The Effect of Chlorhexidine versus Alcohol Povidone-Iodine on Occurrence of Central Venous Catheter Infection among Critically Ill Patients

Soheir Mohamed Weheida[1], Aml M. EL-Badawy[2], Manal E. Fareed[*2], Aza Z. Labeeb[3] and Shimaa E. Ibraheem[2]

Department of Medical Surgical Nursing[1], University of Alexandria , Adult Health Nursing Department[2], Faculty of Nursing, Menofia University. Microbiology department[3], Faculty of Medicine, university of Menofia, Egypt
[*]manalfareed2008@yahoo.com

Abstract: This study was carried out to compare the effect of Chlorhexidine gluconate 0.25% versus alcohol 70% Povidone-iodine 10% on occurrence of central venous catheter infection among critically ill patients. A sample of 60 patients divided randomly and alternatively into two equal groups; 30 patients for each one. For Group I: dressing of central venous catheter was done using Chlorhexidine gluconate 0.25%, while for Group II: dressing of central venous catheter was done using alcohol 70% in Povidone-iodine 10%. The study was conducted in Intinsive Care unites and Critical Care Department of Menofia University Hospital . Two Tools were applied for the study: tool 1: An interviewing questionnaire ,it includes two parts , tool 2: Biophysiological measurement tool , it consists of three parts. The results revealed that the mean age for group I and group II were 48.33± 9.47, 49.80±7.94 years, respectively. Infection occurred was 3.3% for group I and 23.3% for group II. This infection occured in the sixth day for group I,while most of infection among group II occured in the third day.The centeral venous catheter infection rate for study group I was significantly less than study groupII. The most common microorganisms present in central venous catheter sites for both groups were *Staph. Aureas*. It is conculded that, the occurrence of infection for the catheters disinfected with Chlorhexidine gluconate 0.25% were significantly lower than those disinfected with alcohol 70% Povidone - iodine 10%. Moreover, there were no side effects of both used antiseptic solutions among patients of the both groups.It is recommended that , useing Chlorhexidine0.25% to prevent or avoid catheter related infection and a strict written procedural manual for nurses about caring for critically ill patients with central venous catheter should be available and should be revised continuously.
[Soheir Mohamed Weheida, Aml M. EL-Badawy, Manal E. Fareed, Aza Z. Labeeb and Shimaa E. Ibraheem,**The Effect of Chlorhexidine versus Alcohol Povidone-Iodine on Occurrence of Central Venous Catheter Infection among Critically Ill Patients**]. Nature and Science 2011; 9(9): 39-48]. (ISSN: 1545-0740).
http://www.sciencepub.net.

Keyword: Effect, Chlorhexidine, Alcohol Povidone-Iodine, Central venous catheter infection, critically ill patients

1. Introduction

Central venous access system is defined as a placement of a catheter in a central vein such as internal jugular or subclavian vein that lead directly to the heart through the superior or inferior vena cava for many purposes such as monitoring central venous pressure, pulmonary capillary wedge pressure, cardiac output, nutrition and feeding, cardiac pacing and /or administering intravenous solutions and blood products [(1).]

This catheter has critical complications such as Pneumothorax, hemothorax and/ or infection. The infection is most likely to occur during the insertion of the central venous catheter, dressing changes, changing infusion bags or bottles and adding substances to infusion bags. Risk of infection is influenced by the adequacy of asepsis maintained, the solution and technique used to disinfect the skin prior to insertion, the type of dressing and the catheter material. Infection may also occur because of movement of the catheter and inadequate training of nurses. Moreover, an increased length of time of the catheter and a larger number of catheter ports and lumens also increase the risk of infection [(2-3).]

Central venous catheter related nosocomial infections in intensive care unit was higher three times than elsewhere in hospitals and constitutes of 11.3% of all nosocomial infection that increases the morbidity and mortality of hospitalized patients in Intensive care unites. The rate of mortality may reach up to fifty percent among those patients [(4).]

In Egypt, the average central venous catheter' infection were 4.5 to 6.1 per 1000 catheter in medical and surgical Intensive care unit [(5).] In Alexandria University Hospital, the average of about 500–600 patients were admitted annually to the Intensive care unites, 25% of those patients were suffered from catheter related infection**.** The infection rate for femoral vein was 40%, while 20% in the internal jugular vein and 45.4% in subclavian vein [(6).]

Catheter related infection is particularly increased in patients with neutropenia, heamodialysis and hematological disorders and acquired immune deficiency syndrome (AIDS) [(7).] More than 50% of all infections are caused by gram positive aerobes from the skin such as *staph aureus, staph epidermis,*

and streptococcus species and about 25% to 33% of infections are caused by gram negative aerobes from the gastrointestinal tract such as *E. coli, Kelbsiella, and Pseudomonas aeruginosa* [8].

The nurses in Intensive care unites play an important role in preventing and controlling central venous catheter infection through good hand hygiene before catheter insertion or maintenance combined with proper aseptic technique during catheter manipulation and full barrier precautions during central venous catheters insertion to provide protection against infection and reduce morbidity and mortality [9].

The skin around the catheter insertion site should be decontaminated with an antiseptic agent. Chlorhexidine gluconate 0.25% and Alcohol 70% in Povidone-iodine 10% are much more effective in eradicating catheter related infection than conventional antimicrobial therapy. Chlorhexidine gluconate 0.25% is a widely used antiseptic and antibacterial solution. Its concentration permits the exertion of a bacteriostatic effect. It causes irreversible bactericidal activity as the result of causing disruption of the integrity of the cell membrane and leakage of intracellular components of the organisms that occur immediately after its absorption onto the organism's cell wall. Its effects can lasts for 6 hours after one application [3, 10].

Alcohol 70% in Povidone-iodine 10% is the widest scope of antimicrobial activity, killing all principal pathogens such as gram positive and gram negative bacteria as most fungi, yeasts, viruses and protozoa. It works through disruption of pathogenic cell walls and used in hospitals for cleansing, disinfecting the skin and preparing the skin preoperatively [11].

Various researches suggested that Chlorhexidine 0.25% has been the most widely used antiseptic solution for cleansing central venous catheter insertion site; it significantly reduced the incidence of microbial colonization of catheters and prevents catheter related blood stream infection as compared with alcohol 70% in Povidone-iodine 10% [12].

Aim of the Study

The aim of the present study was to compare the effect of Chlorhexidine gluconate 0.25% versus Alcohol 70% Povidone-iodine 10% on occurrence of central venous catheter infection among critically ill patients.

Research Hypotheses

The following research hypothesis was formulated to achieve the aim of the study:

- There will be a decrease in the occurrence of central venous catheters infection in patients who will dressed by Chlorhexidine Gluconate 0.25% compared to patient's who will dressed by alcohol 70% povidone-iodine10%.

2. Material and Methods

1-Material

Design:

An experimental research design was utilized to achieve the aim of this study.

Setting:

The study was carried out at Intinsive Care Unites: Surgical; Medical; Cardic;Chest and Neurological unites and Critical Care Department of Menofia University Hospital .

Subjects:

Subjects of this study were compromised of 60 patients divided alternatively and randomly into two equal groups; 30 patients each.

- Group (I) dressing of central venous catheter was carried out for them using Chlorhexidine gluconate 0.25%.
- Group (II) dressing of central venous catheter was carried out for them using alcohol 70% Povidone-iodine 10%.

Inclusions criteria:

- Patients were randomly selected immediately after insertion of central venous catheter within 24 hours.
- Both sexes.
- Age range from 21 to 60 years old.
- Have normal vital signs.
- Expected not to remove central venous catheter before 7 days.
- Free from any risk factors for infection as diabetes or immuno-compromised diseases.
- Willing to participate in the study.

Tools:

Two tools were developed and utilized by the researchers except part I of tool II and part B of the same part, based on review of the related literature. These tools are:

Tool I : An interviewing questionnaire:

It was developed by the researchers to assess patients clinical data. It comprised of two parts:

Part one : Sociodemographic Data

It included information about patient's age, sex, marital status, level of education and occupation.

Part two: Clinical Data

It was comprised of questions about primary

diagnosis, fluid or medication prescribed, number of other inserted invasive tubes or catheters and central venous catheter insertion site.

Tool II : Biophysiological measurement tool:

It was developed by the researchers except part I that was developed by Penwarden and Montgomery [13] and part B of the same part was developed by Bain *et al.* [14] and modified by the researchers to collect data about physical findings of central venous catheter infection. It included three parts:

Part one: Clinical observational data:

It was develop by Penwarden and Montgomery [13] and utilized by the researchers to observe the patient's signs and symptoms of central venous catheter infection for seven days post dressing and post insertion. It included the following :

A. Vital signs as temperature, pulses rate and characteristics, respiratory rate and characteristics and blood pressure.
B. Localized pain at insertion site: It was assessed by using visual analogue pain scale (VAS) which developed by Bain *et al.* [14] to record pain intensity. The measurement is from zero to ten to rate the patient's level of pain.

The measurement parameters were included of four items. A score of zero mean no pain, while a score of 1-3 denoted mild pain and a score of 4-6 indicated moderate pain while a score of 7-10 illustrated worst pain.

C. Presence of exudates or drainage: The researchers assessed the following:

1-Amount: It was measured by using centimeter. The measurement is from zero to ten to determine the amount of drainage. The measurements were:

- Zero cm illustrates no drainage.
- 1-3 cm denoted mild drainage.
- 4-6 cm indicated moderate drainage.
- 7-10 cm illustrated sever drainage.

2- Color if yellow, green or red

3-Odor if normal or offensive

4-Consistency: It was measured by using sterile cotton. If the cotton completely absorbed the drainage, it indicated liquid drainage. While if the cotton was partially absorbed the drainage, it indicated semi liquid drainage, and if the cotton did not absorb the drainage, it indicated thick drainage.

Of note: All subjects had no exudates all over the period of the study.

B. Other signs and symptoms of infection around central venous catheter insertion site as redness, hotness, tenderness or swelling, chills and /or bone ache.

Part two: Laboratory Findings**:**

Specific diagnostic assessments were carried out to assess presence of CVC infection and side effect of both antiseptic solutions. It included the following:

1- Swap cultures that were taken if signs and symptoms of infection appear. These swaps were taken from:

a. Insertion sits of central venous catheter.
b. Patient's skin.
c. Physicians and nurses hands that cared for the infected subjects.

2- Kidney function.

3- Serum sodium level.

4- Blood PH.

Part three : Side effect of the used antiseptic solutions**:** It was developed and utilized by the researchers to assess the side effects of antiseptic solutions used .It was comprised of two sections:

Section A : Assssment of side effect of Chlorhexidine gluconate 0.25% **:** as skin irritation, blistering, burning, itching, swelling of hand and face, skin rash, Peeling and allergies**.**

Section B:Assessment of side effect of Alcohol 70% povidone-iodine 10% as:

a) Signs of skin reactions such as rash, itching, redness and hotness.
b) Signs of kidney affection such as edema of lower, limb, high blood pressure, fatigue, vomiting, diarrhea and oral ulcer.
c) Signs of Hypernatremia as thirst, dry swollen tongue and sticky mucous membranes, flushed skin, restlessness and weakness.
d) Signs of metabolic acidosis as headache, drowsiness, increase respiratorty rate and depth, nausea and vomiting**.**

Of note: All subjects did not suffer from these side effects of antiseptic solutions used all over the period of the study.

2-Methods

1-Written approval: an official written permission to carry out the study was obtained from the hospital directors and the head nurses of the units prior to data collection and after explaining the significance of the study and its purpose.

2-Tools development: The study tools were devloped by the researchers except part I of tool II was developed by Penwarden and Montgomery [13] and part B of part one of tool II was developed by Bain *et al.* [14]. All tools were submitted to jury of 5 experts in Nursing and Medical field to obtain its content validity. Modifications were done accordingly.

3-Verbal consent: The researchers obtained a verbal consent for participation in the study from all subjects after introducing themselves to every participant, explaining the purpose of the study, and assuring that the confedentiality would be maintained throughout the study.

4-Pilot study: A pilot study was carried out before starting data collection on 6 patients to evaluate the tentative developed tools for clarity and applicability and to estimate the time needed to collect data then necessary modifications were carried out before actual study.Data obtained from the pilot study were excluded from the study.

5-Data collection:

a- Data were collected from **1/2009 to 4/2009.**

b- The subjects who fulfill the inclusion criteria were selected randomly and divided alternatively into two equal groups, study group (I) and study group (II). 30 patients for each

c- All participants were interviewed individually at Intinsive Care Unites: Surgical; Medical; Cardic; Chest and Neurological unites and Critical Care department to collect data about sociodemographic and clinical characteristics using tool I.

d-All nurses who worked in ICU unites were instructed about the performance of infection control measures related to dealing or caring with patient who had central venous catheter such as hand washing , wearing personal protective barrier as sterile gloves and masks and they were instructed about how to maintain principles of aseptic technique.

e- Dressing was done for both groups for seven days by the researchers following the principles of aseptic technique.

*For group I dressing was done using Chlorhexidine gluconate 0. 25% for skin disinfection around catheter site daily and for seven days post dressing.

* For group II dressing was done using alcohol 70% Povidone-iodine 10% for skin disinfection around catheter site daily and for seven days post dressing.

f-All participants in both groups were assessed daily for signs and symptoms of catheter related infection during carrying out central venous catheter dressing using part one of tool II, if signs and symptoms appear, swabs were obtained from catheter insertion site, patient's skin and hands of physicians and nurse who caring for these patients using part two of tool II.

g-All participants in both groups were assessed twice for the presence of side effects of both antiseptic solutions using part two and three of tool II execpt swap cultures.The first assessment was done before starting the study while the second at the seventh day post dressing (at the end of the study).

h- If signs and symptoms of infection appeared, specimens were collected aseptically and transported to bacteriological examination immediately as soon as possible

6-Microbiological study was done for all specimens

Statistical analysis:

Results were collected, statistically analyzed by personal computer using statistical software package (SPSS), version 11 and tabulated.

Data were presented using descriptive statistics in the form of frequencies and Percentages, Quantitative variables were presented in the form of mean ($\overline{X}$) and standard deviation (SD) and tested by Student t-test which is a test of significance used for comparison between two groups having quantitative variables, Qualitative variables were compared using a Chi-square test (χ^2) which was used to study association between two qualitative variables and The P-value of < 0.05 was considered statistically significant.

3. Results:

T able (1) revealed that, the mean age for group I was 48.33± 9.47 and for group II was 49.80±7.94 years. About three fourth of both study groups were male (70% and 73.3%, respectively). Almost all of group 1 (93.3%) and group II (96.7%) were married. More than three fourth of the study group I (80%) and group II (76.7%) had secondary or university education. Also the majorities of the study group I (76.7%) and study group II (83.3%) were workers.

Table (2): presents distribution of the studied sample according to their clinical data.

It was noticed that there were no statistical significant differences between both groups (I & II) related to all clinical data.

Table (3): showed there was a statistical significant difference between both group I and group II related to occurrence of CVC infection in which 3.3% of group I and 23.3% of group II acquired the infection in the CVC insertion site.

Table (4): demonstrated that, the majority of the study group I (96.7%) had normal vital signs compared to 76.7% of group II. Less than one forth

of study group II (23.3%) had moderate localized pain, tenderness or swelling, hotness and redness. While the minority of group I (3.3%) had mild localized pain, tenderness or swelling and redness.

Table (5): Revealed that, the most common microorganism present in central venous catheter sites for group I and group II were *Staph. aureas* (100 % and 57 .14%, respectively). More than half of group II (57.14%) had *Staph. Epidermis* in their skin. 75% of nurses hands that were cared for groups I and 46.15% of nurse's hand who cared for group II were contaminated by *Kelbsiella*. The majority of physician hands who cared for group II (88.8%) were contaminated by *Staph. aureas.*

Figure (1) showed that, the positive infection for group I was 3.3%.

Figure (2) showed that, the positive infection for group II was 23.3%.

Table (6): showed comparison between both groups I and II as regard to side effects as presented by laboratory investigation at pre and seven days post dressing. There were no statistical significant differences between both groups (I and II) related to all laboratory investigations

Table (I): Distribution of the studied sample according to their sociodemographic characteristics

Sociodemographic characteristics	Group I n=30		Group II n=30		Test of significant	P
	No.	%	No.	%		
Age (years)						
20-	3	10.0	2	6.7	0.64	>0.05
30-	1	3.3	2	6.7		
40-	8	26.7	9	30.0		
≤ 50	18	60.0	17	56.6		
X ± SD	48.33± 9.47		49.80±7.94			
Sex						
Male	21	70.0	22	73.3	0.08	>0.05
Female	9	30.0	8	26.7		
Marital status Married	28	93.3	29	96.7	0.35	>0.05
Single	2	6.7	1	3.3		
levels of education Illiterate	4	13.4	4	13.4	2.41	>0.05
Read and write	1	3.3	2	6.7		
Primary	1	3.3	1	3.3		
Secondary or university	24	80.0	23	76.7		
Occupation Worker	23	76.7	25	83.3	0.24	>0.05
Not worker	7	23.3	5	16.7		

Table (2): Distribution of the studied sample according to their clinical data.

Clinical data	Group I n=30		Group II n=30		Test of significant	P
	No.	%	No.	%		
Diagnosis						
Viral hepatitis	18	60.0	19	63.3	0.12	>0.05
Myocardial infraction	1	3.3	1	3.3		
Intestinal obstruction	2	6.7	1	3.3		
Lower limb ischemia	1	3.3	2	6.7		
Stable angina	4	13.3	5	16.7		
Amputation	4	13.3	2	6.7		
Medication and/ or fluids prescribed*						
Analgesic	6	20.0	10	56.6		
Anti coagulant	6	20.0	5	26.7	0.09	>0.05
Anti hemorrhagic	25	83.3	22	73.3		
Anti parasitic	20	66.7	20	66.7		
Number of other inserted invasive devices **					0.08	>0.05
1	8	26.7	9	30.0		
More than 1	22	73.3	21	70.0		
Site of CVC insertion						
Right jugular vein	29	96.7	28	93.3	0.35	>0.05
Left jugular vein	1	3.3	2	6.7		

N B: All subjects in both groups received Antibiotics, Antacids and normal saline 0.9%

* Patients may have been taken more than one drug and / or fluid

** Patients may have one or more invasive device as central venous catheter, urinary catheter, intracranial catheter, end tracheal tube and nosogastric tube.

Table (3): Distribution of occurrence of central venous catheter infection among both groups.

Occurrence of infection	Group I (n=30)		Group II (n=30)		Z test	P
	No.	%	No.	%		
Positive infection	1	3.3	7	23.3%	1.90	< 0.05 s
Negative infection	29	96.7	23	76.70		

N B: Five subjects of group II acquired infection in CVC site at the third day post insertion, while the other two of them acquired the infection at the fifth day. But the positive infective subjects of group I acquired the infection in CVC at the six day post CVC insertion.
S: significant at P<0.05

Table (4) Clinical manifestations of infection at central venous catheter site of both studied groups seven days post insertion.

Signs and symptoms	Group I n=30		Group II n=30		Test of significant	P
	No.	%	No.	%		
Vital signs						
Normal	29	96.7	23	76.7	3.61	<0.05
Elevated	1	3.3	7	23.3		S
Localized pain						
Yes						<0.05
Mild	1	3.3			3.61	S
Moderate			7	23.3		
No	29	96.7	23	76.7		
Localized tenderness or Swelling						
Yes	1	3.3	7	23.3	3.61	<0.05
No	29	96.7	23	76.7		S
Localized hotness						
Yes	0	0.0	7	23.3	5.82	<0.01
No	30	100	23	76.7		S
Localized redness						<0.05
Yes	1	3.3	7	23.3	3.61	S
No	29	96.7	23	76.7		
Total	30	100.0	30	100.0		

S: significant at P<0.05
All of the participants (100.0%) of the group I and group II did not suffered from generalized bone ache, chills or had any exudates or drainage.

Table (5) Distribution of microorganism's type as illustrated by culture specimen from different sites for both studied groups seven days post dressing among infected cases.

Types of organisms	CVC site				Patient skin				Nurses hands				Physician hands			
	(GI) n=1		(GII) n=7		(GI) n=1		(GII) n=7		(GI) n=4		(GII) n=26		(GI) n=2		(GII) n=9	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Staph aureas	1	100	4	57.14	0	0	2	28.57	1	25	8	30.8	0	0	8	88.8
Staph epidermis	0	0	3	42.85	0	0	4	57.14	0	0	4	15.38	0	0	1	11.11
Kelbsiella	0	0	0	0	0	0	1	14.28	3	75	12	46.15	0	0	3	33.3
No growth	0	0	0	0	1	100	0	0	0	0	2	7.69	2	100	1	11.11

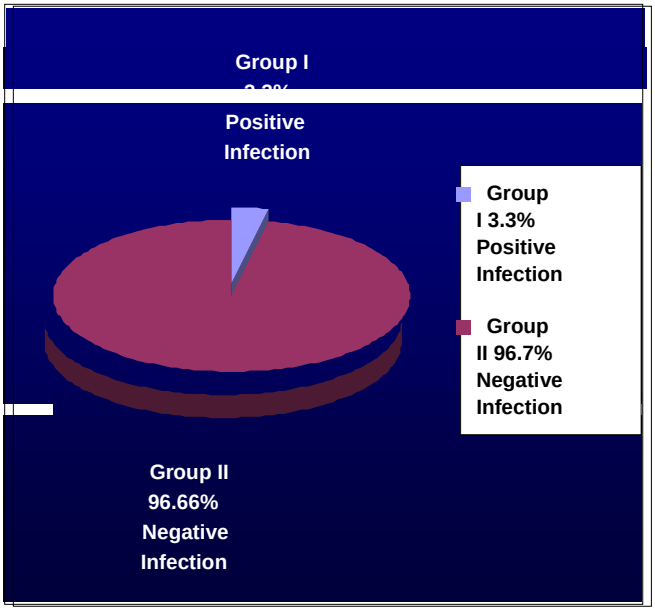

Figure (1): Effect of chlorhexidine 0.25% on occurrence of central venous catheter infection among study group I

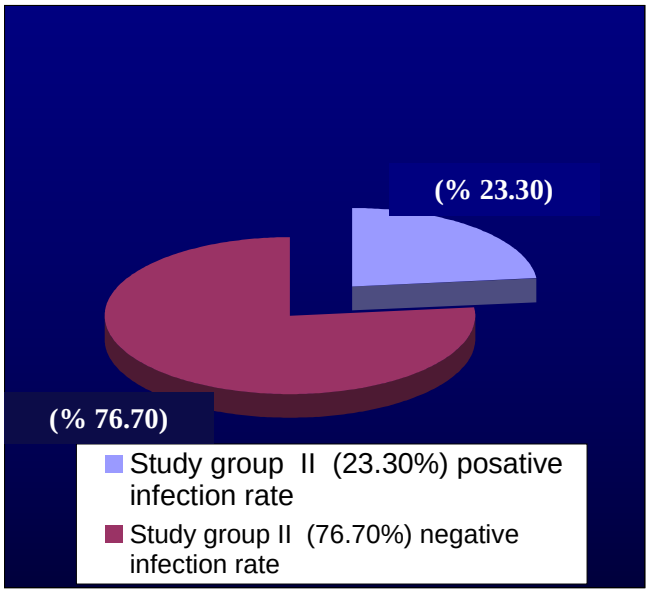

Figure (2): Effect of alcohol 70% povidone-iodine10% on occurrence of central venous catheter infection among study group II

Table (6): Comparison between both groups I and II as regard to side effects as presented by laboratory investigation at pre and seven days post dressing

laboratory investigation	Pre dressing		t-test	P	Post dressing		t-test	P
	Group I $\overline{X}$ ± SD	Group II $\overline{X}$ ± SD			Group I $\overline{X}$ ± SD	Group II $\overline{X}$ ± SD		
Kidney function test								
Urea	19.13 ±7.94	24.41±12.69	1.93	>0.05	13.78 ±3.38	16.23±9.53	1.33	>0.05
Creatinine	0.80 ± 0.18	0.81± 0.11	0.26	>0.05	0.73 ±0.11	0.70± 0.10	1.11	>0.05
Serum Na^+	138.03±2.45	138.03 ± 2.26	0	>0.05	138.30±2.96	138.1± 2.27	0.29	>0.05
Blood PH	7.37 ± 0.06	7.37± 0.03	0	>0.05	7.38 ± 0.03	7.39 ± 0.02	1.52	>0.05

4. Discussion

Catheter related infections are important causes of morbidity and mortality in critically ill patients and it is considered the highest rates of nosocomial infections in the ICUs [4]. The results of the present study illustrated that more than half of both groups were in age groups of 50 years or more. This finding is in consistent with the study of Abdulrahman *et al.* [16] who reported that the most common age for central venous catheter insertion was about 50 years old. Also Sallam *et al.* [4] mentioned that the age of the patients in their study ranged from 40 years to less than 60 years.

As regard to sex, the results of the present study revealed that about three fourth of the both groups were male. This result was in line with the study of Galal and Gomaa [17] who reported that the majority of their patients were male.

Concerning educational level and occupation, the results of the present study revealed that more than three fourth of the both groups had secondary or university education and workers. These results were consistent with the study of Abdulrahman *et al.* [16] and EL Minshawy *et al.* [18] who reported that the patients in their studies were highly educated and worker.

Clinical data:

Regarding the numbers of inserted devices, the findings of this study revealed that, more than two thirds of both groups had more than one tube or catheter. This result was consistent with the study of Sallam *et al.* [4] who reported that half of the sample had more than two devices. Also Rasslan and Abd El Sabour [19] stated that more than half of their samples had three devices.

Concerning site of central venous catheter insertion, the results of the present study showed that the majority of both groups inserted catheter at right jugular vein. This was in agreement with the study of Zaki [6] and Mubarak and Gamal [20] who reported that, the highest percentage of critically ill patients had central venous catheter inserted in right jugular vein.

Clinical manifestations of central venous infection:

It was noticed from the present study that the infected cases had elevated vital signs. This result was in consistent with the results of Rasslan and Abd El Sabour [19] who reported that the majority of their samples had elevated vital signs due to infection. Also Simcock [21] stated that patients with infected central venous catheter site had elevated temperature which can be reached from 37.7 to 38.9 c^0.

Moreover, most of the infected patients in the current study complained from hotness and tenderness at the site of insertion. This result was coincide with the study of Dimick *et al.* [22] who sated that catheter related infection is usually accompanied by specific signs of inflammation as hotness and tenderness.

Types of organisms present at central venous catheter site:

The finding of this study revealed that, *staph. aureas* was the commonest microorganism present in central venous catheter sites for both groups. This result was consistent with the results of Peacock *et al.* [23] who reported that more than half of their patients had infection at central venous catheter site with *staph. aureas*. Also Sheretz *et al.* [24] stated that about forty percent of patients in their sample were infected by gram positive especially *Staphylococcus aureus* at CVC site.

Types of organisms present at patient skin and nurses hands:

The results of the present study showed that more than half of microorganism isolated from patient skin of group II was *Staph. Epidermis.* This result was in agreement with the study of Farber *et al.* [25] who reported that the most common organism isolated from patient skin was *staph. Epidermis* and can cause central venous catheter infections. Moreover Bouza *et al.* [26] added that, the majority of central venous catheter infection is caused by *staphylococcus Epidermis* that migrates from the patient skin into the subcutaneous tract created by indwelling catheters.

It was reported that, the majority of organisms are usually introduced into the hub from the nurses hands, the organisms migrate from the hub along the internal surface of the catheter, where they can cause a bloodstream infection especially *Kelbsiella* [26]. This supported the results of current study which reported that, the most common type of organism present for nurses hand was *Kelbsiella.*

Occurrence of infection as presented by both studied groups:

Finding of recent research mentioned that Chlorhexidine 0.25% based solutions should be considered as a replacement for alcohol 70% Povidone-iodine 10% formulations in an effort to prevent catheter related infection [27]. This supported the results of the current study which reported that there was a decrease in the incidence of infection among patients who dressed by Chlorhexidine 0.25% than patients who dressed by alcohol 70% Povidone - iodine 10%. Also Shelton [28] reported that the use of Chlorhexidine gluconate 0.25% solution for care of

catheter sites is significantly more effective than alcohol 70% Povidone - iodine 10% solution for preventing vascular catheter related infections.
Moreover it was stated that the usage of Chlorhexidine 0.25% for skin preparation reduced the occurrence of catheter related infection, patient risks and hospital costs [29] .Also Garland *et al.* [30] advised routine cleaning of catheter exit sites with Chlorhexidine gluconate 0.25% after use of sterile normal saline and sterile gauze with the aim of removing blood, exudates or other debris that might provide a septic focus for infection.

Side effects of antiseptic solutions used in present study:

It was noticed from the present study that, there were no side effects for the both used solutions**.** This was supported by Pratt *et al.* [31] who recommended the use of chloroxidine 0.25% or alcohol 70"% in Povidone iodine 10% with little caution. On the other hand Okano *et al.* [32] mentioned that, no hypersensitivity reactions have been reported with use of Chlorhexidine, however, clinicians should be alert when using alcohol 70% in Povidone iodine 10% due to increase erythema, and bacterial resistance but this may be occurred when it is used for extended period.

Conclusion:

Based on the results of this study, it can be concluded that:

1-The catheters disinfected with Chlorhexidine gluconate 0.25% were significantly had lower infection than those disinfected with alcohol 70% Povidone - iodine 10%.
2-The most common clinical manifestations of infection around central venous catheter insertion site for both groups were elevated vital signs, localized pain, tenderness and redness.
3-The most common microorganisms isolated from central venous catheter sites was *staph. aureus*, while the most common microorganisms from patients skin was *staph. Epidermis* but for the nurses hands was *kelbsiela* and physicion hands was *staph. aureas*.
4-No side effects were presented for patients of the both groups as a result of any of the used antiseptic solutions.

Recommendations:

1-Apply the current research findings to minimize catheter related infection and improve patients outcomes regarding dressing on central venous catheter insertion site and efforts should be made for using Chlorhexidine 0.25% to prevent or avoid catheter related infection rather than Alcohol 70% in povidone-iodine10%.
2-Staff should carry out a periodical patient's assessment for signs and symptoms of infection during their hospitalization routinely and continuously.
3- An in service training programs should be held regularly to nursing staff caring for critical care patients with CVC to equip them with the needed knowledge and skills of central venous catheter care.
4-A replication of the study using a larger probability sample from different geographical areas to attain more generalization of the results.

Corresponding author
Manal E. Fareed
Adult Health Nursing Department, Faculty of Nursing, Menofia University
manalfareed2008@yahoo.com

References:

1- Haley R. (2006). Measuring the costs of nosocomial infections: Methods for estimating economic burden on the hospital. Am J Med.; 91(26): 25-8.
2- Girbes A. and Polderman K. (2003).Mechanical and infectious complications of central venous catheters. Minerva Anestesiol.; 69(16):330-2.
3-Field J. (2002). Prevention of infection: Central venous catheters. Nursing Standard. Br J N.; 16 (38): 42.
4- Sallam A., Arafa M., Razek A., Naga M. and Hamid A. (2005). Device related nosocomial infection in intensive care units of Alexandria University. Health Journal; 11(2):88–96
5-EL-Mahallawy H., Attia I., Ali N., Salim A. and Abo el naga S., (2002). A prospective study on fungal infection in children with cancer. Middle East Journal; 23(12):162-4.
6- Zaki S. (2000). Nosocomial infection in Alexandria University Hospitals: Control and preventive measures. Middle East Journal; 8 (2):58–62.
7- Gould K. and McGee D. . (2007). Preventing complications of central venous catheterization. NEJM.; 348(55): 2684-6.
8- Weber D., Saviteer S., Rutala W. and Thomann C. (2004). Clinical significance of Bacillus species isolated from blood cultures. South Med J.; 82(6):705-9.
9- Laura R. and Mocali M. (2003). Comparison of two different time interval protocols for central venous catheter dressing in critical patient .Crit Care Med.; 85(19):275-9.
10- Mimoz O., Villeminey S. , and Ragot S. (2007). Chlorhexidine based antiseptic solution versus alcohol based Povidone-iodine for central venous

catheter care. Arch Intern Med. ; 167 (19): 2066–72.
11- Eming A., Krieg T. and Davidson M. (2007). Inflammation in wound repair: Molecular and cellular mechanisms. J Invest Dermatol.; 127 (3): 514–25.
12- Digiovine B., Chenoweth C., Watts C. and Higgins M. (2007).The attributable mortality and costs of primary nosocomial bloodstream infections in the intensive care unit. Am J Respir Crit Care Med.; 160(32):976-81.
13- Penwarden D .and Montgomery C. (2002). Protocol for obtaining blood cultures from central venous catheters and peripheral sites .Clin Microbiol Infect.; 8(1):290-4.
14-Bain G., Kuwahata H., Raymond B. and Foster R. (2005). Tea tree/Hydro gel dressings used in wound care. Rural Industries Research and Development Corporation. Available at http://www.rirdc.gov.au/reports/TTO/05-114.pdf
15-Brown P.and Lambert E.(2006) . Medical Microbiology, 4th ed, Philadelphia, Lippincott, Williams and wikins, 567-9.
16- Abdulrahman S., Al-Mueilo S., Bokhary A.,Ladipo O. and Al-Rubaish A.(2004.) A prospective study of central access related bacterial infections. J Infect Chemother.; 8 (6): 242-6.
17- Galal H. and Gomaa K. (2002). Septic and technical complications of central venous catheterization. J of Public Health; 27(2):104–7.
18-EL Minshawy O., Abd- EL aziz T. and Abd EL ghani H. (2005). Evaluation of vascular access complications in ICU. Health journal; 16(8):35-9.
19-Rasslan O and Abd El Sabour M. (2001).Infection in intensive care in Egypt: Problems and control. Middle East Journal; 19(4):108–11.
20- Mubarak M. and Gamal A. (2005). The role of color Duplex study (CDS) in the evaluation of the heamodialysis arteriovenous fistulae. The Egypt Journal of Radiology & Nuclear Medicine; 33(9): 1241-6.
21- Simcock L. (2001). Central venous catheters: Some common clinical questions. Nursing Times; 97 (19): 34-6.
22-Dimick J., Pelz R., Consunji R., Swoboda S., Hendrix C. and Lipsett P. (2004).Increased resource use associated with catheter related blood stream infection in the surgical intensive care unit. Arch Surg.; 136(19):229-34.
23- Peacock S., Bowler C. and Crook D. (2004).Positive predictive value of blood cultures growing coagulase negative staphylococci. Lancet; 346(10):191-2.
24- Sheretz J., Carruth W., Hampton A., Byron P. and Solomon D. (2005). Efficacy of antibiotic coated catheters in preventing subcutaneous Staphylococcus aureus infection in rabbits. J Infect Dis.; 167 (74):98-106.
25- Farber B., Kaplan M. and Clogstron A. (2006). Staphylococcus Epidermidis extracted slime inhibits the antimicrobial action of glycopeptide antibiotics. J Infect Dis.; 20(11):37-40.
26- Bouza E., Burillo A. and Munoz P. (2002). Catheter related infections: Diagnosis and intravascular treatment. Clin Microbiol Infect.; 8(1):265-74
27- Richard H., (2008). Use Chlorhexidine for vascular catheter site care. Journal Watch General Medicine; 14(6):25-7.
28- Shelton D.(2007). A comparison of the effects of two antiseptic agents on Staphylococcus epidermidis colony forming units at the peritoneal dialysis catheter exit site. Adv Perit Dial.; 7(44):120-4.
29- Civetta J., Hudson M. and Ball S.(2005). Decreasing catheter related infection and hospital costs by continuous quality improvement. Critical Care Medicine; 24(10): 1660–5.
30- Garland S., Buck K. and Maloney P. (2007).Comparison of 10% Povidone-iodine and 0.25% Chlorhexidine gluconate for the prevention of peripheral intravenous catheter colonization in neonates: A prospective trial. Pediatr Infect Dis J.; 14(6):510-6.
31- Pratt R., Pellowe C., Harper P., Loveday H. and Robinson N. (2001) Preventing infections associated with central venous catheters. Nursing Times; 97(15): 36-9.
32- Okano M., Nomura M., Hata S., Okada N., Sato K. and Kitano Y. (2003). Anaphylactic symptoms due to Chlorhexidine gluconate. Arch Dermatol.; 125(72):50-2.

7/28/2011