EXPLORE NURSES' COMPLIANCE WITH INFECTION PREVENTION MEASURES

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Abstract:

Aim of this study was to explore nurses' compliance with infection prevention measures at Outpatient Obstetrics and Gynecological clinics at Mansoura City Hospitals. **Study Design:** Descriptive study design. **Tools of data collections:** three tools were used, structured interviewing questionnaire, an observational checklist to assess nurses' compliance with infection prevention measures and a questionnaire to assess barriers for compliance with infection prevention measures. **Results:** The study findings revealed that all nurses had correct knowledge about definition, signs of infection, and disposal of used needles, while more than half nurses had incorrect knowledge about cross of pathogens between staff and clients. All nurses did hand washing after contacting blood, while more than quarter of nurses didn't practice hand washing before contacting patients. Also all nurses wear gloves when contact with blood & during invasive procedures and use anew gloves for each patient. While about third of nurses did not wear gloves during skin disinfection. The main factors that prevented nurses to comply with infection prevention measures were shortage of staff and lack of supplies at Mansoura University Hospital. **Conclusion:** All nurses did hand washing after contacting blood ,and used a circular motion, While more than quarter of nurses didn't practice hand washing before contacting patient ,half of nurses didn't assess area around sink correctly**,** all of nurses wear gloves when contact with blood & during invasive procedures and used a new gloves for each patient. While about third of nurses did not wear gloves during skin disinfection. Also, third of nurses wear gown during procedures, but about three quarter did not hold gown away from body while working and third of nurses didn't wash their hands before masking. **Recommendations:** Providing orientation programs for newly employed nurses about standard precautions infection control. Availability of all facilities and equipment required for applying standard precautions of infection prevention measures.

Key word: Compliance, knowledge , Attitude, Infection and Infection prevention

Introduction:

Infection prevention measures refer to policies and procedures used to minimize the risk of spreading infections, especially in hospitals. The term chain of infection is used to describe the processes leading to patients acquiring infection within healthcare settings. The knowledge about this cycle is essential in order to understand how infection can occur. All precautions and measures taken in order to prevent and control infection are based on the interruption of this cycle. Transmission of infectious agents within a healthcare setting requires the following elements: a source or reservoir of infectious agents, a mode of transmission and a susceptible

host *Centers for Disease Control and Prevention, (2012).*

Nurses in particular are often exposed to various infections during the course of carrying out their nursing activities; therefore nurses should have knowledge and good compliance to infection control practice. Compliance is the extent to which certain behavior is in accordance with the instructions or health care advice. Compliance can be influenced or controlled by a variety of factors like culture, economic and social factors, self-efficacy, and lack of knowledge or supplies *Manchikanti et al. (2011).*

Infection transmission in healthcare settings has become increasingly recognized threat to patients and healthcare providers, though not a recent problem, this very complex threat is growing and taking on different forms. Hospital-acquired infection, or nosocomial infection, are infection that were not present or incubating on admission of a patient to hospital. *Mersal and Keshk, (2016).*

A major element for infection control practice is hand washing, it is the single most important infection prevention and control practice. It is vital that nurses follow hand washing protocols that are appropriate for their clients and facility, hand hygiene is considered to be the primary measure to prevent health care-associated infection and to reduce the spread of multi-resistant microorganisms *Unicef and Organization, (2015).*

Also the use of personal protective equipment (PPE) provides a physical barrier between micro-organisms and the wearer. It reduces but does not completely eliminate the risk of acquiring an infection. It also does not replace basic infection control measures such as hand hygiene, selection of PPE should be based on risk assessment, also the protective barriers which include gloves, masks, eyewear, gowns and plastic aprons should

be used when blood, secretions or bodily fluids are likely to come in contact with the nurse's skin or mucous membranes, or could penetrate clothing *Timen et al., (2010).*

The purpose of infection control is to reduce the occurrence of infectious diseases. These diseases are usually caused by bacteria or viruses and can be spread by human to human contact, animal to human contact, human contact with an infected surface, airborne transmission through tiny droplets of infectious agents suspended in the air, and, finally, by such common vehicles as food or water *Centers for Disease Control and Prevention.,(2012).*

Disinfection and sterilization of patient care instruments are necessary to prevent transmission of organisms between patients. Disinfection is used to reduce the number of microorganisms, while sterilization is used to remove all living microorganisms including bacterial spore. Standard Precautions should be applied when handling used instruments *Casanova et al., (2016).*

Significance of the study

Compliance with infection prevention practices is critical component while providing competent nursing care. It is a basic right for every patient, woman or staff members in health care setting. Proper infection prevention measures in outpatient clinic can assist greatly in preventing or reducing avoidable hospital-acquired infections and create a climate of safety so that health workers feel they can provide care, and women are willing to seek care without risking their health *Schaffer et al., (2015).*

There was significant number (23.58%) of maternal deaths due to infectious diseases. Out of a total of 37266 deliveries over a period of five years, 407 maternal deaths occurred and out of these 96 patients died due to infectious diseases. *Shah et al., (2015),* No previous study was

implemented in woman health and midwifery department to evaluate nurses' compliance regarding infection prevention measures.

Aim of the study:

The study conducted to evaluate nurses' compliance regarding infection prevention measures at obstetrics and gynecological outpatient Clinics in Mansoura city.

Subjects and Method:

The Sample Type: the sample was a convenient sampling of all nurses working in obstetric and gynecological Outpatient clinics at the following hospitals of Mansoura city. They are totaled (50) as follow: Mansoura University Hospital (13), Mansoura General Hospital (8), El-Salam International Hospital (19), and Health insurance Hospital (10).

Tools of Data Collection

To achieve the aim of the study, three tools were used for data collection:

First tool: Interviewing questionnaire, which included two parts:

First part: was designed to collect data about nurses' general characteristics:
Such as, name, age, education level, occupation, residence, socioeconomic status.

Second part: was designed to assess nurse knowledge regarding infection prevention measures such as hand washing, personal protective barriers, sharp box, sterilization, etc.

Second tool: An observational checklist
By which the researcher evaluated nurses' compliance with infection prevention measures through observation of nurses while they were practicing compliance with infection prevention measures such as procedure of hand washing, gloving, gowning, masking, giving injection, cleaning and sterilization.

Third tool: Attitude scale
It was designed to assess nurses' attitude regarding compliance with infection prevention measures such as their opinion regard to some principles and practices related to infection control, using likert scale as follow: agree, disagree ,and uncertain.

Ethical considerations

- Ethical approval obtained from the research committee of the faculty of nursing.
- Prior to the study, written consent was obtained from each nurse enrolment in to the study after clarification of the purpose of the study.
- The investigator emphasized participation was absolutely and confidential.
- Anonymity, privacy, safety and confidentiality were absolutely assured throughout the whole study.
- Each participant had the right to withdraw from the study at any time.
- All interviewing questions didn't include any harmful words that hurt nurses' dignity culture respect.
- After data analysis all tools of data collection were burned to maintain confidentiality of the study.

Results:

General Characteristics of Nurses
Figure (1) Distribution of Nurses at Mansoura City
Hospitals (n=50).
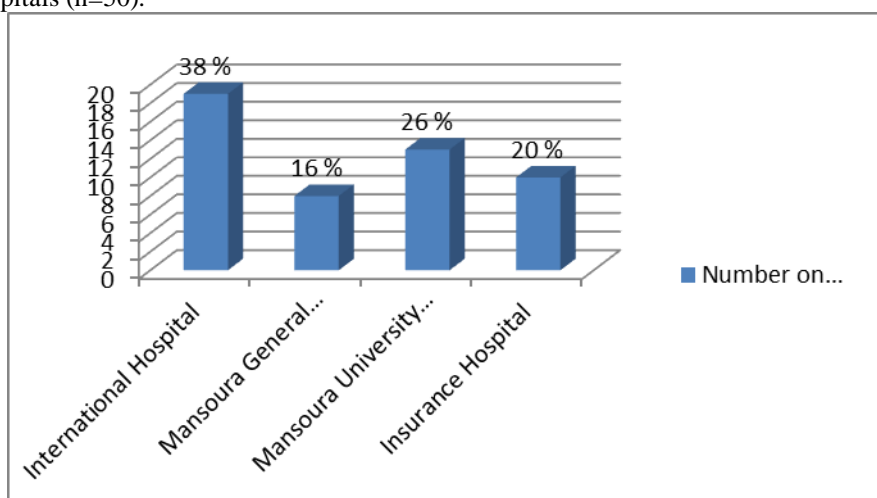
(Figure 1): Illustrates distribution of nurses in obstetric and gynecological clinics at
Mansoura city hospitals.

Table (1): Distribution of nurses' knowledge regarding compliance with infection
prevention measures (n=50).

Variables	Knowledge			
	Correct		Incorrect	
	No	%	No	%
Definition of infection	50	100	-	-
Chain of infection	49	98	1	2
Definition of nosocomial infection	38	76	12	24
Infection prevention measures can prevent infection	48	96	2	4
Cross of pathogens between staff and clients may cause infection	24	48	26	52
Fever is considered as a sign for infection	50	100	-	-
Time of hand hygiene	46	92	4	8
Time of wearing personal protective equipment (gloves)	41	82	9	18
Wearing personal protective equipment (mask) is important for infection control	29	58	21	42
Wearing personal protective equipment (gloves) protect hands from infection	49	98	1	2
Wearing sterile gloves keep hands clean	43	86	7	14
Changing of gloves is important after	50	100	-	-

Variables	Knowledge			
	Correct		Incorrect	
	No	%	No	%
finishing work and before starting another work				
Time of removing the gloves	50	100	-	-
Hand hygiene is necessary after removing gloves	49	98	1	2
Wearing gold make disinfection of hands is impossible	49	98	1	2
Wearing protective gown during work help to prevent nosocomial infection	50	100	-	-
Wearing gown is important during invasive procedures	50	100	-	-
When using syringes and needles we should use one for each client	41	82	8	18
Correctly dispose of used needles	50	100	-	-
Sharp box is important in work place	50	100	-	-
Way for changing of sharp box	32	64	18	36
Sharp box should be changed if filled till the marked sign	50	100	-	-
Giving injection and taking blood sample	46	92	3	8
Doing of equipment Processing	46	92	4	8
Sterilization of instruments by using containers with opening in autoclave	41	82	9	18
When we are in doute of sterilization of an item we should considered it as unsterilized	50	100	-	-
dry heat sterilization can destroy all viruses	42	84	8	16
Time needed for disinfection by boiling	42	84	8	16
Accurate temperature for autoclave	14	28	36	72
Using prepared cidex is kept in a special containers and date of preparing is written	41	82	9	18
Place for keeping of sterilized items	40	80	10	20
Time of removal of wastes	45	90	5	10
Cleaning process	44	88	6	12
Decontaminate all equipment after use	45	90	5	10
Removal of wastes should be daily	50	100	-	-

Table 1 shows distribution of nurses' knowledge about compliance with infection prevention measures, The majority of studied nurses had correct knowledge regarding infection prevention measures except in causes of infection cross by pathogens between staff and clients, definition of nosocomial infection, accurate temperature for autoclave and importance of wearing mask for infection control between nurses and patients (48%&

76%& 28%& 58%) .While (72% & 52% respectively) of them had incorrect knowledge about autoclave temperature and cross pathogens between staff and client led to infection.

Table (2): Distribution of Nurses' Attitude about Infection Prevention Measures

Items	Disagree		Uncertain		Agree	
	No	%	No	%	No	%
Hand hygiene is important before starting any procedure	-	-	-	-	50	100
We should use personal protective equipment (mask) to prevent infection	-	-	31	62	19	38
Wearing gloves is important before starting any procedure	-	-	10	20	40	80
Wearing mask is important before starting any procedure	4	8	34	68	12	24
Single use of needles &syringes is important to prevent infection	2	4	1	2	47	94
Disposal of used needles &syringes should be done immediately after giving injection	1	2	1	2	48	96
Changing of sharp box when reach the marked sign is important	-	-	4	8	46	92
After using equipment must be contaminated then clean and serialized	-	-	-	-	50	100
Sterilization is an important process for work	-	-	-	-	50	100
Rapid removal of wastes is important	-	-	-	-	50	100
Cleaning start from more clean area to less clean	1	2	-	-	49	98
Work area should be cleaned before starting work	-	-	4	8	46	92
Changing of filter of air condition is necessary	-	-	23	46	27	54
Attending class about infection control is important	-	-	14	28	36	72
It is important to take virus B vaccination	-	-	1	2	49	98
Blood &body fluids is a source for infection	-	-	5	10	45	90
Periodical checkup is important	-	-	4	8	46	92
Infection control precautions should be achieved	-	-	4	8	46	92

Table (2) presents nurses' attitude about infection prevention measures, all of nurses agreed with the importance of hand washing, sterilization and rapid removal of wastes. Also the majority of them agreed with importance of single use of needles , periodic checkup , disposal of items immediately and importance of take virus B vaccination (94% , 92% , 96% , 98%). While (62% and 68% respectively) of them were uncertain about importance of wearing personal protective barriers and mask.

Table (3): Distribution of hand washing steps among nurses

Step	Not done		Done incorrectly		Done	
	No	%	No	%	No	%
Before contact with patient	15	30	21	42	14	28
Before exiting patient care area	-	-	29	58	21	42
After contact with blood	-	-	-	-	50	100
Determine hand contamination	-	-	28	56	22	44
Assess area around sink	20	40	25	50	5	10
Remove jewelry	10	20	20	40	20	40
Adjust water temperature	-	-	27	54	23	46
Wet hands and wrists	-	-	7	14	43	86
lather hands with liquid soap	-	-	37	74	13	26
Wash using a circular motion	-	-	-	-	50	100
Wash and rinse using friction	-	-	31	62	19	38
Rinse completely ,keep hands lower than elbows	-	-	7	14	43	86
Clean finger nails	-	-	8	16	42	84
Dry hands with paper towel	-	-	-	-	50	100
Use hand lotion	44	88	4	8	2	4
Inspect hands for cleanliness	-	-	23	46	27	54

This table shows that all of nurses did hand washing after contacting blood, used a circular motion and dry hands with paper towel (100%).While more than quarter of nurses didn't practice hand washing before contacting patient (30%) ,half of nurses didn't assess area around sink correctly (50%). Also (20%) of nurses didn't remove jewelry before hand washing.

Table (4): Distribution of Factors Prevents Nurses to Comply with Infection Prevention Measures at Mansoura City Hospitals.

Items	International Hospital		Mansoura General Hospital		Mansoura University Hospital		Insurance Hospital	
	N	%	N	%	N	%	N	%
Shortage of staff	-	-	30	60%	35	70%	15	30%
Shortage of supplies	15	30%	10	20%	40	80%	10	20%
Emergency situation	35	70%	10	20%	30	60%	10	20%
Too much work	10	20%	10	20%	35	70%	30	60%

Table 8 shows factors that prevent nurses to comply with infection prevention measures, the main factor that prevent nurses to comply with infection prevention measures was shortage of staff at Mansoura General Hospital (60%) while shortage of supplies (80%) at Mansoura University Hospital, emergency situation at international hospital (35%) and too much work at insurance hospital (60%).

Table (5): Relationship between Nurses' knowledge Score and General Characteristics of Studied Nurses

General characteristics		Knowledge score Mean ± SD	Significance test
Age			
20-30	40	31.33 ± 2.25	T= 3.040
>30	10	29.10 ± 0.99	P 0.004 *
Residence			
Rural	41	31.12 ± 2.03	T= 1.661
urban	9	29.78 ± 2.91	P 0.103
Hospitals			
International Hospital	19	31.68 ± 1.53	
Mansoura General Hospital	8	29.86 ± 2.59	T= 16.607
Mansoura University Hospital	13	28.69 ± 1.25	P 0.000*
Insurance Hospital	10	33.50 ± 1.05	
Education			
Nursing Diploma	27	31.81 ± 1.88	
Technical institute	17	29.76 ± 2.17	T= 4.191
Nursing bachelors	4	29.5 ± 2.08	P 0.011*
Master	2	30.88 ± 3.54	
Experience			
<1 year	3	30.33 ± 1.53	T= 1.508
2-5 years	6	32.33 ± 0.52	P 0.232
6-9 years	41	30.71 ± 2.37	
Training course in infection prevention measures		31.16 ± 2.23	T= 1.168
Yes	32	30.39 ± 2.26	P 0.248
No	18		
HB vaccination			
Yes	28	31.82 ± 2.4	T= 3.785
No	22	29.68 ±1.76	P 0.000*
Periodic Examination			
Yes	10	29.40 ± 0.96	T= 2.456
No	40	31.25 ± 2.32	P 0.018*

*p< 0.05

This table shows the relationship between knowledge score and general characteristics of studied nurses, there was significance relation between age, hospitals, educational level, vaccination, periodic examination and nurses' knowledge score.

Table (6): Relationship between Nurses' Attitude Score and General Characteristics of Studied Nurses

General characteristics		Attitude score Mean ± SD	Significance test
Age			
20-30	40	50.68 ± 1.82	T= 2.433
>30	10	52.10 ± 0.57	P 0.019*
Residence			T= 2.113
Rural	41	51.20 ± 1.62	P 0.040*
urban	9	49.89 ± 1.95	
Hospitals			
International Hospital	19	51.58 ± 1.02	T= 5.056
Mansoura General Hospital	8	51.13 ± 1.73	P 0.004*
Mansoura University Hospital	13	49.54 ± 2.03	
Insurance Hospital	10	51.5 ± 1.58	
Education			
Nursing Diploma	27	50.78 ± 1.80	
Technical institute	17	51.12 ± 1.83	T= 0.262
Nursing bachelors	4	51.50 ± 1.29	P 0.852
Master	2	51.00 ± 1.41	
Experience			
<1 years	3	52.00 ± 1.53	T= 0.990
2-5 years	6	51.50 ± 1.05	P 0.379
6-9 years	41	50.80 ± 1.85	
Training course in infection prevention measures		51.31 ± 1.73	T= 1.968
Yes	32	50.33 ± 1.61	P 0.055
No	18		
HB vaccination			
Yes	28	51.68 ± 1.36	T= 3.702
No	22	50.04 ± 1.61	P 0.001*
Periodic Examination			
Yes	10	51.50 ± 1.43	T= 1.101
No	40	50.83 ± 1.80	P 0.276

*p< 0.05

This table shows the relationship between attitude score and general characteristics of studied nurses, there was significance relation between age, residence, hospitals, and acquired vaccination and nurses' attitude score.

Table (7): Relationship between Nurses' practical score and general characteristics of studied nurses

General characteristics		Practices score Mean ± SD	Significance test
Age			
20-30	40	241.50 ± 4.22	T= 1.814
>30	10	238.90 ± 3.21	P 0.046*
Residence			
Rural	41	241.34 ± 4.36	T= 1.325
urban	9	239.33 ± 2.55	P 0.191
Hospitals			
International Hospital	19	242.74 ± 3.40	
Mansoura General Hospital	8	239.38 ± 3.46	T= 12.738
Mansoura University Hospital	13	237.00 ± 0.00	P 0.000*
Insurance Hospital	10	244.10 ± 4.33	
Education			
Nursing Diploma	27	241.89 ± 4.73	
Technical institute	17	239.18 ± 2.98	T= 1.693
Nursing bachelors	4	242.00 ± 3.37	P 0.182
Master	2	240.00 ± 1.41	
Experience			
<1 years	3	241.67 ± 3.06	T= 0.103
2-5 years	6	241.50 ± 2.51	P 0.902
6-9 years	41	240.85 ± 4.44	
Training course in infection prevention measures		240.94 ± 4.40	T= 0.096
Yes	32	241.06 ± 3.78	P 0.924
No	18		
HB vaccination			
Yes	28	242.93 ± 4.33	T= 4.392
No	22	238.50 ± 2.13	P 0.000*
Periodic Examination			
Yes	10	237.60 ± 1.35	T= 3.129
No	40	241.82 ± 4.19	P 0.003*

*p< 0.05

This table shows the relationship between Practices score and general characteristics of studied nurses, there was significance relation between age, hospitals, acquired vaccination, periodic examination and nurses' practical score.

Table (8): The relation between hand washing score and socio demographic characteristics of nurses

Socio demographic characters		Hand washing score Mean ± SD	Significance test
Age			
20-30	40	30.33 ± 1.51	T = 2.319
>30	10	29.20 ± 0.42	P 0.025 *
Residence			
Rural	41	30.07 ± 1.46	T = 0.280
Urban	9	30.22 ± 1.39	P 0.781
Hospitals			
International Hospital	19	30.68 ± 1.73	T = 8.022
Mansoura General Hospital	8	29.38± 0.52	P 0.000 *
Mansoura University Hospital	13	29.0 ± 0.0	
Insurance Hospital	10	31.0 ± 1.05	
Education			
Nursing Diploma	27	30.56 ± 1.58	T = 2.502
Technical institute	17	29.47 ± 1.01	P 0.071
Nursing bachelorism	4	29.50 ± 0.58	
Master	2	30.5 ± 2.12	
Experience			
<1 years	3	29.33 ± 0.58	T = 0.504
1-5 years	6	30.33 ± 1.37	P 0.607
>5 years	41	30.12 ± 1.49	
Training			
Yes	32	30.03 ± 1.31	T = 0.449
No	18	30.22 ± 1.67	P 0.656
HB vaccination			
Yes	28	30.71 ± 1.63	T =3.882
No	22	29.32 ± 0.48	P 0.000 *
Periodic Examination			
Yes	10	29.10 ± 0.32	T = 2.611
No	40	30.35 ± 1.49	P 0.012 *

*p< 0.05

This table shows the relationship between hand washing score and general characteristics of studied nurses, there was significance relation between age, hospitals, vaccination, and periodic examination and hand washing score

Discussion :

The aim of the present study was to evaluate nurses' compliance regarding infection prevention measures at obstetrics and gynecological outpatient clinics in Mansoura city. This aim was achieved through answered the present study questions, because the present study result revealed that the majority of nurses had correct knowledge and positive attitude regarding infection prevention measures. Also there were some factors that prevent nurses to comply with infection prevention measures, such as shortage of staff, shortage of supplies, emergency situation and too much work.

In relation to attendance of training course about infection prevention

measures, about two third of nurses attended training course and more than half of nurses had got virus B vaccination. The present study result disagreement with ***Amin and Wehedy (2009)*** study about infection prevention and control measures at King Faisal University who revealed that less than quarter of nurses attended training courses. In contrast with study findings ***Manchikanti et al., (2011)*** study about the effect of nursing guidelines compliance to infection control among nursing student at faculty of nursing, Menoufia University found that more than tenth of the study group attended training courses about infection prevention measures and this difference may be due to periodically training courses which introduced by infection prevention unit in the studied hospitals that had effective role.

In addition, the current results showed that more than half of nurses took virus B vaccination that in contrast to the result of Alshiddi (**2015**) in Kingdom of Saudi Arabia who reported that majority of nurses took virus B vaccination.

Concerning to nurses knowledge about infection prevention measures, all nurses had correct knowledge about definition, signs of infection, disposal of used needles, wearing protective gown, changing gloves, and importance of sharp box and this may be due to more than two third of them had attended periodical training and courses regarding infection prevention measures, while more than two thirds of them had incorrect knowledge about autoclave temperature, more than half had incorrect knowledge about cross pathogens between staff and client and more than third of them had incorrect knowledge about importance of wearing mask in infection prevention. The

present study findings in agreement with ***Amin and Wehedy (2009)*** study results at a Saudi University who found that knowledge scores related to sharp injuries, personal protective equipment of health care providers showed the least knowledge scores.

In the same line ***O'grady et al., (2011)*** study result found that majority of responders have good knowledge about standard precautionary measures. Also knowledge of universal precautions was highest among nurses in the study done by ***Vaz et al. (2010)*** at the University Hospital of the West Indies. Nurses were knowledgeable about standard precautions; majority of nurses had good knowledge about standard precautions that was reported among Jordanian nursing students by ***Al-Hussami, Darawad (2013)***.

Concerning to nurses attitude about infection prevention measures, all of them agreed with the importance of hand washing, sterilization, rapid removal of wastes. Also, the majority of them agreed with importance of single use of needles and periodic checkup and disposal of items immediately and importance of take virus B vaccination.

In the same line ***Al-Hussami, Darawad (2013)*** found in the study done among Jordanian nursing students that nurses' attitudes toward infection control measures were found to be positive among the majority ***Alshiddi (2015)*** study among students in Kingdom of Saudi Arabia reported that all of them had positive attitude about wearing gloves, and majority had positive attitude about face mask.

The majority of nurses had comply with infection prevention measures at their clinical setting , which was near to

the result which reported by *Fashafsheh et al., (2016)* in Palestinian Hospitals as compliance with standard precautions was more than three quarter. Also, another study was reported by *O'grady et al.,(2011)* in Niger revealed that more than three quarter practice both medical and surgical asepsis of standard precaution, and adequate number of them comply with standard precautionary measures.

Also, *Alshiddi (2015)* at Kingdom of Saudi Arabia revealed that most of the students and staff care about protective equipment (gloves, face mask and protective gown). However, they were less concern in using other protective equipment. In the same line *Ayed et al., (2015)* reported that using protective glasses and head cap were low, around more than half and less than half, respectively.

Regarding two factors that prevent nurses to comply with infection prevention measures , the result revealed that more than three quarter among nurses reported lack of equipment's and supplies and this may be due to large number of daily admission, which was near to the result of *Amoran and Onwube(2013)* who found in their study about infection control and practice of standard precautions among healthcare workers in northern Nigeria that, the majority of the respondents reported that the major reason for noncompliance to standard precautions is the non-availability of the equipment's.

Also, the result of the present study found that in Mansoura university hospital and Mansoura general hospital there were three quarter of nurses complained of lack of staff and large number of admission that need more nurses and more than half of nurses at Mansoura general hospital had the same complain, and about quarter of nurses at insurance hospital.

While *Manchikanti et al., (2011)* study result indicated that lack of knowledge was the most common barrier impeding proper infection prevention precaution practice. There was no statistically significance differences between both groups related to their opinion about all factors impeding proper infection prevention precaution practice.

Concerning to the relationship between knowledge score and general characteristics of studied nurses the current study showed that, there was significance relation between age, hospitals, educational level, vaccination, periodic examination and nurses' knowledge score, and this due to increase amount of knowledge they had during years of education and during work experience. In contrast to our study result findings *Manchikanti et al., (2011)* revealed that there was no statistically significance relation between general characteristics of studied nurses and knowledge score.

Also, the relationship between attitude score and general characteristics of studied nurses showed that, there was significance relation between age, residence, hospitals, and vaccination and nurses' attitude score. But in contrast to our study findings *Manchikanti et al., (2011)* revealed that there was no statistically significance relation between attitude score and general characteristics.

In addition, the relationship between Practices score and general characteristics of studied nurses showed that, there was significance relation between age, hospitals, vaccination, periodic examination and nurses' practical score.

Also the relationship between hand washing score and general characteristics of studied nurses showed that, there was significance relation between age, hospitals, vaccination, and periodic examination.

In the same line *Mollaoglu (2011)* study at Turkey about compliance with standard precautions in clinical practice revealed that there was a positive significant relation between participants' age and their compliance with universal precautions. In addition, those in the upper year of training compliance with universal precautions were high. Also training and education have been found to be an important to develop awareness among health care workers, as well as improving good clinical practice.

Conclusion:

Based on the results of the present study the following can be concluded that, about two thirds of nurses had correct knowledge about definition and signs of infection, disposal of used needles, wearing protective gown, changing gloves, and importance of sharp box, about two third of nurses were attained training course about infection prevention and control. While more than half of them had incorrect knowledge about cross of pathogens between staff and clients, third of them had incorrect knowledge about accurate temperature for autoclave, and more than third of them had incorrect knowledge about importance of wearing personal protective equipment (mask). Also all of nurses' had positive attitude about importance of hand washing and rapid removal of wastes, While more than half of nurses were uncertain regarding wearing mask before starting any procedure, near than half were uncertain

regarding importance of changing of filter of air condition, and near than three quarter agreed that attending class about infection control was important.

Recommendations
In the light of the study findings, the following are recommended
1- Establishing staff development unit for providing orientation programs for newly employed nurses about standard precautions of infection control.
2- Continuous training program for personal about identify infection prevention measures.
3- Follow up the nurses' compliance utilization of standard precautions of infection prevention by the infection control team.
4. Provide the work places with needed supplies and equipment as possible.
5. Provide health places with more staff to maintain good quality of care.

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