviewing questionnaire instrument developed by the researcher team after reviewed the related literature; it was consisted of three parts:

- **Part (I):** include the nurses Socio-demographics data such age, education, job, qualifications, years of experience and previous training courses.
- **Part (II)**: Knowledge to assess nurses knowledge about Infection control and universal stander precaution:

It is modified by researchers and adopted from(Travers J, *et al.*, 2015) was used to assess nurse knowledge about IC and SPs with a total of 60 items of closed ended questions in multiple choice or true or false, such as general concepts of IC and SPs infection control (7 questions), hand hygiene (10 questions), personal protective equipment (PPE) (5questions), sharps disposal and injuries (7 questions) Safety Injection(6questions)Waste disposal**(**10questions) clean &dis infection (6questions) cough etiquette (5questions).health education about immediate vaccination anti B vaccine of new born(5).

- **Part (III):** Observational checklists sheet that were adopted from Patricia and Anne, (2005) and Terese and Marlene, (2010); Observational checklist was developed for assessing nurses' practice; this tool was used before and after to evaluate the extent to which the training guidelines affected nurses practice. Observation checklist included 12 procedure related to hand hygiene, personal protective equipment (gloves, mask, gown), handling sharp instrument, visitors, environmental hygiene, handling laboratory specimen, respiratory hygiene, safe injection practice, urinary catheter, infection control for mechanical ventilator, caring of wound dressing and giving intravenous infusion. It was done during routine work.

Scoring system of nurses practice: Total score of practice test was ranged from 0- 60. One mark was given for done and zero for not done. It was distributed as follow: hand hygiene 7 score, personal protective equipment 12 score (gloves, mask, gown), handling sharp instrument 7 score, safe injection practice 9 score, caring of wound dressing 8 score, waste disposal7 score, and operation room cleaning10 score. The scored below 60% had poor practice, the scored 60% and more had fair practice and the scored 80% or over had good practice.

2. VALIDITY & RELIABILITY

Validity

The validity of the instrument was established by five qualified experts (two professors in maternal and newborn health nursing department at the Faculty of Nursing, two physicians from obstetrics and gynecology department at the Faculty of Medicine and one physician from microbiology department from national liver institute). They judged the instrument for the content accuracy and internal validity. They were also asked to judge the items for completeness and clarity (content validity). Suggestions were considered and modifications were made.

Reliability

The reliability of the instrument was tested to determine the extent to which items in the tool were related to each other. Pearson correlation co-efficiency was done to test the internal consistency(r=0.96) of all item of the tool.The World Health Organization (2011) and Centre for Disease Control (2017).

Ethical consideration:

An approval from the Committee of Hearing and Ethics was obtained from Faculty of Nursing, Menoufia University. (16/12/2015). Approaches to ensure the ethics were considered in the study regarding confidentiality and informed consent. Written letter form the Faculty of Nursing explaining the purpose of the study was directed to director of hospital to conduct the study. Written consent took from each participant before enrolling them in the study and after explains the purpose of study. Participants were ensured to maintain the confidentiality. Participants have the right to withdraw from the study at any time without any adverse consequences. There are no any invasive methods will be used during the study.

Administrative approval:

An approval to conduct the study was granted from the ethical committee obtained from the dean of faculty of nursing to director of University hospital and director Shebin El-kom Teaching hospital after explanation purpose of study.

Pilot study: A pilot study was conducted to test feasibility, clarity and applicability of the tool, and to estimate the time needed to make it. It was conducted on 10 nurses of the total sample. They were excluded from the study population to assure the stability of the results and did the necessary modification. The results of pilot study was used to finalized the instrument and schedule the time needed for the fieldwork. Some changes were done in the questionnaire based on the findings of the piloting.

Field work: **A** written official letter was obtained from the Dean of the Faculty of nursing, Menuofia University. At the time of data collection written agreement was taken from every participant in the study after clear and proper explanation of the study purpose and its importance for them. The study was carried out through four phases: initial assessment, planning, implementation, and follow up and evaluation. These phases were carried out from beginning of April 2017 to end of October 2017, Covring a long period of one year.

Study procedure

The current study was carried out in two consecutive phases, namely; preparatory and implementation phases and evaluate phase.

Preparatory Phase

An extensive review related to the study area was done including electronic dissertations, available books, articles and periodicals. A review of literature to formulate knowledge base relevant to the study area was also done. A written

permission from the institutional authority of the four settings was obtained before carrying out the study. The researcher prepared the data collection instrument, in addition to seek the managerial arrangement to carry out the study. Also prepared booklet to help for understands the sessions.

Initial Assessment Phase

At the beginning the researcher distributed the questionnaire to find out the general characteristics of the nurses who received the program of infection control in all level of education .Then application of the study according to the inclusion criteria .The researcher greeted the nurses at the beginning of interview ,introduced herself to all nurses included in the study ,Every nurse was interviewed to collect general socio-demographic data ,previous attended infection control course, in the time between 5 to 10minutes at from the first session.

Implementation phase: this study hypothesized that the nurse's practice of universal precaution measures will improve after implementing program than before. the implementation of program universal precaution of infection control guideline was implemented through small group discussion. It consisted of 6 sessions were conducted for 10 groups each groups had 10 nurses .Three days /week each day special for one group to cover all nurses .Duration of each between 45-60 minutes. The researcher gave session in place of work to nurses .Each session started by summary of previous session and objectives of new session, using very simple slang language to be suitable to nurses education. These education sessions include definition of each key concept and its objectives. The education booklet was used as a learning material.{ Booklet was developed by researcher as guidelines for nurses to use in work}. Different learning methods were used during the educational session namely interactive lecture and discussion.

Pre intervention assesses nurse's practice by self-administrated instrument initial data collection was carried out to obtain information about nurses socio-demographic data. The researcher was set with participant to check practice by check list questionnaire pretest to evaluate level of practice. The preliminary assessment showed that the nurse had poor score level of practice, universal precaution of infection control. Further they had negative practice of universal precaution of infection control.

Developing guideline: - According to the preliminary data assessment of practice and evidence recommendations of universal precaution of infection control guideline was developed by the researcher according to nurses practice defect.

Evaluation phase: the last phase in which the researcher assess the achievement of the aim of the study through reintroducing the research tools.

Post intervention determines whether there was effective and comprehensive universal precaution of infection control education by using post intervention.

Follow up intervention after 3 months determine whether there was effective and comprehensive universal precaution of infection control education through evaluation of nurses practice universal precaution of infection control education by using follow up test.

3. DATA ANALYSIS

Up on completion of data collection, the collected data were organized, tabulated; each answer sheet was coded and scored. The researcher coded the data into a coding sheet so that data could be prepared for computer use statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 20, SPSS Inc. Chicago, IL, USA). Where the following statistics were applied: Data from questionnaires was being entered as numerical or categorical, as appropriate. Two types of statistics were being done. Descriptive statistics to Quantitative data were being shown as mean, SD, and range. Qualitative data were being expressed as frequency and percent. Analytical statistics Chi square test were used to measure association between qualitative variables. Student t test were being used to compare mean and SD of 2 sets of quantitative normally distributed data, while willcoxon test were being used when this data is not normally distributed. Pearson's correlations were being used to study correlation between two variables having normally distributed data, while Spearman's correlations were be used when this data is not normally distributed. McNemar test were being used to measure association between two dependent qualitative variables.

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4. RESULT

Table (1): Socio-Demographic Characteristics of the Studied Participants (N =100):

Variable	No	%
-Age(Mean±SD):	(26.92±6.292)	
-Age groups:		
✓ 20-30	76	76%
✓ 31-39	14	14%
✓ ≥40	10	10%
Education		
1-Nursing Technician Institute	45	45%
2- Secondary Nursing Diploma	34	34%
4. Bachelor	21	21%
Job		
1-Nursing Supervisor	25	25%
2- Nurse	55	55%
3-Student intership	15	15%
Years of Experience		
1-5	50	50%
5:10	43	43%
10:15	5	5%
=>15	2	2%
Previous attendance of training courses:		
Yes	16	16%
No	84	84%

Table (1) It illustrated that (76%-14%and10% respectively) their age ranged between 20-30,31-39 and ≥ 40respectively.according to staff nurses level of education 45%had technical institute nursing,34 had secondary school of nursing while 21had bachelor degree.The years of experience 50%,43%,5%,2% respectively)range between 1-5,5-10,10-15 ≥ 15respective)previous attendance of training program16%attendance while majority 84%not attend.

Table (2): Knowledge of Nurses Staff about Standard Precautions pre &post intervention N=100

Item Standard Precautions	Pre-intervention		Post-intervention		p- value	Chi square
	True	false	True	false		
Standard Precautions protect	54 54%	46 46%	84%	16 16%	.0001	23.117
Content Standard Precautions	45 45%	55 55%	82%	16 16%	.0001	32.185
Personal Protective Equipment	56 56%	44 44%	82%	16 16%	.0001	33.625
Universal precaution include saliva	62 62%	3636%	90%	10 10%	.0001	21.491
Universal precaution not include nasal secretion	56 56%	44 44%	85%	15 15%	.0001	33.523
Universal precaution apply to all patient	42 42%	48 48%	80%	20 20%	.0001	30.349
Universal precaution include hand wash , PPE gloves	49 49%	51 51%	85%	15 15%	.0001	29.158
Universal precaution protect all health worker	42 42%	48 48%	80%	20 20%	.0001	30.349

Table (2): Shows that knowledge of nurse's staff about standard precaution pre&post intervention. There was statistical significance difference (p value>.001) after training program than before, P value <0.001: Highly Significant.

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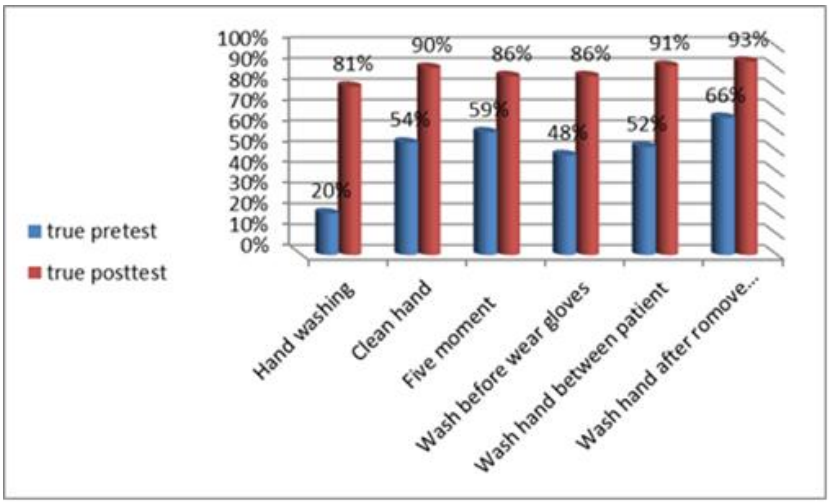

Figure (1): Distribution of nurses in two groups regarding their hand hygiene.

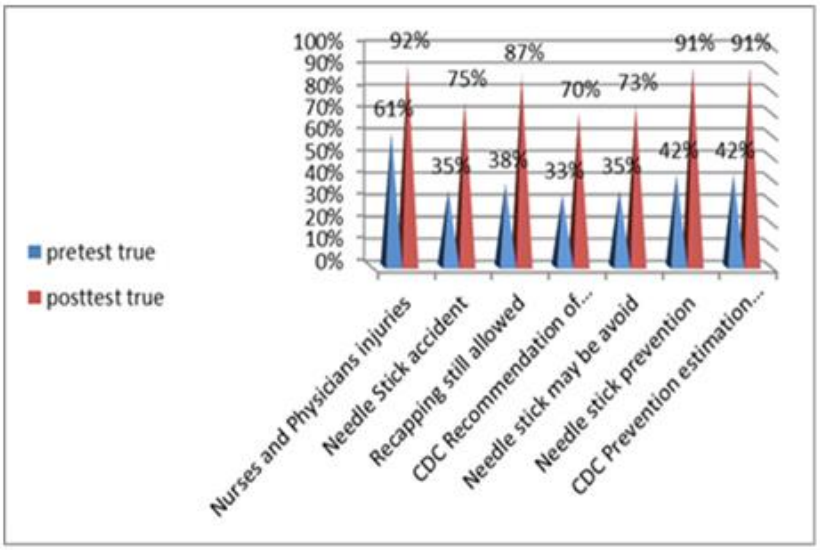

Figure (2): Distribution of nurses in two groups regarding Sharp Injury.

Table (3): Knowledge of Staff Nurses about Person Protect Equipment pre &post Intervention

Item PPE	Pre intervention		Post intervention		P-value	Chi square
	True No %	False No %	True No %	False No %		
Wear mask	57 57%	43 43%	89 89%	11 11%	.0001	25.977
Wear gloves before Pelvic exams	55 55%	45 45%	91 91%	9 9%	.0001	48.702
Change mask between patient	60 60%	40 40%	73 73%	27 2 7%	.0001	22.544
Eye protect	52 52%	48 48%	91 91%	9 9%	.0001	37.321
Change gloves between patient	48 48%	52 2%	86 86%	14 14%	.0001	32.655

ecaution of Infection Control.

Table (3): Shows statistical significant difference was found related to correct knowledge of Person Protect Equipment and the test related of items "PPE, Content wear mask, wear gloves, change mask, eye protect, choose gloves, among nurses in the pre-test showed that (57%, 55%, 60%, 52%, 48%). After application of the program, the nurses practice for the same items improved (89%, 91%, 73%, 91%, 86% and 80 %).

P value<.001

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Table (4): knowledge of Staff Nurses about Disinfection and Sterilization pre &post Intervention N=100

Item of sterilization	pre-intervention		post-intervention		P- value	Chi square
	True No %	False No %	True No %	False NO%		
Clean endoscopy	36 36%	64 64%	80 80%	20 20%	.0001	39.737
Dis infection Endoscopy	55 55%	45 45%	91 91%	9 9%	.0001	34.441
Sterilization	57 57%	43 43%	91 91%	96 96%	.0001	30.042
Methods of sterilization	39 39%	61 61%	91 91%	9 9%	.0001	59.429
Methods of dis infection	25 25%	75 75%	84 84%	16 16%	.0001	70.187

Table (4): Shows statistical significant difference was found related to correct knowledge of sterilization and disinfection the test related of items " sterilization and disinfection, clean, dis infection, sterilization , methods of sterilization, methods of dis infection, among nurses in the pre-test showed that (36%, 55%, 57%, 39%, 25%). After application of the program, the nurse's practice for the same items improved (80%, 91%, 91%, 91% and 84 %).

P value <.001

Highly Significant

Table (5): Knowledge of Staff Nurses about Waste Management pre and Post Intervention

Items of Waste Management	pre-intervention		post-intervention		P Value	X2
	True No %	False No %	True No %	False No %		
Biomedical Waste	26 26%	74 74%	91 91%	9 9%	.0001	87.015
A diaper contaminated with Cytotoxic	46 46%	54 54%	93 93%	7 7%	.0001	54.329
Transport waste	57 57%	43 43%	92 92%	8 8%	.0001	32.341
Cytotoxic place Container	44 44%	56 56%	91 91%	9 9%	.0001	50.348
sharps Containers	49 49%	51 51%	91 91%	9 9%	.0001	42.000
Biohazards Waste	45 45%	55 55%	85 85%	15 15%	.0001	32.185
Put A syringe	38 38%	64 64%	88 88%	12 12%	.0001	53.625
Sharps Injuries	26 26%	74 74%	91 91%	9 9%	.0001	87.015
Put a Cytotoxic Vial	61 61%	39 39%	92 92%	8 8%	.0001	26.728
Put a blood product pack	36 36%	64 64%	76 76%	24 24%	.0001	32.458
Put Pills	26 26%	74 74%	91 91%	9 9%	.0001	87.015
Sharps Hard	72 72%	28 28%	95 95%	5 5%	.0001	21.228
Put A placenta	58 58%	42 42%	95 95%	5 5%	.0001	38.057

Table(5): shows statistical significant difference was found related to correct knowledge of waste Management and the test related of items" waste Management Biomedical Waste, A diaper contaminated with Cytotoxic, Transport Liner, Cytotoxic place Container, sharps Containers , Biohazards Waste, Put syringe, Sharps Injuries, Put a Cytotoxic Vial, Put a blood product pack, Put Pills ,sharps hard ,put placenta among nurses in the pre-test showed that (26%, 46%, 57%, 44%, 49%, 45%, 38%, 26%, 61%, 36%, 26%, 72%, 58%). After application of the program, the nurses practice for the same items improved (91%, 93%, 92%, 91%, 91%, 85%, 88%, 91%, 92%, 76%, 91%, 95% and 95 %).

P value<.001

Table (6): Reported barriers of practicing Staff Nurses Universal Precautions of Infection Control among Study Sample

Barriers	No (%)
Inadequate knowledge	60 %
Increased numbers of patients	60%
Inadequate facilities and equipment	55%
Frequent forgetfulness	53%
Lack of resources	60%
Lack of time	65%

Table (6): showed that concerning the reported barriers of practicing staff nurse's universal precaution. the most frequently reported barrier was lack of time 65followed by increased numbers of patients 60%, lack of resources 60%, inadequate knowledge 60%, inadequate facilities and equipment 55% and frequent forgetfulness 53% the result provide barriers of practice of infection control.

5. DISCUSSION

Infection control is a key component of practice for all healthcare professionals including nursing staff, not only for their health but also to reduce infections transmission and thus improve the patient's safety.

The finding of the current study succeeded to answer the research hypothesis. Findings are discussed in the following sequences:-

Regarding of the nurses in the present study had no long experience, especially in current job. Added to this is their qualification, which was mostly at the diploma

level. These factors might have their repercussion of the levels of their knowledge and practice. These results are in an agreement with **Meltany., (2006)** who reported that, the studied sample had higher mean scores of knowledge of nurses who had medium experience and have Secondary Nursing Diploma.

Regarding to finding of study, half of the nurses determine the components of standard precautions (hand hygiene, using personal protective equipment, safe handling, and disposal of sharps, managing spilled blood and body fluids, decontaminating equipment, collecting and handling specimens and maintaining a clean clinical environment) in pre intervention but the majority of the nurses determine the components of standard precautions in post intervention. The researcher encourages the nurses to have more knowledge about the standard precautions of infection control. This may be rationalized as the educational program increases level of knowledge to the staff nurses. This finding was in agreement with Abdel-Rasoul et al., (2016) who reported that health education interventions have successful effect in increasing the knowledge of health care workers including nurses regarding transmission and prevention of HCAIs, improving the risk perception and increasing compliance of universal precautions and in the same line Adly et al.;(2014) found that the nurses from intensive care units at El Mansoura University Children's Hospital had significant improvement in their knowledge, practices, and compliance of standard precautions of infection control after implementation of the training sessions.

The present results showed that a the minority of the nurses had 60% of knowledge, while the knowledge level of the majority of them ranged from 30% to 50% regarding general knowledge about the universal precautions of infection control, hand hygiene, using personal protective equipment, safe handling, and disposal of sharps, managing spilled blood and body fluids, decontaminating equipment, collecting and handling specimens and maintaining a clean clinical environment as well as overall nurses' level of knowledge about the staff nurses and principles of its prevention and control Present study results showed that the majority of staff nursing interns demonstrated post intervention improvement in their knowledge regarding general measures of infection control standard precautions include hand hygiene, personal protective equipment, handling sharp instruments, environmental hygiene and handling laboratory specimen than pre intervention. This finding agreement with ***Al-Hussami and Darawad and Rosenthal et al.,*** were supported our study finding and they found that the educational programs about the infection control precautions are significantly influenced the staff nurse practice. These results were agreement with several studies; Al-rubaiee et al.,

(2018) reported that the majority of Yemeni nurses had poor level of knowledge regarding hand hygiene, personal protective equipment, safe injection practices, routine hospital cleaning, safe hospital waste handling & disposal and the overall level of knowledge. Tirivanhu, et al., (2012) in Bindura Provincial Hospital, Zimbabwe reported that 72.0% of the nurses had poor to moderate knowledge regarding the infection control measures. Salam, et al., (2014) concluded that more than half of the nurses who are working in family health settings in Shebin El-Kom district, Egypt had poor to moderate knowledge regarding the infection control measures. Eskander, Morsy, and Elfeky,(2011) reported that approximately two-thirds of the nurses who are working at Intensive Care of a selected Cancer Hospital in Egypt had unsatisfactory level of knowledge about the infection control measures. Mukthar, Karani and Miriein Kenya, (2015) reported that the general knowledge score of nurses about the standard precautions was 58.5%. Moreover, Shrestha., (2012) revealed that the nurses who are working Patan Hospital in Nepal had poor (18%) to moderate (82%) level of Knowledge, but the percentage of the nurses with moderate level of knowledge was more than the present study findings. This can be explained that the study participants might still have fresh knowledge from their basic education, as most of the nurses in the study were in an early stage of career with less than five years of experience, while in the present study nearly half of the nurses had 10 years of

Regarding to post-intervention, the score of knowledge the majority of nurses ranged from 75% to 95% level of knowledge with increasing percentage of nurses level of knowledge to universal precaution of infection control and the highest percentage was in using personal protective equipment and the general knowledge about the universal precautions of infection control. Moreover, the majority of the nurses achieved high level in overall knowledge about the universal precautions of infection control. It was high significant in the mean overall score of knowledge in post-intervention compared to the mean overall score of knowledge in pre-intervention. These findings showed that the significant effect of a training program regarding practicing universal precaution measures for the infection control among the maternity nurses. This may be due to positive effect of the program on the staff nurses. These results were compatible with several studies; Phan, et al., (2018) illustrated that the educational intervention significantly improves level of knowledge of the staff nurses about hand hygiene to. The study finding regarding knowledge level of about decontamination, high-level disinfection and sterilization was significantly increased after the educational intervention supported by Abdel-Rasoul et al., (2016) who (reported that the health education intervention has successful effect on increasing level of knowledge of the health care workers including the nurses regarding transmission and prevention of infection, improving the risk perception and increasing compliance of the universal precautions. Adly, et al., (2014) found that the nurses who are working at intensive care units, at El Mansoura University Children's Hospital had significant improvement in their level of knowledge, practices, and compliance of the standard precautions of infection control after implementation of the training sessions.

As regard to causes of needle stick injury and recapping of needles. The current findings showed that about half of study nurses are recapping of the needles in pretest while in posttest the majority of the nurses didn't recapping the needles. The researcher stated that the knowledge that was presented had positive effect to change the practice. This finding is in agreement with Wilson E Sadoh et al., (2006) who found that 31.9% of the study participants uses the need again and recapping the used needles. Zungu, et al., (2008) who study knowledge and experiences of needle prick injuries (NPI) among the nursing students at a university in Gauteng, South Africa and stated that 44.8% of them always recapped the used needles. The correct knowledge significantly increased after the training program in the present study. On the other hand, these findings came in disagreement with Janjua, et al., (2007) who stated that poor knowledge--predictor of non-adherence Pakistan to universal precautions for blood borne pathogens at first level care facilities in BMC they are finding the highest percentage of the participants were of the opinion that the used syringes should be disposed after recapping. Only 18.75% of the nurses answered correctly that soiled sharps objects should be shredded before the final disposal. This indicates that the nurses need more education about the sharp objects management. Regarding the barriers of practicing staff nurses universal precautions of infection control, the present study findings reported that the barriers of practicing staff nurses universal precautions of infection control included lack of time 65% followed by increased numbers of the patients 60%, lack of resources 60%, lack of equipment 60% and frequent forgetfulness55%. In spite of 100% of present study participants had received some forms of training about infection control. This could be explained that these results are in congruent with Tirivanhu, et al., who stated that lack of knowledge, lack of equipment and resources as and lack of time were the factors impeded the nurses from proper infection control practice in the same line with Travers et al.,

revealed that workload, forgetfulness, and lack of knowledge were perceived as factors affecting the effective implementation and adherence to infection prevention and control practices among the nurses who are working in the nursing homes in USA . These findings are in agreement with Gichuhi, Kamau, Nyangena and Otieno-Ayayo (2015:39-44) who reported that frequent shortages of water as a barrier to infection prevention practices and control compliance among the health care workers.

6. CONCLUSION

Based on result of the present study the nurses' work in obstetrics &gynecology units at El-Menoifia Hospitals were lacking the necessary basic knowledge and practices related to infection control so, training program was based on nurses' needs of knowledge and practices, this came from pre-test results. By the implementation of the program there was remarkable improvement of nurses' knowledge and practices, it was clear in post-test results. By the end of the program there was successful in correcting the deficiency in nurses' knowledge and practices.

7. RECOMMENDATIONS

Based on results of the present study are: The developed program should be applied and repeat again every 6 months in the same study setting and adopted in other similar settings with required modifications, provision of continuing education programs on regular basis is suggested in order to refresh and update nurse's knowledge, as well as reinforce proper practices related to infection control.

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