Efficacy of Implementation Management program about Infection Control practices for Nursing Staff

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Back ground: Management program about infection control is important to help head nurses gain knowledge to perform their roles, and for nurses to comply with standard infection control measures . **Objective:** Evaluate efficacy of implementing management program about infection control practices for nursing staff. Setting: All departments in Tanta University Emergency Hospital. Subjects: All head nurses (N= 31) and nurses (N =175) working in all departments of emergency hospital. **Tools:** (1) Infection Control Knowledge Questionnaire sheet, (2) Head Nurses' Performance Role on Infection Control Assessment Scale and, (3) Observational checklist, related to Infection Control practices. **Results:** Head nurses 58.1% and nurses 80.0% had poor level of total knowledge about infection control pre- program , while majority (90.3%- 86%) were at high level post program. Head nurses 61.3% had poor level of total specific knowledge pre-program, changed to be 90.3% and 87.1% had good level of knowledge post program . Pre-program majority (90.3%) of head nurses had mild level of performance of educational , consultation, research and support team in surveillance roles decreased to (3.2%) post program. Nurses range (15.4% - 22.9%) showed compliance level to infection control practices pre-program, improved to range (75.4% - 84.0%) post program with highly statistically significant differences (p= < 0.001). **Conclusion:** At Tanta University Emergency Hospital nursing staff basic knowledge, head nurses specific knowledge and role performance and nurses' compliance were low and statistically improved after implementation of needed management program. **Recommendation:** conduct regular training programs for nursing staff and encourage culture of compliance to infection control practices.

Key words: Infection control, Nursing staff, Head nurses role, Nurses' compliance, knowledge and practice.

Introduction

Health care-associated infections, affect patients in a hospital or other health-care facility, and are not present or incubating at the time of admission[1]. They also include infections acquired by patients in the hospital or facility but appearing after discharge, and occupational infections among staff[2]. Infections prolong hospital stays, create long- term disability, increase resistance to antimicrobials, represent a massive additional financial burden for health systems, generate high costs for patients and their family, and cause unnecessary deaths[3].

The magnitude of the problem is more in developing countries than developed countries due to poor hygiene and sanitation which play an important role in increasing the risk of infection[4]. In Egypt, limited data exist on the morbidity, mortality and costs associated with nosocomial infections[4,5].

Infection prevention and control is an integral component of nursing care delivery in any setting to reduce risks for morbidity and mortality in patients and care givers at all levels[6]. Basic principles of infection prevention are simple and include personal hygiene and hand washing. More comprehensive infection risk reduction

strategies are needed for the management of indwelling devices such as central venous catheters and equipment for assisted ventilation and for surgical procedures that involve permanently implanted foreign bodies such as total joints[7].

Nursing staff play a vital role in preventing the development and spread of infections among hospital patients. Some nurses, called infection control nurses, specialize in this, but all nurses in a hospital share responsibility for monitoring patients, practicing good hygiene and implementing all other methods designed to keep hospitals sterile and patients safe[8]. They will be personally accountable for their action and are responsible for ensuring that they comply with Infection Prevention and Control policies[9]. They must understand their legal duty to take reasonable care of their health, safety and security and that of other persons who may be affected by their actions and for reporting untoward incidents and areas of concern[7].

Head nurse play vital role in reducing risks for infection through a variety of roles (educational, consultation, administration, supervision, research, support team in surveillance and risk management rols). While nurses share responsibility with other health care personnel for infection risk

reduction in patients across entire continuum of direct care activities[10]. Head nurses have an active roles, they regulary monitoring, evaluating and reporting of outcomes, processed and strategies at national level and in health-care facilities[9]. In addition the nurse should follows principles and practices including standard precautions to prevent and control of infection and it spread[8]. During daily routing care the nurse basic medical aseptic techniques to break the infection change for example, use gloves and a mask during dressing change to break the entry of pathogens[9].

Nursing staff education is an important component of the hospital infection control program[8,9]. The efficiency of infection control measures is highly dependent on the compliance of the hospital staff[11]. To secure their compliance, education is needed to inform the staff and to convince them that these measures are really worthwhile. Without an effective in-service education program, the work of infection control be rendered ineffective[12,13]. So, training programs are needed for both nurses and head nurses to maintain infection control measures[14].

Infection control and prevention in a healthcare setting requires a comprehensive, coordinated program designed to prevent and control nosocomial or healthcare-associated infections. Implementation of patient care practices for infection control is the role of the nursing staff[11]. Nurses should be familiar with practices to prevent the occurrence and spread of infection, and maintain appropriate practices for all patients throughout the duration of their hospital stay[13,14].

Effective infection prevention and control at emergency department aimed to preventing the transmission of infectious diseases from ill patients to health care personnel and to other patients, and reducing the risk of infection associated with receiving emergency care[15.] Basic principles of infection prevention are simple and include personal hygiene and hand washing. So the current study will be carried out in attempt to help nurses to increase their working knowledge and change faulty practices and enhance head nurses role to infection control though an implementation of designated managment program.

Aim of the study

To evaluate efficacy of implementing management program about infection control practices for nursing staff.

Research hypothesis

Implementing of management program expected to enhance head nurses' role and nurses' compliance with infection control practices

Subjects and Method

Study design

Quasi experimental research design was used to achieve the aim of the present research. Such design fits the nature of the problem under investigation. A quasi-experiment is an empirical interventional study used to estimate the causal impact of an intervention on its target population without random assignment.

Setting

The present study was conducted at all departments of Tanta emergency hospital affiliated to Tanta University, including emergency, casualty department surgical departments, burn, medical surgical, neurology, orthopedic and urology departments. Tanta Emergency Hospital is a private section where complete and continuous caring is provided for very sick patient who can benefit from service provided. This hospital has 187 beds, and nursing staff were 108 nurse specialist and 699 nurses.

Subjects

The study subject consisted of nursing staff 206 working at the 8 departments understudy including nurses n=175 and head nurses n=31.

Tools

The data of the study collected using three tools as follows:-

Tool I: Infection Control Knowledge Questionnaire sheet

This tool developed by the researcher guided by Moyo (2013)[13] , Patel (2009)[16] and National Guidelines for Infection Control (2009)[17] to collect data from head nurses and nurses about infection control. It included two parts:

Part one: Characteristics of subjects including age, marital status, level of education, job position, years of experience, department name, attended of educational or training program in infection control.

Part two: Infection control knowledge questionnaire to evaluate nursing staff knowledge about infection control, include 87 questions for nurses, and 137 questions for head nurses were classified into two parts as follows:

 a- Nursing staff knowledge

1- Aspects of infection control include item related to:

- Epidemiology of infection include 10 questions.
- Health care associated infection 10 questions - Infection control principles and practice 10 questions.

2- Standard precautions include item related to:

- Hand hygiene, respiratory hygiene and cough etiquette 10 questions.
- Wearing protective equipment and aseptic techniques (12) question.
- Management of sharps, needle stick injuries and waste disposable 9 questions.
- Environmental cleaning, spills-management and handling and disposal of linen 7 questions.
- Management of patient equipment, cleaning, disinfection and sterilization 8 questions.

3- Isolation precautions 11 questions.

b- Head nurses specific knowledge

Include questions in section (a) and specific questions 10 questions on each of items:

- Role of head nurse on infection control
- Management and leadership skills
- Risk management
- Surveillance and auditing
- Teaching and presentation skills

Scoring system

Answers of participants were scored

87degree for nurses and 137degree for head nurses. It was allotted a score of (1) for correct and (0) for wrong answer.

Level of nursing staff knowledge

- Poor = < 60%,
- Fair = 60 % - 80%,
- Good = > 80%.

Tool II: **Head Nurses' Performance role on Infection Control Assessment Scale**.

This tool was developed by Mariy (2012)[18] and modified by the researcher to include items of head nurses' role on infection control. The scale used by the researcher to evaluate the head nurses' role as follows:

1. Educational role include being a role model, and create learning environment

2. Consultation role include providing of ongoing in-service training to hospital employees on infection control, conducts orientation for new employees on infection control and isolation techniques.

3. Administration role include participating on committees, task forces to study and make recommendations regarding the prevention and spread of infection.

4. Research role include assist in caring out research, application on evidence based practices and conducted of quality improvement activities.

5. Supervision role include monitoring and making corrective practice according to need.

6. Support team in surveillance include assist in the prevention and reporting of sharp injuries among staff, collection and reporting of Healthcare-associated infections and outbreaks and support in audit activities and documentation.

7. Risk management include identify unsafe and hazardous infection control practices, recommend cost effective preventive measures, and help health care facilities set priorities.

Scoring system

Head nurses were scored by 150 degree which observed on a three points Likert scale, (1-3), where 3= Always done, 2= Sometimes done, 1= not done and 0= not applicable.

Levels of head nurses performance:

- Mild   = < 60%
- Moderate = 60 % - 75%,
- High   = >75%.

Tool III: Observational checklist, related to Infection Control practices.

This tool will be used to assess nurses' compliance to infection control practices at word level related to:-

- Hand hygiene.

- Respiratory hygiene and cough etiquette.
- Wearing protective equipment.
- Aseptic techniques.
- Management of sharps and needle stick injuries.
- Waste disposable.
- Environmental cleaning and spills-management.
- Handling and disposal of linen.
- Management of patient equipment.
- Cleaning, disinfection and sterilization.
- Human resources.
- Isolation precautions.

Scoring system

Nurses were scored by 309 degree which observed on a three points Likert scale, measured by three points Likert scale (1-3), where 3= Always done, 2= Sometimes done, and 1= not done and 0 = not applicable.

Nurses' level of compliance will be as follow

- Minimal compliance = < 60%.
- Partial compliance   = 60% - 75 %.
- Compliance   = > 75%.

Methods

1- An official permission to carry out the study and for implementation of the program, were obtained through a letter issued from the responsible authorities at the Faculty of Nursing, Tanta University to medical and nursing directors of Tanta

Emergency Hospital, explaining the research aim and procedures. The researcher met with the nursing director of the hospital and supervisors in each department. The aim of study and the tools to be used for data collection were explained to take their agreement, support and cooperation.

2- Ethical consideration: nursing staff consent to participate in the study was obtained. They were informed about the privacy of information obtained from them, nature of the study, their rights to withdraw, and the confidentiality of their names.

3- Tools of study were developed by the researcher based on recent related literature.

4- Tools (I, II, and III) was tested for its content validity and relevance by a jury of nine experts in the area of specialty. They were one professor and two assistant professor from Faculty of Nursing Damanhur University, three assistant professor and three lecturers from Faculty of Nursing Tanta University (nursing service administration department).

5- The expert's responses were represented in four points rating score ranging from (4-1); 4 =strongly relevant, 3 = relevant,

2= little relevant, and 1= not relevant. Necessary modifications were done included; clarification, omission of some questions and adding others and simplifying work related words. The content validity for knowledge questionnaire was 92.82% for nurses' and 94.16% for head nurses, 89.22% for head nurse role performance and 93.37%for nurses' compliance to infection control practices.

6- Reliability of tools was tested using Cronbach,s Alpha and coefficient test. Its value was 0.915 for tool (I a), 0.766 for tool (I b), 0.959 for tool (II), and 0.997 for tool (III).

7- A pilot study was conducted on 10%of total sample randomly selected to test clarity and applicability of tools. Including the content clarity of the tools, relevance, the practicability and feasibility of observation checklist for assessing the head nurses' performance and nurses' compliance to decide any obstacles that may be encountered during data collection as confusion about meaning of specific word or item. It also served in deciding the time required to fill the tools. The pilot study was collected from 1st mars 2018 to 15th mars 2018.The administration time for filling

questionnaire sheet approximately 45minutes.

8- Data collection phase

-Knowledge questionnaire about nursing staff, tool (I) was used before, after and post three month implementation of program.

-Head Nurses' Performance role on infection control assessment scale tool (II) was used before, after and post three month implementation of program to assess head nurses' role on infection control.

-Observational checklist, related to infection control practices tool (III) was used before, after and post three month implementation of program to assess nurses' compliance to infection control practices at word level. Every nurse was observed 3 times for each of 3 assessments.

-Head nurses divided into four groups and nurses into ten groups. The program time for nursing staff was one hour every session for nurses 5 session. Head nurses only get specific additional 5 sessions. Nursing staff prepared to get sessions at their work place hospital during their work shifts morning, afternoon or night.

-The researcher was given direction for nursing staff duration of 3 months at their ward.

-After 3 months of program implementation there was post -test using tools I, II &II to determine the level of knowledge retention for nursing staff, role performance on infection control for head nurses and changes for nurses' compliance to infection control practices.

9- Management program on infection control practices was developed based on review of relevant recent related literature and results of nursing staff knowledge test scores.

10- Data collection started from February month until end of July month. It takes 6 months.

Design of the program

First step was the statement of general and specific objectives

General objective

At the end of the program implementation the nursing staff knowledge, nurses' compliance and head nurses' role performance in infection control will be enhanced.

Specific objectives

At the end of the program nursing staff should be able to understand, apply, comply and manage infection control activities through:

- Introduction of infection control.
- Health care associated infection.
- Infection control principles and practices.
- Standard of infection control precautions.
- Isolation precautions.
- Role of head nurses on infection control.

- Skills of head nurses for infection control.

Program content

The content was selected after carful assessment of subject needs. Simple and scientific language was used. This content was designed to provide knowledge related to infection control. The program includes 5 sessions for nursing staff and 5 sessions for specific knowledge to head nurses as follows: Sessions for nursing staff:-

- Session (1) Introduction of infection control.
  - Session (2) Health care associated infection.
- Session (3) Infection control principles and practices.
- Session (4) Standard of infection control precautions.
- Session (5) Isolation precautions.
- Session (6) Role of head nurse on infection control.
- Session (7) Management and leadership skills.
- Session (8) Risk management.
- Session (9) Surveillance and auditing.
- Session(10) Teaching and presentation skills.

Teaching- learning strategies

Selections of teaching methods were governed by studying the subject themselves and content of program. The methods used were lecture, role play, group discussion, power point, demonstration, and procedures for practical contents.

Teaching aids

The teaching aids used for attainment of program objectives were data show, posters, handouts, flow sheets, pens, and papers.

Implementation of the program

Head nurses divided into four groups and nurses into ten groups. The total program time for head nurses was 10 hours for each group and for nurses was 5 hours for each group, one hour every session. The program was applied for nursing staff at their work environment in the study hospital. The nursing staff was already told about the general objectives of the program and of each session. At the beginning of each session, the researcher makes good relationship and motivated nursing staff for involvement.

Evaluation of the program

Evaluation of effectiveness of the program is final step that was planned to determine the extent to which nursing staff subjects have acquired knowledge and practiced it through:

-Pre implementation of the program pre-testing of nursing staff knowledge using (tool I) head nurses role performance using (tool II) and nurses' compliance to infection control practices using (tool III).

-Post testing of nursing staff knowledge, head nurses role performance and nurses' compliance to infection control practices after implementation of the program using (tool I, II and III).

- Comparison was made between the pre ,immediate post-test and 3months post program result to evaluate change in nursing staff knowledge, head nurses role performance and nurses compliance to infection control practices

Statistical analysis

-Data were fed to the computer and analyzed using IBM SPSS software package version 20.0.(Armonk, NY: IBM Corp) Qualitative data were described using number and percent Quantitative data were described using mean, standard deviation. Significance of the obtained results was judged at the 5% level[19].

Results

Table (1) shows nursing staff characteristics. Age range of nursing staff was(18- >40) years with total mean 28.61 ± 5.03, head nurses' mean 33.58 ± 5.30, and nurses' mean 27.73 ± 4.44. Nursing staff 75.2%were married, head nurses77.9% and nurses 74.9%. All of head nurses had bachelor degree of nursing and all of nurses had technical diploma degree of education. Nursing staff 49.0% had 10-15 years of

experience, about half (51.6%) of head nurses and (48.6%) of nurses. Mean experience of nursing staff8.90 ± 4.88, head nurses 10.00 ± 4.39 and for nurses 8.70 ± 4.95.Equal percent (12.9 %) of head nurses and nurses were worked in most of department under study. High percent (66.5%) of nursing staff, (64.5%) of head nurses and 66.8%of nurses hadn't attended

training on infection control.

Figure (1) shows level of total knowledge for nursing staff (head nurses and nurses) about infection control pre, Immediate and 3 months post program. Pre- program few of nursing staff compared to most of them immediate and 3months post program were at good level of total knowledge about infection control.

Table (2) shows comparison between head nurses and nurses' knowledge levels about infection control items pre, immediate and 3 months post program. There was highly statistically significant improvement of head nurses and nurses' level of knowledge post program in all infection control items at(p <0.001).Statistically significant difference found between head nurses and nurses level of knowledge pre-program for items of health care associated infection, standard precautions and isolation precautions at $p \leq 0.05$. But post program no statistical

significant differences found between head nurses' and nurses' knowledge level.

Pre-program range 54.1%- 64.5%of head nurses' and range 77.1% -100% of nurses showed poor level for items of health care associated infection, standard precaution and isolation precaution which changed to be range90.3% -93.5% of head nurses and 85.1% -87.4% of nurses were at good level immediate post and 3 months post program respectively. Also preprogram 54.8% of head nurses had and 71.4% of nurses showed poor level of total knowledge about infection control principles and practices changed immediate post and 3 months post program to be none of head nurses and 7.4% and 8.0 of nurses showed poor level.

Figure (2) shows level of head nurses' total specific knowledge about infection control pre, Immediate and 3 months post program. Pre-program more than one quarter of head nurses compared to most of them immediate and 3months post program were at good level of total specific knowledge about infection control.

Table (3) shows head nurses' levels of total specific knowledge about infection control sub-scales pre, immediate and 3 months post program. There was statistically significant improvement of head nurses' level of knowledge in all items of infection control at

(p <0.001).Preprogram head nurses 35.5%, 25.8% had good level of knowledge about management and leadership skills, and surveillance and auditing, respectively. Also equal percent 22.6% of head nurses had good level of knowledge about role of head nurse on infection control, risk management, teaching and presentation skills.

Pre-program range of 71%-61.3% showed poor level of knowledge which changed immediate post program at good level for range 93.5%-87.1% and range 90.3%-83.9% at 3 months post program for all items of infection control specific knowledge including role of head nurse on infection control, management and leadership skills, risk management, Surveillance and auditing and teaching and presentation skills.

Table (4) shows level of head nurses' total role performance of infection control items pre, immediate, and 3 months post program. The table shows that there was highly statistically significant improvement of head nurses' levels of total role performance in all items on infection control post than preprogram (p= <0.001). Pre- program majority (90.3%) of head nurses had mild level of total performance on educational role, consultation role, research role and support team in surveillance which decreased to 3.2%atimmediateand 3 months post

program.

High percent (67.7%) of head nurses pre-program showed mild level of total performance on risk management which decreased to be 3.2% at both immediate and 3 months post program. More than half (58.1%, 54.8 %) of head nurses showed mild level of total performance on supervision role and administration role pre-program which decreased to 3.2% at immediate and 3months post program.

Figure (3) shows levels of nurses' compliance of total infection control practices pre, immediate, and 3 months post program. Pre-program, few nurses had compliance level of total infection control practices, which improved to majority post and 3 months post program.

Table (5) illustrates nurses' levels of total compliance about seven infection control practices sub-scales pre, immediate, and 3 months post program. There was highly statistically significant improvement of nurses' compliance to seven infection control practices sub-scales immediate and 3 months post program at (p= < 0.001).

Pre- program, nurses range (17.7%- 22.9%) showed compliance level about infection control practices of environmental cleaning and spills-management, waste disposable, respiratory hygiene and cough etiquette,

hand hygiene, wearing protective equipment, aseptic techniques, and management of sharps and needle stick injuries, increased to be range (83.4% - 88.6%) immediate post program decreased to be range (77.7% - 84.0%)at 3 months post program.

Table (6) illustrates nurses' percent levels of total compliance about five infection control practices sub-scales pre, immediate, and 3 months post program. There was highly statistically significant improvement of nurses' compliance to five infection control practices sub-scales immediate and 3 months post program at (p= < 0.001).

Pre- program, nurses range (22.9% -15.4%) of nurses showed compliance level about infection control practices of handling and disposal of linen, cleaning, disinfection and sterilization, management of patient equipment and, human resources increased to be range (88.6% - 81.1%)immediate post program and decreased to be range (83.4% - 75.4%) at 3 months post program

All nurses showed partial compliance level about infection control practices of isolation precautions pre and post program because some items not applicable.

Figure (4) shows correlation between nurses' total knowledge and compliance about infection control practices pre, immediate,

and 3 months post program. There was highly statistically significant Positive correlation between nurses' total knowledge and compliance about infection control.

Figure (5) shows correlation between head nurse' specific knowledge and performance of their role on infection control pre, immediate, and 3 months post program. Statistically Positive correlation was detected between head nurse specific knowledge and performance of their role on infection control pre, immediate, and 3 months post program at (p<0.001).

Figure (6) shows correlation between head nurse role performance and nurse's compliance about infection control pre, immediate, and 3 months post program. There was statistically significant positive correlation between head nurses' role performance and nurse's compliance about infection control.

Table (1): Nursing staff characteristics (No=206)

| Variables	Head nurse (n=31)		Nurses (n=175)		Total (N = 206)	
	N	%	N	%	N	%
Age (years)						
18 – 25	9	29.0	78	44.6	87	42.2
>25-30	18	58.1	40	22.9	58	28.2
>30-40	4	12.9	2	1.1	6	2.9
>40	0	0.0	55	31.4	55	26.7
Range	25.0 – 45.0		21.0 – 42.0		21.0 – 45.0	
Mean ± SD	33.58 ± 5.30		27.73 ± 4.44		28.61 ± 5.03	
Marital status						
- Single	5	16.1	32	18.3	37	18.0
- Married	24	77.4	131	74.9	155	75.2
- Widow	2	6.5	5	2.9	7	3.4
- Divorced	0	0.0	7	4.0	7	3.4
Education						
- Bachelor Degree	31	100.0	0	0.0	31	15.0
- Technical Degree	0	0.0	175	100.0	175	85.0
Position						
-Head nurse	31	100.0	0	0.0	175	85.0
-Nurse	0	0.0	175	100.0	31	15.0
Experience/ years						
- <5	3	9.7	41	23.4	44	21.4
- 5-10	12	38.7	48	27.4	60	29.1
- >10 -15	16	51.6	85	48.6	101	49.0
- >15	0	0.0	1	0.6	1	0.5
Range	2.0 – 20.0		2.0 – 30.0		2.0 – 3.0	
Mean ± SD	10.00 ± 4.39		8.70 ± 4.95		8.90 ± 4.88	
Department						
- Emergency	4	12.9	22	12.6	26	12.6
- Casualty	3	9.7	22	12.6	25	12.1
- Surgical	4	12.9	22	12.6	26	12.6
- Burn	4	12.9	22	12.6	26	12.6
- Medical	4	12.9	22	12.6	26	12.6
- Neurology	4	12.9	22	12.6	26	12.6
- Orthopedic	4	12.9	22	12.6	26	12.6
- Urology	4	12.9	21	12.0	25	12.1
Infection control training						
- No	20	64.5	117	66.8	137	66.5
- Yes	11	35.5	58	33.2	69	33.5

Nursing staff knowledge
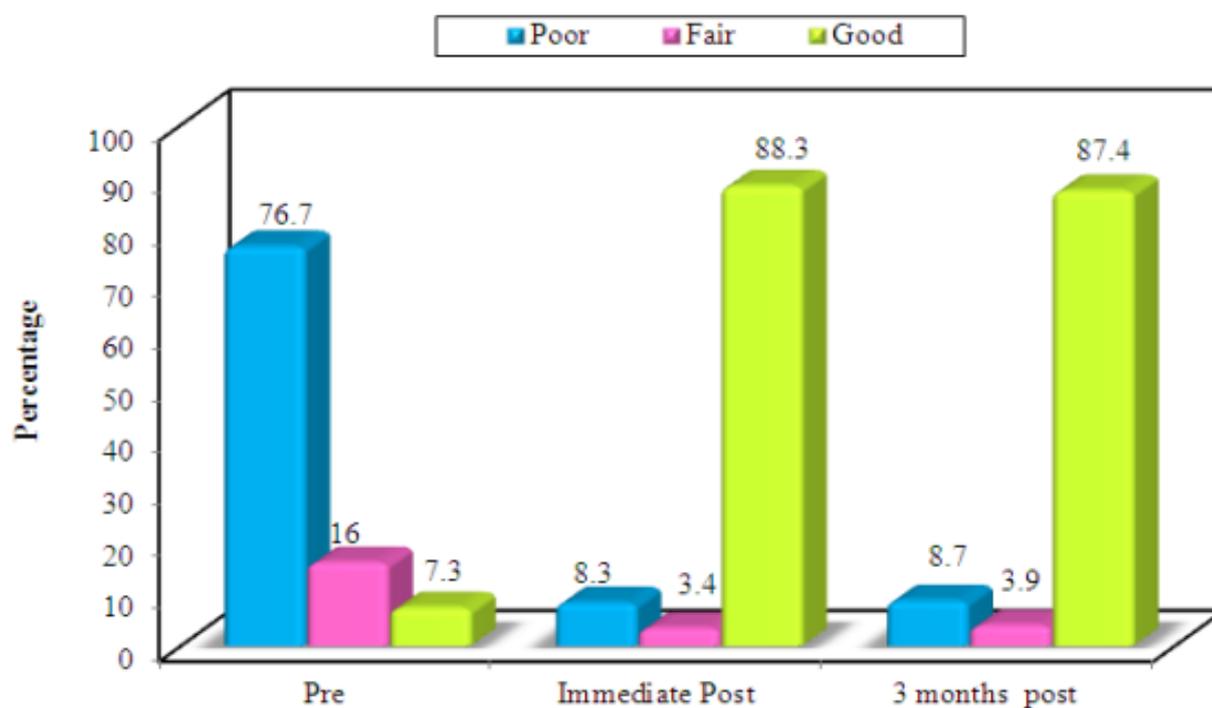
Figure (1): Levels of total knowledge for nursing staff about infection control pre, immediate and 3 months post program (N=206).

Table (2): Comparison between head nurses and nurses' knowledge levels about infection control items pre, immediate and 3 months post program (N=206) head nurses(31) and nurses (175).

| Items	Levels	Pre						Immediate Post						3 months post						Differences P$_2$
		Poor		Fair		Good		Poor		Fair		Good		Poor		Fair		Good		
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
- Epidemiology of infection	Head nurses	18	58.1	9	29.0	4	12.9	1	3.2	3	9.7	27	87.1	1	3.2	3	9.7	27	87.1	<0.001***
	Nurses	127	72.6	25	14.3	23	13.1	15	8.6	6	3.4	154	88.4	15	8.6	7	4.0	153	87.4	<0.001***
-χ^2(p)		4.258(0.119)						2.568 (^{MC}p=0.245)						3.059 (^{MC}p=0.210)						
-Health care associated infection	Head nurses	18	58.1	9	29.0	4	12.9	1	3.2	2	6.5	28	90.3	1	3.2	2	6.5	28	90.3	<0.001***
	Nurses	138	78.9	32	18.3	5	2.9	14	8.0	5	2.9	156	89.1	17	9.7	5	2.9	153	87.4	<0.001***
-χ^2(p)		9.115*(0.010*)						1.854(^{MC}p=0.401)						2.320 (^{MC}p=0.297)						
-Infection control principles and practice	Head nurses	17	54.8	11	35.5	3	9.7	0	0.0	3	9.7	28	90.3	0	0.0	3	9.7	28	90.3	<0.001***
	Nurses	125	71.4	42	24.0	8	4.6	13	7.4	8	4.6	154	88.0	14	8.0	9	5.1	152	86.9	<0.001***
-χ^2(p)		3.687(0.158)						3.456 (^{MC}p=0.150)						3.511 (^{MC}p=0.159)						
-Standard precautions	Head nurses	17	54.8	8	25.8	6	19.4	1	3.2	1	3.2	29	93.5	1	3.2	1	3.2	29	93.5	<0.001***
	Nurses	135	77.1	26	14.9	14	8.0	15	8.6	3	1.7	157	89.7	19	10.9	6	3.4	150	85.7	<0.001***
-χ^2(p)		7.186*(0.028*)						1.480 (^{MC}p=0.426)						1.586 (^{MC}p=0.420)						
-Isolation precautions	Head nurses	20	64.5	6	19.4	5	16.1	2	6.5	1	3.2	28	90.3	2	6.5	1	3.2	28	90.3	<0.001***
	Nurses	175	100	0	0.0	0	0.0	22	12.6	1	0.6	152	86.9	21	12.0	5	2.9	149	85.1	<0.001***
χ^2(p)		42.249*(^{MC}p=<0.001*)						2.869 (0.205)						0.827 (^{MC}p=0.652)						

Head nurse's specific knowledge
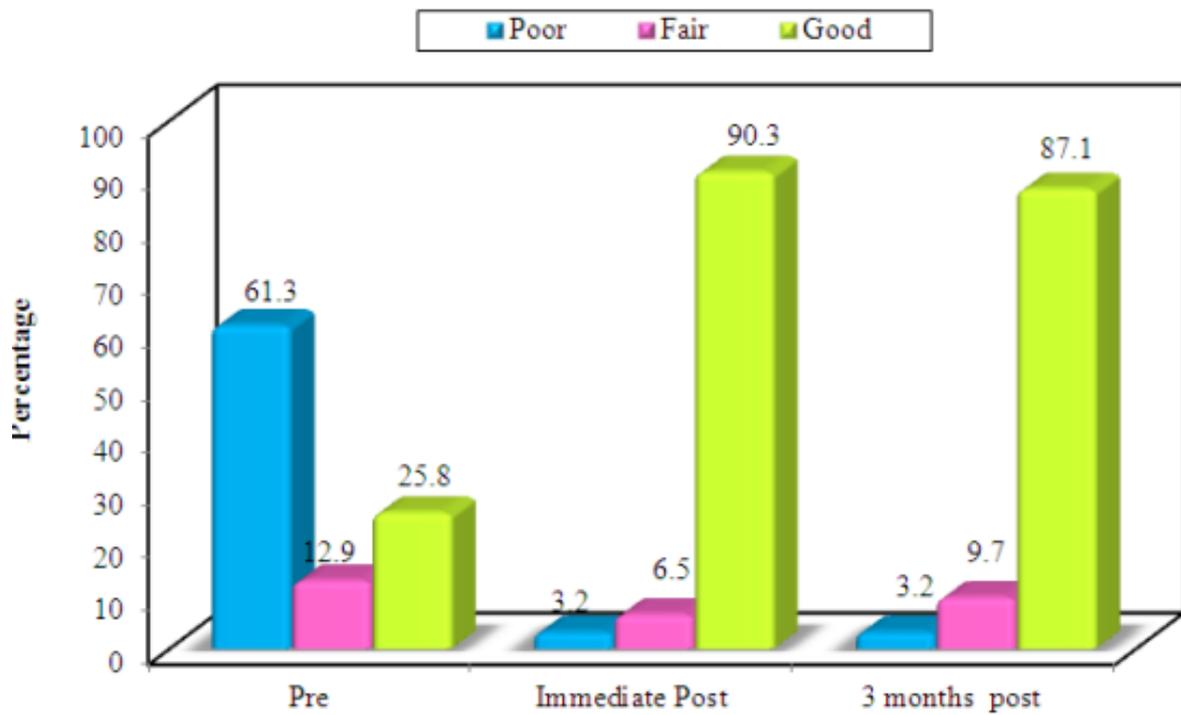
Figure (2): Level of head nurses' total specific knowledge about infection control pre, Immediate and 3 months post program, (N=31).

Table (3): Head nurses' levels of total specific knowledge about infection control pre, immediate and 3 months post program, (N=31).

Levels / Items	knowledge of head nurses (N=31)							
	Pre		Immediate Post		3 months post			
	N	%	N	%	N	%		
Role of head nurse on infection control								
- Poor	22	71.0	1	3.2	1	3.2		
- Fair	2	6.5	2	6.5	3	9.7	39.974*	<0.001***
- Good	7	22.6	28	90.3	27	87.1		
Management and leadership skills								
- Poor	14	45.2	1	3.2	1	3.2		
- Fair	6	19.4	2	6.5	2	6.5	31.355*	<0.001***
- Good	11	35.5	28	90.3	28	90.3		
Risk management								
- Poor	19	61.3	1	3.2	1	3.2		
- Fair	5	16.1	2	6.5	3	9.7	40.132*	<0.001***
- Good	7	22.6	28	90.3	27	87.1		
Surveillance and auditing								
- Poor	21	67.7	1	3.2	1	3.2		
- Fair	2	6.5	3	9.7	4	12.9	39.629*	<0.001***
- Good	8	25.8	27	87.1	26	83.9		
Teaching and presentation skills								
- Poor	19	61.3	1	3.2	1	3.2		
- Fair	5	16.1	1	3.2	3	9.7	43.571*	<0.001***
- Good	7	22.6	29	93.5	27	87.1		

Fr: Friedman test   p: p value for comparing between the studied periods
*: Significant at $p \leq 0.05$ ***: very highly significant

Table (4):Level of head nurses' total role performance of infection control items pre, immediate, and 3 months post program, (N=31).

Total role performance	Head nurses performance						Fr	P
	Pre		Immediate Post		3 months post			
	n	%	n	%	N	%		
Educational role								
- Mild	28	90.3	1	3.2	1	3.2		
- Moderate	1	3.2	3	9.7	4	12.9	51.152*	<0.001***
- High	2	6.5	27	87.1	26	83.9		
Consultation role								
- Mild	28	90.3	1	3.2	1	3.2		
- Moderate	2	6.5	2	6.5	4	12.9	53.766*	<0.001***
- High	1	3.2	28	90.3	26	83.9		
Administration role								
- Mild	17	54.8	1	3.2	1	3.2		
- Moderate	6	19.4	1	3.2	1	3.2	42.087*	<0.001***
- High	8	25.8	29	93.5	29	93.5		
Research role								
- Mild	28	90.3	1	3.2	1	3.2		
- Moderate	1	3.2	3	9.7	5	16.1	50.667*	<0.001***
- High	2	6.5	27	87.1	25	80.6		
Supervision role								
- Mild	18	58.1	1	3.2	1	3.2		
- Moderate	5	16.1	1	3.2	1	3.2	42.087*	<0.001***
- High	8	25.8	29	93.5	29	93.5		
Support team in surveillance								
- Mild	28	90.3	1	3.2	1	3.2		
- Moderate	2	6.5	2	6.5	3	9.7	54.280*	<0.001***
- High	1	3.2	28	90.3	27	87.1		
Risk management								
- Mild	21	67.7	1	3.2	1	3.2		
- Moderate	4	12.9	2	6.5	3	9.7	44.333*	<0.001***
- High	6	19.4	28	90.3	27	87.1		

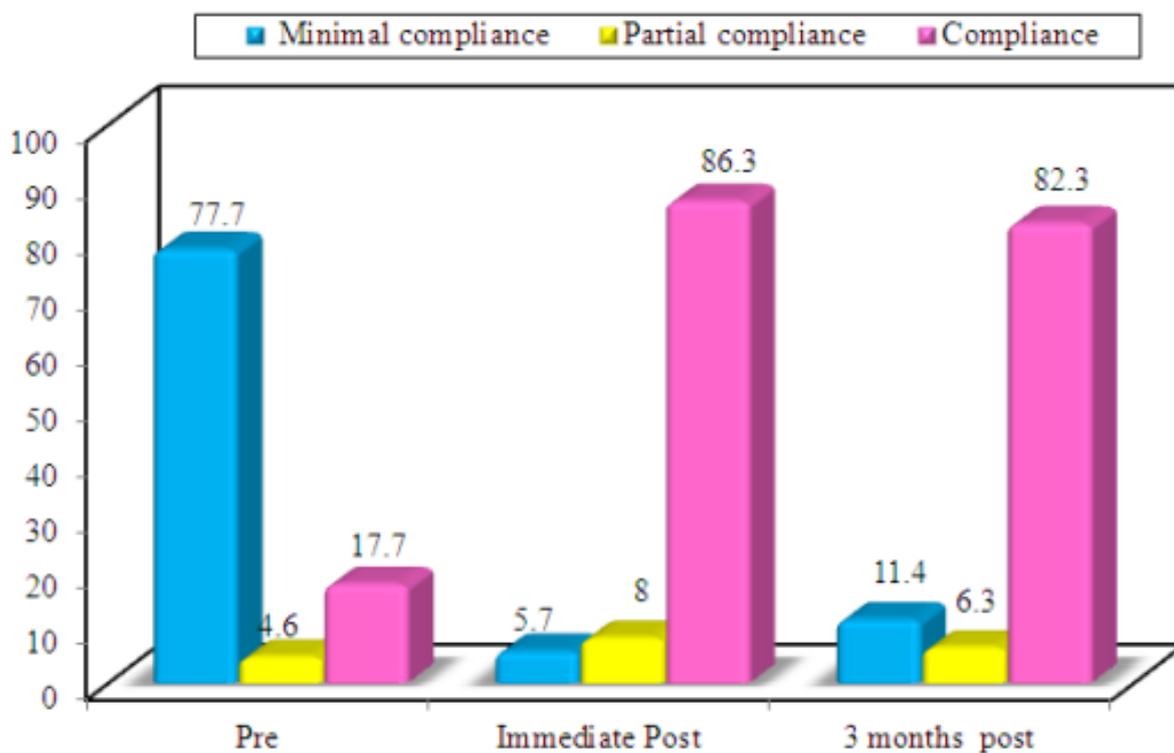**Nurses' compliance to infection control practices**

Figure (3): Levels of nurses' compliance of total infection control practices pre, immediate, and 3 months post program,   (N=175).

Table (5): Nurses levels of total compliance about seven infection control practices sub-scales pre, immediate, and 3 months post program, (N=175).

Total compliance to infection control practices	Nurses' compliance						Fr	P
	Pre		Immediate		3 months post			
	N	%	N	%	N	%		
1.Hand hygiene.								
- Minimal compliance	133	76.0	9	5.1	20	11.4	194.667*	<0.001***
- Partial compliance	7	4.0	13	7.4	11	6.3		
- compliance	35	20.0	153	87.4	144	82.3		
2.Respiratory hygiene and cough etiquette.								
- Minimal compliance	133	76.0	10	5.7	20	11.4	187.375*	<0.001***
- Partial compliance	7	4.0	15	8.6	11	6.3		
- compliance	35	20.0	150	85.7	144	82.3		
3.Wearing protective equipment.								
- Minimal compliance	136	77.7	11	6.3	21	12.0	203.394*	<0.001***
- Partial compliance	8	4.6	16	9.1	12	6.9		
- compliance	31	17.7	148	84.6	142	81.1		
4.Aseptic techniques								
- Minimal compliance	136	77.7	13	7.4	25	14.3	189.477*	<0.001***
- Partial compliance	8	4.6	16	9.1	13	7.4		
- compliance	31	17.7	146	83.4	137	78.3		
5.Management of sharps and needle stick injuries						14.3		
- Minimal compliance	136	77.7	12	6.9	25		190.588*	<0.001***
- Partial compliance	8	4.6	17	9.7	14	8.0		
- compliance	31	17.7	146	83.4	136	77.7		
6.Waste disposable.								
- Minimal compliance	122	69.7	8	4.6	19	10.9	181.703*	<0.001***
- Partial compliance	13	7.4	12	6.9	9	5.1		
- compliance	40	22.9	155	88.6	147	84.0		
7.Environmental cleaning and spills-management.								
- Minimal compliance	125	71.4	8	4.6	19	10.9	176.505*	<0.001***
- Partial compliance	10	5.7	12	6.9	10	5.7		
- compliance	40	22.9	155	88.6	146	83.4		

Table (6): Nurses levels of total compliance about five infection control practices sub-scales pre, immediate, and 3 months post program, (N=175).

Total compliance to infection control practices	Nurses' compliance						Fr	P
	Pre		Immediate		3 months post			
	N	%	N	%	N	%		
8.Handling and disposal of linen.							179.178*	<0.001***
- Minimal compliance	125	71.4	8	4.6	19	10.9		
- Partial compliance	10	5.7	12	6.9	11	6.3		
- Compliance	40	22.9	155	88.6	145	82.9		
9.Management of patient equipment							181.766*	<0.001***
- Minimal compliance	144	82.3	30	17.1	35	20.0		
- Partial compliance	0	0.0	0	0.0	0	0.0		
- Compliance	31	17.7	145	82.9	140	80.0		
10.Cleaning, disinfection and sterilization.							187.863*	<0.001***
- Minimal compliance	130	74.3	10	5.7	19	10.9		
- Partial compliance	10	5.7	14	8.0	10	5.7		
- Compliance	35	20.0	151	86.3	146	83.4		
11.Human resources.							194.993*	<0.001***
- Minimal compliance	140	80.0	14	8.0	26	14.9		
- Partial compliance	8	4.6	19	10.9	17	9.7		
- Compliance	27	15.4	142	81.1	132	75.4		
12.Isolation precautions							–	–
- Minimal compliance	175	100.0	0	0.0	0	0.0		
- Partial compliance	0	0.0	175	100.0	175	100.0		
- Compliance	0	0.0	0	0.0	0	0.0		

Nursing staff correlations
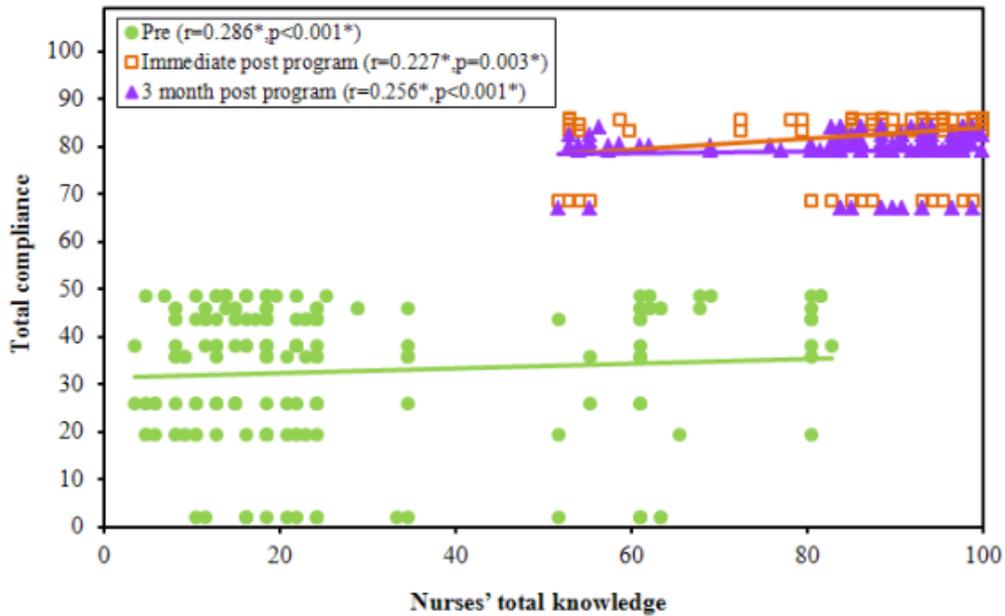
Figure (4): Correlation between nurses' total knowledge and compliance about infection control practices pre, immediate, and 3 months post program, (N=175).
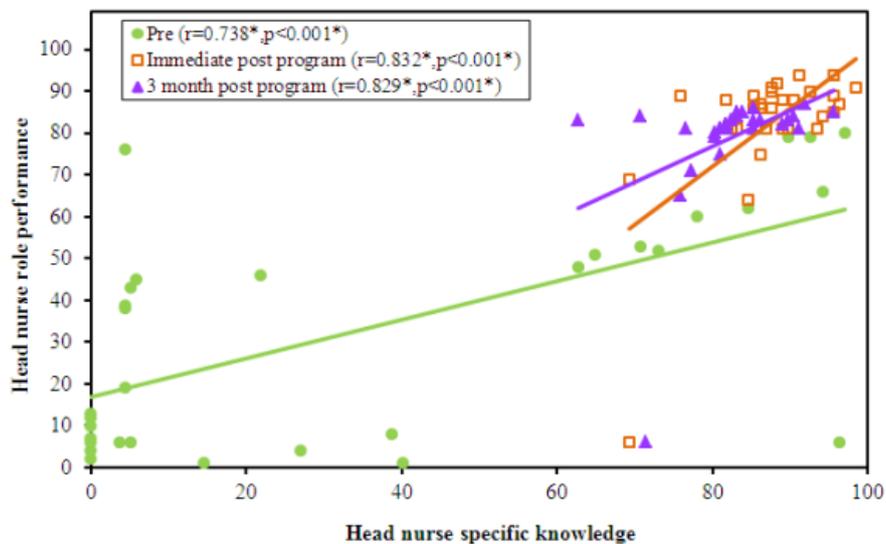

Figure (5): Correlation between head nurse specific knowledge and their role performance on infection control pre, immediate, and 3 months post program, (N=31).
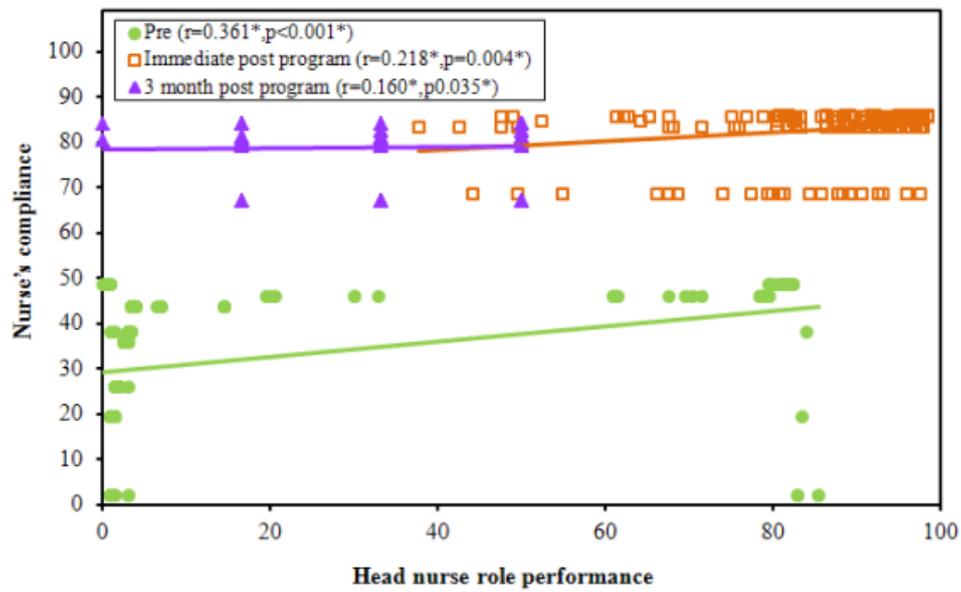
Figure (6): Correlation between head nurse role performance and nurse's compliance about infection control pre, immediate, and 3 months post program(N=206).

Discussion

The findings of this study showed that most nurses had a poor knowledge (43%), an average practice (42%), and a moderate attitude (37%) about HAI control. The results of this study are not consistent with the results of a study conducted by Yang Luo et al. in China on 1,444 nurses, in which they assessed the knowledge of nurses about standard precautions as average (Luo et al., 2010). In their study on the knowledge, attitude and practice of nurses in the context of HAI control, Ghadamgahi et al. concluded that most nurses do not have a good knowledge of HAI (Ghadmgahi et al., 2011). The results of this study are not consistent with the finding of the study by Gould et al. on 173 nurses working in three wards (ICU, Medical-surgical wards), in which they assessed the knowledge of nurses about standard precautions as low (Gould & Chamberlain, 1994). The results of a study by D'Alessandro et al. showed that 90.8% of students had a poor knowledge about infection control (D'Alessandro et al., 2014). The results of another study by Sodhi et al. showed that more than 90% of ICU nurses had a very good knowledge of infection control (Sodhi et al., 2013). Chan's study also showed that 56%

www.ccsenet.org/gjhs   Global Journal of Health Science Vol. 8, No. 3; 2016 196 of nurses had a good knowledge about infection control and 79% of them had a good practice in relation to standard precautions for infection control (Chan et al., 2002). Allah-Bakhshian et al. assessed the knowledge, attitude and practice of ICU nurses working at training centers in Tabriz, Iran, about hospital infection control and concluded that the majority of nurses in this study had an average knowledge about HAI control (Allah-Bakhshian et al., 2010). It is important to note that the knowledge of nurses about HAI depends on many factors, including individual and educational characteristics, training courses, and managerial and motivational factors. In their study on the knowledge, attitude and practice of different groups of healthcare personnel about infection control, Suchitra et al. concluded that training has a positive impact on the improvement of knowledge, attitude and practice in healthcare personnel. They also suggested that the development of a continuous training program for all healthcare workers is necessary (Suchitra, 2007). Training courses have been shown to be effective in promoting the knowledge and practice of

health care personnel in the UK (Elliott et al., 2005). Training and knowledge improvement are the most effective ways to fight HAI.

Obviously, continuous training and knowledge improvement besides the use of appropriate and effective methods of disinfection and sterilization will reduce the frequency of developing HAI (Askarian et al., 2004).

The results of a study by Nasirudeenet al. on the knowledge and practice of students in Singapore showed that 66.3% of them had a have good practice and 48.9% of them had a good knowledge about hand hygiene (Nasirudeen et al., 2012). It seems that since infection control topics are not included in academic nursing courses and since they are not dealt with in the work environment either, nurses have a poor knowledge in this area. Therefore, considering the guidelines on the treatment of hospital infection - that nurses should be trained and retrained at least twice a year (Bischoff et al., 2000)- differences in the results can be interpreted. There was a significant relationship between knowledge and gender which is consistent with the results of the study (Ghadmgahi et al., 2011). The results of the present study showed that nurses have a poor practice in

the prevention of HAIs (Akyol, 2007). Bischoff et al. claimed that under normal conditions, the frequency of hand washing by doctors and nurses was at an unacceptably low level. A study in India reported less than desirable levels of practice among healthcare personnel (Bischoff et al., 2000). Akyol (2007) noted that hand hygiene compliance by healthcare workers was at a poor level. This is not consistent with the results of the study by Allah-Bakhshian in which almost all participants (99.1%) had an average practice in relation to infection control (Allah-Bakhshian et al., 2010). A study in Jamaica showed that 85% of nurses, despite having the knowledge, did not observe all safety precautions when performing nursing procedures (Figueroa et al., 1997). Mahmoudi andHassani (2000) stated that the mere having of knowledge does not lead to good practice so attitudes should also change and belief structures should be reworked in a rigorous and scientific manner to achieve proper practice. There was a significant relationship between knowledge and practice in the present study. The study by Lou also reported a significant relationship between knowledge and practice(Luo et al., 2010). One of the limitations of this study is that

the sample population does not represent all nurses in Iran.

5. Conclusion

According to the results, most nurses do not have a good knowledge and practice about infection control despite

having an average efficacy. Therefore, it is necessary that Iran's Ministry of Health and Medical Education and the subsidiary universities do their best to inform the nurses and all the medical personnel about the prevention of HAIs according to world standards and tailored to each region's ecology by way of academic courses, posters, and conferences. It is also necessary to improve the knowledge of standard precautions, develop progr.

Majority of present study head nurses have deficit of the specific knowledge of their role on infection control. They didn't realize that they should influence compliance with infection control precautions through acting as role model and consultant for nurses. They lack knowledge about their role to monitors nurses' performance adherence to infection control policies, to educate and supervise them. They need clear definition of their responsibilities, knowledge about surveillance, teaching activities,

implementation of preventive measures and management support.

Ideally head nurses necessary to be knowledgeable about their role on infection control, management and leadership skills, risk management, surveillance and auditing, teaching and presentation skills. They are the constellation of key activities perceived as essential for the delivery of knowledgeable; competent legally and ethically based nursing care to patient in the ward. They play very important role in controlling hospital infectious and their specific knowledge is most important factor to perform their role. Head nurse play an important role in addressing the interpersonal skills of nurses and providing an ongoing education on collaboration in the practice setting.

Head nurses need to have knowledge about best course of action, leadership style for each situation and methods for maintaining healthy work environment depending on effective planning and organizing of work. **Millward (2018)**[32] support this study finding, and found gaps of head nurses' specific knowledge.

Head nurses role performance

Head nurses of present study showed mild level of performing their educational,

consultation, research, surveillance, risk management, administration and supervision roles. These results can be explained by their excessive work load, organizational barriers, inadequate specific knowledge, and excessive administrative duties. Currently head nurses roles are becoming increasingly complex and challenging require strong leadership to motivate staff to comply with infection control measures. Really those head nurses need periodical educational and training programs to carry out their responsibilities and professionally lead nursing staff to comply with measures of infection control in practices.

Millward (2018)[33] indicated that head nurses don't perform their role in infection control due to their knowledge deficiency and improper training for their role.

Mahdy and Mahfouz (2016)[34] found that participants not attend educational programs relevant to professional interest and not improve self-professional knowledge and competence.

Results of pre-program revealed that head nurses didn't orient new member of staff to be aware with the standards infection control. Even they didn't create resource files, or give hands-out to guide them and not give any practical teaching. They neither act as role model in demonstration any of proper practice nor create learning environment to reinforce culture among nursing staff. Apparently, those head nurses failed to be an educator, while education is an expected core competency for them but they are not prepared for educator role. This gap leads to a narrow conceptualization of education, limited application of theory and not using attractive teaching method.

Theoretically head nurses as an educator provide information to assist in education of staff and act as a resource person for staff concerning infection control and should provide an effective learning environment. Really, the educational role of head nurse central to every effort to reduce the risk to patient's infection. They are most valuable for day to day educational activities, give advice, make day-to-day decisions and connect with staff in all areas where potential risks of infection exist. Ensuring the use of safe, effective and ethical infection prevention and control measures is an important component of educational role[35].

Meyers(2017)[36] supported the present study, and reported that infection prevention and control programs are charged with educating healthcare workers

to prevent the spread of such microorganisms and infections. **Williams et al (2016)**[35] assert that the function of head nurse as teachers supporting the evidence practice as well as promoting collegiality and trust relationships with clinical staff.

Present study findings illustrated that pre-program more than half of head nurses had mild level of risk management role performance for infection control. Infection control risks can stem from a variety of areas in a healthcare organization, and most can lead to significant patient or staff harm. Some common examples include lack of hand hygiene, unsafe injection practices, poor cleaning, and disinfection, sterilization of instruments and scopes and inadequate environmental cleaning.

Ideally head nurse should protect staff nurses and patient from risks by written action plans with time lines for risk situations, identify tasks and activities that put patient healthcare workers & visitors at risk and monitor effectiveness of reduced risk measures. Risk management is a structured method to identify, evaluate, avoid or reduce hazards in healthcare. It assists with prioritizing risks

and is an essential part of the quality management programme[37].

Farokhzadian et al (2018)[38] supported present study result and found that poor working condition due to lake of nurse leader role in managing risk. **Also, Burns(2016)**[37] revealed that head nurses not identify tasks and activities that put patient healthcare workers & visitors at risk and not monitor the effectiveness of measures which place to reduce the risk.

Nurses compliance to infection control practices

Results revealed that majority of nurses showed minimal compliance level of total infection control practices pre- program. Actually those nurses lack knowledge about infection control principles and practices, beside the absent of head nurses supervision, management, leadership and teaching roles. Apparently both nurses and head nurses were in need for management educational training program to improve their knowledge, and to improve head nurses performance of roles as well as nurses' compliance to infection control practices.

Especially head nurses' supervision is concerned with high level of nurses' compliance to infection control practices. Indeed understanding basic principles and

practice them consistently whenever it is essential is very important. Moreover, up-to-date knowledge and skill regarding infection control practices could also increase the confidence of nurses in complying with recommended guidelines.

Haile et al (2017)[39] and **Hassan et al (2017)**[40] supported present study finding and reported that nurses have low level of compliance with infection control practices due to lack of knowledge and training.

The possible explanation for this finding could be the fact that training on current infection control practices could upgrade the knowledge and skill of nurses in that they would easily understand basic principles, recommendations, and standards of practice and implement them consistently whenever it is essential.

Analysis of results revealed that few nurses showed compliance level of total hand hygiene practice pre- program. The result showed minimal or partial compliance for practice in hand hygiene which might be due to carelessness or might be related to forgetfulness, ignorance of guidelines. Most probably their was insufficient time, high workload, or skin irritation by hand hygiene agents. Many nurses may felt that gloves hinder their skillful performance of

duties especially in situation that calls for immediate intervention.

No doubt that those nurses have potential to spread microorganisms that may result in infection due to greatest potential contact with patient. The most important mechanism of spread of HAIs is via the contaminated hands of nurses. Those nurses should obliged to wash hands before and after touch of patient, before donning sterile gloves for any procedure, after removing gloves and after contact with body fluids or excretion. Also, they must keep finger nails clean, short and free from nails polish as well as before wash hands remove watch, rings and other jewelry.

Garcell et al (2019)[41] and **Tang et al (2019)**[42] Both studies revealed that washing hands compliance was lowest before touching a patient and before aseptic procedure. **Salem (2019)**[43] find that the majority of nurses had a poor practice of hand washing before and after procedure gloving. And stated that although, presence of accessible supplies the health care workers' adherence to hand washing is poor.

But, **Piai-Morais et al (2015)**[44] reported that majority of the participants reported they commonly do hand

hygiene after the end of procedure . Also, **Majeed et al (2018)**[45] revealed that compliance to hand hygiene was highest after patient procedures , after touching the patient surrounding, after exposure to body fluids and before a clean/ aseptic procedure as well as before touching the patient.

Majority of nurses showed minimal compliance level to total respiratory hygiene and cough etiquette items pre- program. They not cover nose and mouth with a disposable tissue when sneezing or coughing, not wear mask for patient with symptoms of respiratory infection and not discard masks

and contaminated tissues in appropriate place. This result on hand with **Gemmae et al (2019)**[46], revealed that health care workers in emergency departments were viewed as not following protocol to compliance respiratory hygiene and cough etiquette because they thought risk was ever-present.

Also**, Yeboah(2019)**[47] found that high percent of nurses have suffered from pneumonia, tuberculosis and influenza following contact with patients without wearing mask and not apply protective measures. In contrast, **Chughtai et al**

(2016)[48] found that use of masks amongst healthcare professional was77%.

Study findings illustrated that majority of nurses had minimal level of compliance to total practice of wearing protective equipment pre- program. The researcher observed that those nurses not select correct, not put on or remove safety personal protective equipment, not disposed decontaminated one but reuse it for another patient. Also, they not stored protective equipment in a clean/dry area and not keep all personal protective equipment located close to point of use.

Those nurses need to train to use personal protective equipment when caring for patients and to change it immediately after use and before contact with another patient. They have to pay attention that medical gloves must be discarded in proper place and after single patient use. While, head nurses responsible to assure the availability of such devices and that nurses were well trained to correctly put it on and remove. The use of personal protective equipment usually requires special expertise in selecting the appropriate equipment or clothing; select the proper size for each staff member and assuring proper fit.

Khalil et al (2019)[49] supported present study result and nurses had unsatisfactory practice regarding personal protective equipment and infection control measures. Finding is in the same line with **Haile et al (2017)**[39] and reported higher proportions of nursing staff were not always compliant with using of personal protective equipment due to lack of up- to date training on the principles of standard precautions and lack of management support.

Conversely, **Soyam and Khaks (2017)**[50] not supported present study finding and revealed that practices of wearing personal protective equipment were better. They emphasized that provision of personal protective equipment was reported by significantly more nursing staff that have worked in the health sector for longer periods and were very aware of universal precautions compared with those who were somewhat or not aware.

Findings illustrated that majority of nurses had minimal level of compliance to total practice of aseptic techniques items pre-program. Apparently those nurses and patient are exposed to high risk biological hazards because they didn't use aseptic technique. Nurses need to know that aseptic technique is a key component of standard precautions which are intended to prevent or minimize the risk of introducing harmful infectious agents into sterile areas of the body, Really when nurses undertaking clinical procedures and without adequate training about aseptic technique they will harm patient, as well as and themselves. They need to know and understand application of the principles of aseptic techniques.

Chepkok J (2016)[51] found that few of the participants maintained the aseptic technique practice throughout the procedure while majority did not apply. Conversely, **Verma et al (2018)**[52] didn't support the present study finding and found that majority of nurse had good knowledge and practice regarding aseptic technique and stated that it is the key issue for better health.

Post program

Results of post program revealed statistical significant improvement in head nurses' knowledge and role performance as well as nurses' knowledge and compliance regarding infection control measures. Nursing staff improvement could be due to their calling needs for knowledge and training about infection control and effectiveness of the intervention program. Apparently head nurses and nurses become

knowledgeable about principles of infection control for reducing morbidity and improving the quality of care. Also, their improvements reflect that head nurses' realized their role and responsibilities toward nurses' compliance for infection control practices.

El-Ashmawy (2017)[53] found significant improvement in the mean knowledge score and performance of nurses to infection control practices immediately and three months post program implementation. Also, **Gaikwad U (2018)**[54] showed that educational intervention had a significant impact on the improvement in the knowledge of nursing staff. Beside, **Mu et al (2016)**[55] found significant improvement in compliance with hand hygiene after intervention.

Finding revealed that there were statistically significant positive correlation between nurses' total knowledge and compliance about infection control pre, immediate, and 3 months post program. This finding highlights their need of knowledge as pre requisite for practice improvement. Those nurses changed and understand that accurate information is essential to compliance practice of infection control. Educational programs should be organized according to the needs

of nurses with continuous evaluation. **El-yosef et al (2019)**[22] supported the present finding and revealed that there was significant positive correlation between knowledge and performance of the nurses about infection control measures.

Statistically significant positive correlations found between head nurse' specific knowledge and their role performance pre, immediate, and 3 months post program. Educational program assist those head nurses on how to be at good level in performing their role, having ability in their profession, being independent, having control over their work, and be self-directing. As well as they possess good knowledge and effective skills to perform their roles effectively. **Millward (2018)**[35] reported that educational program prepared head nurses for their role, surveillance and reporting are robust, and patient safety is enhanced through prompt detection of infection risk and appropriate action.

Present study finding revealed that there were statistically significant positive correlation between head nurse role performance and nurse's compliance about infection control pre, immediate, and 3 months post program. Optimal patient care requires collaboration between head nurses

and nurses. A lack of unity and unresolved tension among different types of nurses influences collaboration and has significant implications on practice and the organizations. Head nurse play an important role in addressing the skills of nurses and providing an ongoing education on collaboration in the practice setting.

Létourneau(2018)[56] supported the present study finding and revealed that there were significant positive correlation between head nurse role performance and nurse's compliance to hand hygiene practice. **Also, Peter (2018)**[57] found that there is a link between head nurses role performance potential and nurses compliance to infection control measures to decrease health care-associated infections.

Apparently, implementation of current management training program was succeed as mean for improving nursing staff basic knowledge about infection control. Specially give head nurses specific knowledge essential to perform their different roles about infection control. Really it assists nurses to better compliance to infection control measures, protect themselves and patient and provide high quality care. Emergency hospital need to take serious actions to provide support

and resources for nursing staff. Such as orientation, periodical educational training opportunities to prepare novice nurses and maintain head nurses roles to best nursing staff compliance with infection control practices.

Conclusion

Nursing staff at Tanta Emergency hospital were at low level of knowledge on infection control pre-program. There was lacking of head nurses roles performance and nurses compliance to infection control practices. But implementation of well designated management program significantly improved nursing staff basic knowledge about infection control. As well as improved head nurses specific knowledge, responsibilities and roles performance. Adding that nurses' compliance to infection control practices significantly improved also. Apparently head nurses and nurses required to be enforced by orientation program pre-employment and periodic in-service training programs to develop head nurses skills for role performance and efficiently supervising nurses compliance to infection control practices.

Recommendations

-Attention to conducting regular workshop to enforce head nurses role performance on infection control.

-Advertise infection control guiding polices and standards at recognized place to be available to nursing staff.

-Activate the role of infection control committee in hospital.

- Prime importance emergency wards be equipped with needed supplies, protective equipment and experienced trained nurses on infection control practices.

Head Nurses

-Novice nurses should have pre-employment orientation program about infection control.

-Head nurses should attend periodic in-service training programs about their role in infection control.

-Head nurses should supervise and direct nurses to wear protective equipment for infection control.

-Make monthly statistics on surveillance of hazards at their units.

-Prime importance makes recognition for nurses whom have well compliance to infection control practices.

-Encourage culture of infection control compliance among nurses, patient and families.

Recommendations for further research:

More studies should be conducted to

-Analyze factors predisposing to lack of compliance with infection control practices at emergency hospital.

-Barriers of head nurses' role performance and solutions.

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