Effects of Nosocomial Infection Control guidelines on Nurses` Performance at Burn Units

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Abstract: The strict follow-up of nosocomial infection control guidelines by nurses working in burn units promotes adherence, overcome challenges, and improves the patient outcomes. The **aim** of the current research was to evaluate the effects of nosocomial infection control guidelines on nurses` performance at burn units. **Methodology:** A Quasi-experimental non-randomized study design using one group (Pre and post) using a convenient sample of every nurse on staff work in the burn units affiliated to Mansoura university hospitals with total number of (82) nurses from both sexes with diverse ages, years of expertise as well as varying educational levels. Three instruments were used: a structured questionnaire to gauge nurses' knowledge and demographic information; a checklist to track nurses' practice level; and a questionnaire to gauge attitudes toward infection control recommendations. Using IBM-SPSS software, the Chi-Square test, Z-test, t-test, Wilcoxon Signed Rank test, and Correlation Coefficient (r) were used to evaluate the data. **Results:** Showed statistically significantly improvement in attitude, practices and knowledge levels post applying of the controlling instructions. The **conclusion of the** research that there is a strict need to follow infection control guidelines as they have positive effects on improving attitude, practices and knowledge of nurses working at the burn units. **Recommendation:** Encourage ongoing research and the use of evidence-based practices in infection control. Stay updated with the latest research findings and incorporate them into the guidelines and training program. [Fathia Abd El Naby Elsayed Abbas Elsayad, Amira Ahmed Hassaneen, Mona Hassan Ibrahim, Shereen Abd El-Moniem Ahmed. Effects of Nosocomial Infection Controlling guidelines on Nurses` Performance at Burn Units. *Nat Sci* 2024,22(12):54-64]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). http://www.sciencepub.net/nature 09. doi:10.7537/marsnsj221224.09

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Introduction

The effective implementation of infection control guidelines not only contributes to the well-being of burn unit patients but also enhances the overall quality of healthcare delivery. To explore these dynamics, this study brings together the insights of dedicated professionals committed for understanding and improving the control of nosocomial infections in burn units **(1).**

Nurses can have inadequate performance and a negative attitude toward burn injuries as a result of basic burn nurses' and newly hired nurses' lack of training. In addition to reviewing nurse-patient ratios and absenteeism in every ward, hospital managers should look into workforce shortages. Poor nursing care was attributed to a number of other management problems, including a lack of essential supplies, inadequate communication, and supervisors' lack of respect. negative attitudes toward work (2).

The skin is the body's largest organ that act as a significant barrier to protect the body against infections **(3).** The World Health Organization According to WHO estimates, there are around 7.1 million unintentional fire-related burns in the East Middle Region (EMR) worldwide, with a mortality incidence of 5.6 fatalities per 100,000 burns (4). Around 100,000 people are burned in Egypt each year, according to the Ahl Masr Foundation. The mortality rate for burn victims is as high as 37%, and most survivors struggle to perform their daily tasks because of the physical deformity and physiological damage (5). Because the immune system loses self-control and the body becomes more vulnerable to infections, the death rate for infectious burn patients is about twice that of noninfectious burns (6).

Health care-associated infections (HAIs) are infections the client experience while under medical treatments at health-care organizations. The HAIs typically manifest after 48 hrs of hospital admission or discharge **(7).** Worldwide, over 24% of patients affected by health care-associated infection and 52.3% of those patients die each year. Deaths are increased

two to three fold when infections are resistant to antimicrobials particularly in burn unit. The annual economic burden of these infections in the United States is about $4.5 billion, and they impact over 2 million individuals (8).

It is possible for resistant organisms to create explosive and protracted outbreaks in burn care units (BCUs) (9). Because of the nature of the burn damage itself, the immune-compromising effects of burns, extended hospital stays, and intense diagnostic and therapeutic treatments, patients who have been burned are particularly vulnerable to infection, which is the leading cause of death among them (10).

To mitigate the risk of nosocomial infections specially in the BCUs; the health-care facilities should implement infection control guidelines that encompass hand hygiene, environmental cleaning, standard and transmission-based measures, and the proper use of personal protective equipment (PPE) (11).

The effectiveness of these infection control guidelines depends on the knowledge, adherence, and compliance of health-care professionals, particularly nurses, who play a vital role in patient care in burn units (**9).**

The effect of nosocomial Controlling infections in burn patients relies on effectively managing wounds and the environment, along with nurses' understanding and implementation of burn care and infection control protocols. Nurses play a crucial role in decreasing septic incidents and the negative outcomes of sepsis in burned patient. So, studying the implementation of nosocomial infection control guidelines positively affects the performance of nurses working in burn units, leading to improved adherence to infection control guidelines.

Research Aim

Assessing the effect of nosocomial controlling instruction on the performance of nurse working in burn units, focusing on adherence to protocols.

Research hypothesis

Implementation comprehensive nosocomial infection control guidelines in the burn unit will significantly improve nurses` performance, as measured by adherence to infection control protocols.

Sample size:

Version 3.1.9.7 of the G*Power package was to determine the participant extent. At a significance equal (α) of 0.050, a one-way repeated measures ANOVA test with a correlation among repeated measures of 0.1 and assumed sphericity (non-sphericity correction $\varepsilon = 1$) yields 99.5% influence to detect a medium effect size (Cohen's $f = 0.25$) between the null hypothesis that mean scores (over the 5 time points) will essentially be the same, with the alternative hypothesis being that the mean score will improve following the intervention.

The research design

This study employed a quasi-experimental research approach as the random choice of the sample have been lost due to reduced number of available populations of the study.

Setting

The Center for Burn, Reconstructive, and Plastic Surgery at Mansoura University conducted this investigation. Building contains five floors to care for burn patients; the ground floor contains the head nurse's office, archives office, and the gas distribution room. The first floor has a sterilization room, two rooms for changing clothes for male and female nurses and room for cases of late burns who suffering from infections and bed sores. The second floor contains ICU for burn; the third floor contains operations for surgeries and ICU of plastic surgery. The fourth floor contains the pharmacy and the doctors' offices, and the fifth floor contains the laboratory for investigations and cases of plastic surgeries

Participants:

Convenience sample of all available nurses' who providing direct care at burn unit with different qualifications were among the 82 nurses that participated in the study. from both sexes with diverse ages, years of experience, and different level of education. Inclusion criteria: all available nurses' who providing direct care at burn unit with voluntarily participated in this study and signed the informed consent form.

Data collecting instruments:

In the present study, three gears were used as follow: **Tool I**: Self-administered knowledge questionnaire adopted from **(13)** to assess the nurses' knowledge regarding nosocomial infection control. This tool consisted of two parts; Part I: Demographic characteristics that comprises nurses' profile with six items of closed ended answer like: age, gender, marital status, and educational level, sum of experience ages and attending of infection control courses.

Part II: One hundred closed-ended questions were used to gauge nurses' understanding of nosocomial infection control. This part needed 35 -45 minutes to be filled and included eight sections as the following: Section I: Nurses' knowledge about burn injury, with ten items about degree, causes, types of burn, estimating the burned area and management of the burn. Section II: Nurses' knowledge about nosocomial infection, with 20 items about chain of infection, method of transmission, incidence, communicable period, hospital acquired infection and immunity.

Section III: Nurses' knowledge about infection control measures with 32 items. Three categories should be included in total: six things for standard precautions, ten items for hand washing, eight pieces of personal protective equipment (including gloves), two plastic aprons, one overhead, three masks, and two overshoes. Section IV: Nurses' understanding of infection prevention strategies for patients with burns includes: A total of 14 pieces, divided into three categories: nursing care for the dressing of burn wounds (5 items), nursing care for injections and solution installation (5 items), and nursing care for urinary catheters (four items).

Section V: Nurses' knowledge about waste management that includes six items about contaminated body fluids and sharp instrument management. Section VI: Nurses' knowledge about linen management that includes five items about contaminated mattresses, pillows, soiled linens and blankets management. Section VII :Nurses' knowledge about sterilization and disinfection that include nine items about medical instruments and wound dressing. Section VIII: Nurses' knowledge about burned patients visiting policy that includes four items about children associating and plants carrying.

System of scoring:
Every right response received one point, while every wrong response received zero, for a total score of score of 100. Then it was transferred in to percentage. The level knowledge categorized as High if nurses `total knowledge is ranged between (85%-100%), moderate if ranged between (60%-84%) and low if less than 60% (0%-59%) **(13)**. Cronbach's alpha for the nurses' infection control knowledge questionnaire was α=0.88.

Tool II: Nurses' practices observational checklists to evaluate nurses' performance of the most common procedures in the burn unit with reference to infection control measures that adopted from **(13)** with inclusion of eight sections as the following:

Section I: Hand washing technique that included (22 items). Section II: Hand scrubbing before burn wound dressing that included (21 items). Section III: Donning and removing sterile gloves technique which included (17 items). Section IV: Burn wound dressing that included (21 items). Section V: Vein puncture/insertion of peripheral IV-line technique that included (24 items). Section VI: Urinary catheter insertion care that included (seven items). Section VII: Four categories comprised the proper use of personal protective equipment, which included 36 categories in total: gloves (14 items), aprons and gowns (5 items), overhead (2 items), face masks (7 items), the sequence for putting on and taking off personal protective equipment (4 items), and the sequence for taking off personal protective equipment (Four things).

Scoring system:

Each element in the checklist has three selections that include appropriately done scored (2), incorrectly finished that scored (1) and not done that scored (0). Observing practices for proper use of PPE scored yes with score of "1" and no with score of "0" When practice scored > 296 it means that the patient has level of practice more than or equal ≥85% so it was classified as good performance level, while practices scored (250-177) it was ranged between 60%: 84%, it was classified as Fair**,** and if practice scored (0- 177) < 60%, it was classified as poor **(13)**, Cronbach's alpha for the nurses' infection control practice questionnaire was α=0.89.

Tool III: Nurses 'Attitude Questionnaire to assess nurse's attitude toward infection control in burn unit. It consisted of 25 items **(14).** The tool needed to 10 minute to be completed. The gauge was evaluated using three-point Likert scales that included agree, neutral, and disagree. Responses were assigned scores of (2) for agree, (1) for neutral, and (0) for disagree. The scores for each item were combined, and the total was divided by the number of items to calculate the mean score for the attitude. The total score was then expressed as a percentage, after which means and deviations of standard were calculated. An attitude was categorized as "Positive" if the percentage score was 60% or higher and "Negative" if it was below 60% **(14),** Cronbach's alpha for the nurses' infection control attitude questionnaire was α=0.88.

Field work:

Faculty approval was obtained to permit the researcher meet nurses; after clarifying the importance and aims of the research. The face and content validity were established through five expertise from medical surgical nursing who examined the tools for comprehensiveness, clarity, relevance, comprehension, applicability, and ease of use. Tools were translated into Arabic language by an expertise translator, then it was translated into English language to ensure the validity of translated versions of the tools.

Cronbach's alpha was used to estimate the internal consistency of the tool during reliability testing in order to evaluate how well it estimated the variables they were trying to measure. This technique showed high reliability of the final version of tools. For this study the correlation coefficient was: (r)=0.88 for nurses' infection control knowledge questionnaire, (r) = 0.89 for nurses' performance observational checklists, (r) =0.88 for attitude questionnaire.

10% of all nurses were the subjects of a pilot study. (8 nurses) to evaluate clarity, ambiguity, applicability, objectivity, relevance and feasibility of tools used for data collection as well as well as to gauge the amount of time required for data collection with each nurse and to detect any issues related to the questionnaires' administration. Changes were made

appropriately. The study sample did not include nurses who participated in the pilot study.

The study took place over a period of nine months, from September 2022 to May 2023, and was carried out in four phases.

Phase I, Phase of assessment: The researcher began this phase by introducing herself to the nurses under study and outlining the goal of the research. Each nurse who took part in the study then gave their oral consent.

The knowledge and attitude of each nurse was assessed individually, followed by observing nurses practices and fill the practice checklist of the studied nurses. Nurses were observed indirectly during morning and afternoon shifts**.**

Phase II, planning phase:

Developing the nosocomial infection control guidelines' booklet. The researcher created a straightforward Arabic booklet based on nurses' knowledge, practices, and attitudes using the data that was evaluated as well as information gathered from literature reviews and online searches.

Nosocomial infection control guidelines at burn unit have four parts. The first part was about burn, the second part was about infection and standard precautions to prevent infection, the third part was about infection control measures at burn unit, and the fourth part was about dealing with wastes and equipment processing with the reference of **(WHO, 2023).**

Phase III: Phase of implementation:

During seven classes, each lasting 20 to 35 minutes, the researcher gave the nurses under study the nosocomial infection guidelines. A variety of instructional resources were employed, including group discussions, demonstrations, and re-demonstrations. Data shows, video tapes, colored pictures, and actual equipment are also included. The researcher gave an overview of the entire nosocomial infection control guideline prior to the start of the classes. A summary of the previously discussed topics was then given to each session. Through the classes, the researcher employed motivation and reinforcement to enhance nurses' learning.

All nurses participated throughout seven classes, those who drop out due to the time of class for any reason, repeating the session to them at other available time to concluded all the studied nurses.

The 1st class included a discussion of definition and causes of burn, degrees of burns, how to calculate total surface burn area as: role of nine, Lund and browser, palm method, in addition to complications as: deformity, disability, infection and psychological complications. This session takes thirty minutes with group discussion, demonstration and re-demonstration.

The 2nd class: discussed definition of infection and its types, chain of infection, actions to control infection and knowledge of global precautions for infection. It takes twenty-five minutes viewed by brochures and printed educational booklet. The 3rd class: included routine Clinical hand washing and hand washing, surgical hand washing and alcohol-based hand washing. It takes around 40 minutes and viewed by audiovisual materials and data show, in addition to demonstration by realistic equipment.

The 4th class discussed and demonstrated how to use gloves and it`s types, the gown and its types, use of overhead in addition to types of masks. It takes thirty-five minutes as the researcher showed steps of all demonstrated topics in brochures and printed educational booklet with application

The 5th class discussed meaning of safe injection, basics of safe injection, sources of infection from IV therapy, how to deal with venous organs and infection control measures. It takes around 40 minutes using data show and educational booklet as educational methods.

The 6th class: included application of types of hand washing, apply wearing and removing personal protective equipment, spare application on burn wounds. It takes forty-five minutes using data show, educational booklet and application through demonstration by the researcher and re-demonstration by the studied nurses.

The 7th class discussed, safe waste disposal policy for dealing with sheets, covers and furnishings, reprocessing and packaging of precision machinery and instruments. It takes twenty-five minutes using data show, educational booklet and application through demonstration by the investigator and re-demonstration by the studied nurse.

Phase 4, Evaluation phase:

Immediately after implementing the nosocomial infection control guidelines, using the same instrument used in the assessment phase, the impact of the guidelines on nurses' knowledge, practices, and attitude was assessed at one-, three-, and six-month intervals after the intervention. To assess the impact of the nosocomial infection control guidelines, the researcher compared the outcomes of the post-intervention phases with the outcomes of the per-intervention. at burn unit and evaluate the quality and engagement in all classes by reported their understanding and feedback and ensuring attendance who participated.

Ethical consideration

Prior to their inclusion in the study, all participating nurses gave their oral consent. The study was approved by the nursing faculty Ethics Committee at Suez Canal University No. (123/9/2021). The collected data was kept confidential, and the

participants were informed that they could withdraw from the study at any time.

Statistical Design:

2017 saw the release of IBM-SPSS software, which was used to enter and analyze data. IBM Corp., Armonk, NY; IBM SPSS Statistics for Windows, Version 25.0. Absolute frequency [N] and percentage [%] were used to express the qualitative data. Shapiro-Wilk'stestwas used to first check quantitative data for normality; if p>0.050, the data were considered normally distributed. Box plots were examined to check for the presence of outliers, or extreme values. If the quantitative data were normally distributed with no significant outliers, they were expressed as mean ± standard deviation (SD); if not, they were expressed as median and inter-quartile range (IQR).

Fisher's exact test, also known as the chi-squared test, was applied. When comparing column proportions, p values were adjusted using the Z-test in conjunction with the Bonferroni method. The percentage of cases anticipated in each category of the multinomial variable makes up this known or hypothesized distribution. Pretest and posttest quantitative data: Samples in pairs If the data was normally distributed, the t-test was employed; if not, Wilcoxon's signed Ranks test was employed.

One test for correlation is Spearman's correlation (Coefficient = rest). This test was used to evaluate the direction and strength of the relationship between ordinal or quantitative variables. The point To determine how strongly a dichotomous variable and a quantitative variable were associated, the bacterial correlation (coefficient = rob) test was employed. We evaluated the degree of correlation between a multinomial variable and a quantitative variable using the eta coefficient (coefficient = η) test. If the p value for any of the tests was less than or equal to 0.050, the results were deemed statistically significant.

Results

Table (1) Represented the demographic characteristics of nurses and revealed that (81.7 %) of studied nurses were females, and (47.5%) of studied nurses aged from 30>40 years with Mean ± SD   (20.5 ± 14.8). Concerning marital status, the largest percentage of studied nurses were married (57.4%). In reference to educational level, (80.5%) of the studied nurses had technical health institute education. Additionally, 51.3 percent of nurses had five to ten years of experience, according to the study. Moreover; (62.1 %) attended training courses about infection control and reported that it one to two times only.

Table (1): Demographic Characteristics,
Frequency Distribution of Studied Nurses (N=82)

Characteristic		No	%
Age of nurse			
20 >30		17	20.7%
30 >40		39	47.5%
40 >50		21	25.7%
50 >60		5	6.1%
Mean ± SD	20.5 ± 14.8		
Sex			
Female		67	81.7%
Male		15	18.3%
Marital status			
Single		23	28%
Married		47	57.4%
Divorced		9	10.9%
Widow		3	3.7%
Educational level			
Bachelor		11	13.4%
Technical health institute		66	80.5%
Nursing school		5	6.1%
Years of experience			
<5		13	15.8%
5 > 10		42	51.3%
≥ 10		27	32.9%
Attending training courses about infection control			
Yes		51	62.1%
No		31	37.8%

Figure (1) Illustrated that total level of knowledge of studied nurses about nosocomial infection is high within (17.2%) at pre-implementation of the infection control guidelines; and improved to (58.5%) in immediate post, then decreased to (51.3%) post one-month and (48.7%) post three months of intervention, with the lowest percentage was at post 6- months by (40.2 %).

Figure (2) Presented that the total level of practice of studied nurses about nosocomial infection was good in (15.8%) of the nurses under study at the pre-intervention stage, went up to 68.3% right after, and then dropped to 57.3%, 46.3%, and 48.8% at 1, 3, and 6 months, respectively, with a statistically significant difference.

Figure (3) Illustrated that attitude of the studied nurses showed significant improvement at the post implementation phase, with (18.2%) of the studied nurses had positive attitude at the pre-implementation that improved to positive by (90.3%) at the immediate post guidelines implementation, then to (84.2%) post one-month and (73.3%) post three- and (64.6%) post six-months intervention phase.

Table (2): Demonstrated the relation between nurses' demographic characteristics and their total practice level at the pre, and six months post implementation of the infection control guidelines. It was found that there was a statistically significant relationship between nurses' overall practice and educational attainment as (p = 0.043) with the good level of practices was among nurses who get technical health institute education by (72.5%) at post implementation phase.

Table (3): Demonstrated the relation between nurses' demographic characteristics and total practice level that showed There is a statistically significant correlation between nurses' overall practice and their educational back ground (p = 0.043) with the good level of practices was among nurses who get technical health institute education by (72.5%) post implementation of the infection control guidelines.

Table (4): showed the relationship between the knowledge level of nurses and their attitudes and practices before, right after, one, three, and six months after the intervention. At the immediate post, one month, and three months, there was a highly statistically significant correlation between nurses' knowledge and their practices, with p values of 0.001**, 0.002**, and 0.025*, respectively. Additionally, the knowledge and attitude of nurses at the immediate post-intervention phase showed a highly statistically significant correlation with a p-value. (p: 0. 017*)

Figure (1): Total Percentage Distribution of Studied Nurses' Level of Knowledge about Nosocomial Infection (N=82)
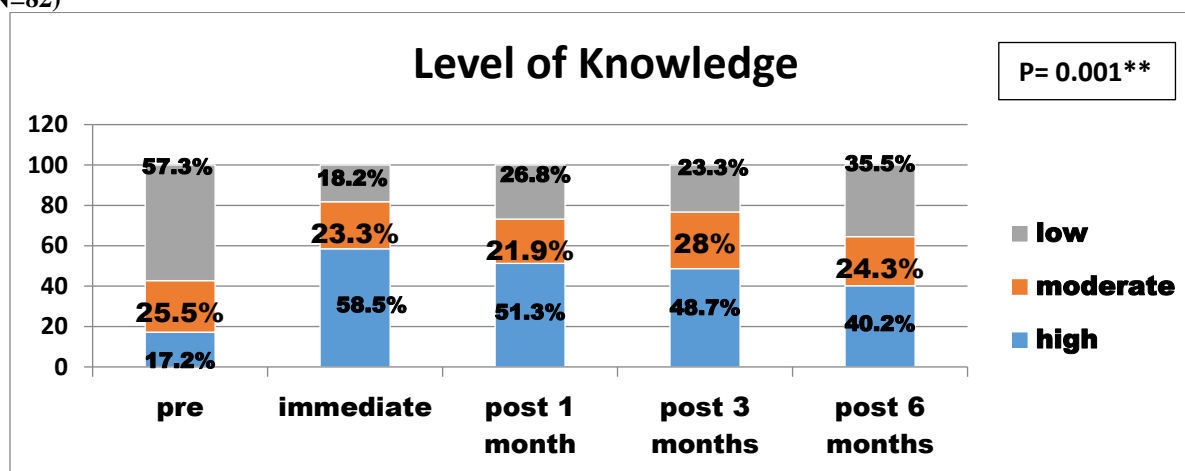
x^2 : Chi- square, Low: score < 60.0 %, Moderate: score 60.0 % to 80.0%, High: score > 80%, P value is significant if ≤ 0.05.

Figure (2): Total Percentage Distribution Level of Practice of Studied Nurses about Nosocomial Infection (N=82)
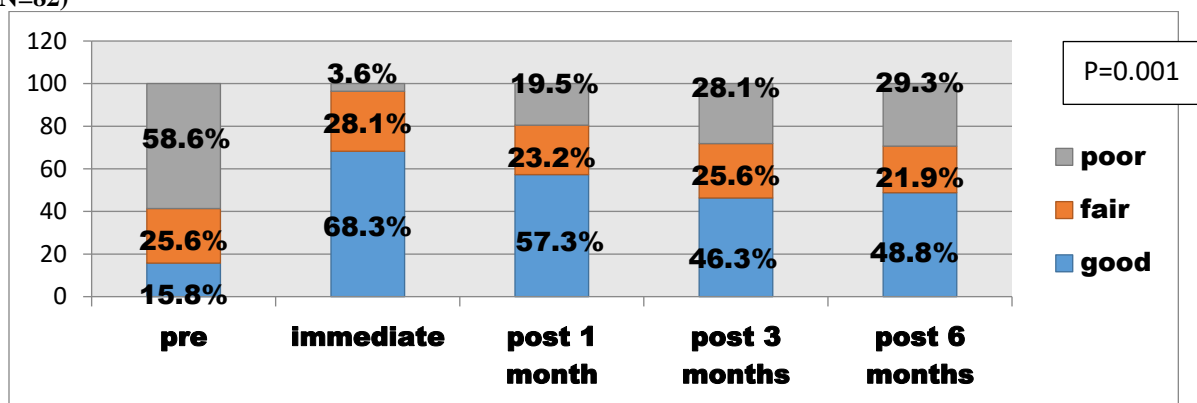
x^2 : Chi- square, Low: score < 60.0 %, Moderate: score 60.0 % to 80.0%, High: score > 80%, P value is significant if ≤ 0.05.

Table (2): Relation between nurses' demographic characteristics and their total knowledge pre and post six months of implementation of the guidelines

Knowledge	Pre intervention				Post 6-month post intervention			
	High (N =14)	Moderate (N = 21)	Low (N = 47)	MCP	High (N =33)	Moderate (N =20)	Low (N =29)	MCP
Gender	N %	N %	N %		N %	N %	N %	
Female	11 78.5	9 42.8	47 100	0.080	23 69.6	17 85.0	27 93.1	0.074

	N	%	N	%	N	%	MCP	N	%	N	%	N	%	MCP
Male	3	21.5	12	57.2	0	0.0		10	30.4	3	15.0	2	6.8	
Age														
20 >30	3	21.4	2	9.6	12	25.5		9	27.3	6	30.0	2	6.8	
30 >40	0.0	0.0	10	47.6	29	61.8		13	39.3	12	60.0	14	48.2	
40 >50	8	57.1	9	42.8	4	8.5		10	30.4	2	10.0	9	31.0	0.0114**
50 >60	3	21.5	0.0	0.0	2	4.2	0.203	1	3.0	0	0.0	4	13.7	
Marital status														
Single	4	28.5	6	28.5	13	27.6		8	24.2	7	35.0	8	27.5	
Married	9	64.4	12	57.3	26	55.5		17	51.7	10	50.0	20	68.9	
Divorced	1	7.1	2	9.5	6	12.7	0.345	6	18.1	3	15.0	0	0.0	0.278
Widow	0	0.0	1	4.7	2	4.2		2	6.0	0	0.0	1	3.4	
Educational level														
Bachelor	2	14.2	2	9.5	7	14.8		3	9.1	1	5.0	7	24.1	
Technical health institute	11	78.5	19	90.4	36	76.5	0.099	30	90.9	19	95	17	58.7	0.047*
Nursing school	1	7.1	0.0	0.0	4	8.5		0	0.0	0	0.0	5	17.2	
Years of experience														
<5	1	7.1	6	28.5	6	12.7		7	21.2	6	30.0	0	0.0	
5 > 10	11	78.7	14	66.8	17	36.1	0.210	25	75.7	13	65.0	4	13.7	
≥ 10	2	14.2	1	4.7	24	51.2		1	3.0	1	5.0	25	86.2	0.129
Attending courses														
Yes	3	21.4	10	47.6	38	80.8		30	90.9	4	20	17	58.6	0.282
No	11	78.5	11	52.3	9	19.1	0.390	3	9.0	16	80	12	41.3	

MCP: P value based on Monte Carlo exact probability   P value is significant if ≤0.05

Table (3): Relation between nurses' demographic characteristics and their total Practices pre and post six months of implementation of the guidelines

	Pre intervention						Post 6-month post intervention						
Practice	Good (N =13)		Fair (N = 21)		Poor (N = 48)		MCP	Good (N =40)		Fair (N =18)		Poor (N =24)		MCP
Gender	N	%	N	%	N	%		N	%	N	%	N	%	
Female	11	84.6	16	76.2	40	83.4		34	85.0	14	77.8	19	79.2	
Male	2	15.4	5	23.8	8	16.6	0.122	6	15.0	4	22.2	5	20.8	0.091
Age														
20 >30	3	23.0	2	9.5	12	25.0		11	27.5	6	33.3	0.0	0.0	
30 >40	4	30.8	0.0	0.0	35	72.9		21	52.5	9	50.0	9	37.6	
40 >50	5	38.6	16	76.3	0.0	0.0	0.226	7	17.5	3	16.7	11	45.8	0.105
50 >60	1	7 .6	3	14.2	1	2.1		1	2.5	0	0.0	4	16.6	
Marital status														
Single	5	8.6	4	19.2	14	29.1		15	37.5	0.0	0.0	8	33.3	
Married	8	1.4	9	42.8	30	62.7		19	47.5	15	83.4	13	54.3	
Divorced	0.0	.0	6	28.5	3	6.2	0.185	4	10.0	3	16.6	2	8.3	0.277
Widow	0	0.0	2	9.5	1	2.0		2	5.0	0.0	0.0	1	4.1	
Educational level														
Bachelor	7	3.8	2	9.5	2	4.1		11	27.5	0.0	0.0	0.0	0.0	
Technical health institute	6	6.2	17	81.0	43	89.7	0.75	29	72.5	13	72.3	24	100.0	0.043*
Nursing school	0.0	0.0	2	9.5	3	6.2		0.0	0.0	5	27.7	0.0	0.0	
Years of experience														
<5	6	46.2	0.0	0.0	7	14.5		9	22.5	3	16.6	1	4.1	
5 > 10	4	30.8	21	100.0	17	35.5	0.311	19	47.5	11	61.1	12	50.0	
≥ 10	3	23.0	0.0	0.0	24	50.0		12	30.0	4	22.2	11	45.9	0.250
Attending courses														
Yes	9	69.0	8	38.0	34	70.8	0.090	22	55.0	12	66.6	17	70.8	0.67
No	4	31.0	13	62.0	14	29.2		18	45.0	6	33.4	7	29.2	

Figure (3) Attitude distribution toward nosocomial infection of studied nurses (N=82)
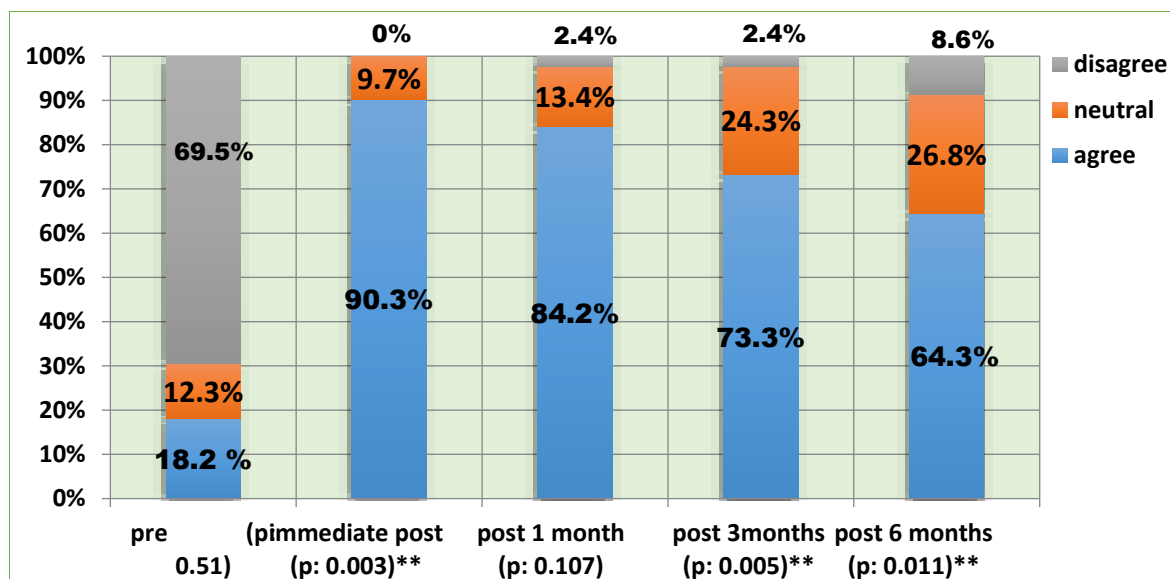
Table (4): Correlation between Nurses' Knowledge and their Practices, and Attitude toward Nosocomial Infection at pre, immediately post and one, three- and six-months post intervention

Correlation	Nurse's Knowledge									
	Pre		Immediate		I month post		3-month Post		6-month post	
	(r)	(P)	(r)	(P)	(r)	(P)	(r)	(P)	(r)	(P)
Practices	0.293	0.44	0.401	0.001**	0.401	0.002**	0.403	0.025*	0.540	0.50
Attitude	0.303	0.077	0.340	0.017**	0.296	0.073	0.300	0.50	0.453	0.163

r= correlation coefficient   P value significant ≤ 0.05

Discussion

Nosocomial infections, pose a significant threat to patient safety and well-being within health-care settings. Among the specialized units where the risk is particularly pronounced is the burn unit, as patients with severe burns require intensive care and meticulous attention to prevent secondary infections **(15)**.

The effective implementation of infection control guidelines not only contributes to the well-being of burn patients but also enhances the overall quality of health-care delivery. To explore these dynamics, this study brings together the insights of dedicated professionals committed for understanding and improving the control of nosocomial infections in burn units **(1).**

Concerning to nurses' knowledge of burn injury, the present study revealed low level in pre-implementation phase of nosocomial infection control guidelines, then about three- quarters post one-month obtained high knowledge level that reduced post six-months to one-third of studied nurses obtained high knowledge about burn injury. This may be attributed to the need for frequent and continuous courses to remember the information and continuous education is a mandatory need for nurses.

These results were agreed with **(16)**, who investigated the "Standardized guidelines' impact on Pakistani nurses' understanding and methods for preventing infection in burn patients. Additionally, **(17)** who looked into the "Efficacy of an educational program on nurses' knowledge toward burn management" in Iraq who found that nurses in study areas have improvement in knowledge of burn injury in post intervention, than pre intervention. The researcher think that they may lose the innovation for good practice and think it`s enough to have knowledge.

This finding was in accordance with **(18)** who reported that baccalaureate prepared nurses had a positive impact on knowledge. Also, **(19)** suggested that the relationship between nurse education and knowledge is needed to identify the optimal mix of nurse education and skills for different situations. In the researcher's opinion the high level in education lead to improvement of knowledge. Additionally, there was a strong statistically significant correlation between the age of the nurse and their overall level of expertise. post six-months of infection control guidelines implementation. These result in the opposite line with **(17)** who studied the " The efficacy of an educational program in improving nurses' understanding of burn care" and reported that no

statistical association between nurses' demographic and their knowledge after implementation the program.

This study represented no statistical significance relation between total nurses' practice pre and post six months of guidelines implementation and courses attendance with the highest ratio was among nursing staff who attending courses of infection control. This finding was in accordance with (**20)** who argued that continuous training and organizational support also affect the infection prevention practices of nurses. This study represented statistical significance relation between total practice level and level of education with the highest level was among bachelor degree nurses. This finding was in accordance with (**21**) who reported that baccalaureate prepared nurses had a positive impact on nurses` performance and level of knowledge.

Referring to attitude of the studied nurses in this study; there was a statistically significant difference among all the study phases shows progress in every area of the studied domains. The educational attainment of nurses and their overall attitude were statistically significantly correlated following the implementation of infection control guidelines. as the highest percentage was among nurses who get technical health institute education, which may be contributed to effective educational and training sessions. For instance, a study by (22) who conducted a study on Imo State University Teaching Hospital nurses' knowledge, attitudes, and practices around infection prevention and control and found a significant improvement in nurses' performance and attitude toward nosocomial infection prevention after implementing evidence-based guidelines. It concluded that evidence-based guidelines are effective in enhancing nurses' performance and attitude, and that regular training and supervision are needed to sustain the improvement.

After implementing the intervention program immediately and after one and three months, this study found a significant positive correlation between nurses' knowledge and practice. This was in line with (23) in Saudi Arabia, which sought to assess health care workers' knowledge, attitudes, and practices regarding standard infection control measures. It found a strong correlation between nurses' practices, attitudes, and knowledge.

Additionally, a statistically significant correlation was found between the attitude of nurses and their training in burn treatment, as well as their credentials and experiences in the burn department (22). However, the expertise of nurses is not statistically correlated with their age or gender. Which implies that other factors, such as organizational culture, managerial support, ethical training, and professional image, may influence nurses' attitudes and motivation more than their practices.

Recommendations:

- Implement regular and thorough training sessions on infection control guidelines.
- Conduct periodic audits to monitor compliance with infection control practices. Provide constructive feedback to nurses and use the audit results to identify areas for improvement and additional training needs.
- Foster collaboration among different healthcare professionals within the burn unit. Effective communication and teamwork can enhance adherence to infection control practices and improve overall patient outcomes.
- Establish a system for continuous improvement in infection control practices.
- Encourage nurses to provide feedback and suggestions for improving guidelines and protocols.
- Implement technology solutions, such as electronic health records and infection control software, to streamline processes and ensure accurate documentation and monitoring of infection control practices.
- Encourage ongoing research and the use of evidence-based practices in infection control. Stay updated with the latest research findings and incorporate them into the guidelines and training program.

Conclusion:

The researcher sees that the continuous evaluation process in assessing the success rate of training program in each study including knowledge, practice, environment and attitude, help in maintenance of good nursing performance, as most of nurses had high knowledge and good practices levels regarding infection control after implementation of infection control guidelines post one, three, and six months. Additionally, a strong statistically significant relationship between nurses' understanding and their practices at immediate post, post one- month and three-months.

Declaration:
Abbreviations
ICU: intensive care unit
Who: world health organization
IV: intravenous
Ethics approval and consent to participate
Ethics Approval and Participation Consent This study was approved by the Suez Canal University nursing faculty's Ethics Committee in accordance with the Declaration.
No (123/9/2021). Following an explanation of the

tool's contents and the study's goals to each participant, written informed consent was acquired. Participants also described the protocols for maintaining the confidentiality of their records, including not disclosing participant identities, erasing records and transcripts six months following analysis, and securing the devices holding the password-protected and encrypted recording files. No conflicts of interest exist with any of the organizations or participants in the study. There have been no particular grants given by the commercial or nonprofit sectors for this research.

Consent for publication
   Not applicable.

Availability of data and materials
   No datasets were generated or analyzed during the current research.

Competing Interests
   The writers say they have no conflicting interests.
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Authors' contributions
   Fathia: conceptualization, methodology, data curation, and Writing. Amira: project administration and supervision. Formal analysis and data curation. investigation and data collection. Shereen: writing-reviewing and editing. the author granted final approval for the published version.

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