

# Relationship between Local Signs of Burn Wound Infection and Nurses' Practice

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**Abstract:** Burn injuries have been recognized as a significant and major public health problem in economically developing countries. Large wound areas containing necrotic tissue make burn patients more susceptible to infection. Nosocomial infections (NI) are common in burn patients because of the typical features of the disease: loss of the first line of defense against microbial invasion; presence of devitalized and dead tissue that provides a favorable environment for growth of microorganisms. Aim of the study: was to assess the relation between local signs of burn wound infection and nurses' performance. Methods: Analytical cross sectional study research design was conducted in Plastic, Reconstructive and Burn Surgery Center - Mansoura University. The data were collected from purposive sample 100 patients of both sexes who correspond to inclusion criteria and available nurses 30. Results: The results indicate that there were a relation between patients with local signs of burn wound infection and nurses' practice regarding burn wound dressing and proper use of personal protective equipment. Conclusion: nurses need a specific teaching guideline and training program about infection control measures to be utilized when caring for burned patients to minimize risk for nosocomial infection.

**Keywords:** Burn, wound infection, local signs of burn wound infection, nurses.

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## I. INTRODUCTION

Burn is the most serious health problem in many countries of the world. Burns are the fourth most common type of trauma worldwide, following traffic accidents, falls, and interpersonal violence<sup>(1)</sup>. Centers for Disease Control and Prevention<sup>(2)</sup> also pointed that burn is the fifth most common cause of unintentional injury deaths in the United States. Burn is often quoted as a major health problem<sup>(3)</sup>.

Nosocomial Infection (NI) is a vital cause of mortality in burns. It has been estimated that 75% of all deaths following thermal burns are due to infections. The rate of nosocomial infections in burn patients are higher because of many factors like nature of burn injury itself, immunosuppression state of the patient, invasive diagnostic, and therapeutic procedures, long hospital stay and overcrowding in burn units<sup>(4)</sup>.

The cumulative experience over the past three decades in the early interventional treatment of burn patients has changed the reason of death; it is now estimated that about 75% of the mortality following burns is due to infections, rather than burn shock and hypovolemia<sup>(5)</sup>.

Burn has been defined as loss of continuity of body surface due to coagulation and destruction of the skin and/or underlying tissues. Burn wounds occur when there is contact between tissue and an energy source, for example heat, chemicals, electrical current, or radiation incompatible with cell life<sup>(6)</sup>.

Severity of burn injury based on the following factors: extent, depth, and site of burn injury, age of patient, etiologic agents involved, presence of inhalation injury and co-existing injuries or pre-existing illnesses. In this point, The American Burn Association has used these parameters to establish guidelines for the classification of burn severity. These classifications include 3 categories of burn injury<sup>(7)</sup>.

Minor burn injury comprises burns involving less than 15% of total body surface area (TBSA) in adults, and full-thickness burns involving less than 2% of TBSA that do not present a serious threat of functional or cosmetic risk to eyes, ears, face, hands, feet, or perineum<sup>(8)</sup>.

Moderate burn injury includes partial-thickness burns of 15-25% of total body surface area (TBSA) in adults, and full-thickness burns involving 2-10% of total body surface area (TBSA) that do not present serious threat of functional or cosmetic impairment of the eyes, ears, face, hands, feet, or perineum. This category excludes electrical injury, all burns complicated by inhalation injury or other trauma with chronic diseases<sup>(9)</sup>.

Major burn injury includes partial-thickness burns involving more than 25% of total body surface area (TBSA); full-thickness burns involving more than 10% of (TBSA) in adults, burns involving the face, eyes, ears, hands, feet, or perineum that may result in functional or cosmetic impairment<sup>(10)</sup>.

Regarding etiologic agents of burn injuries; burn usually results from an energy source that transfers heat to the body. The heat source may be thermal, chemical, electrical and radiation<sup>(11)</sup>.

Burn patients are at a considerable risk for infection because the nature of the burn injury itself, the immune compromising effects of burns, prolonged hospital stays, diagnostic and therapeutic procedures<sup>(12)</sup>.

There are particular set of people who are considered to be more liable to infections than others (high risk groups). These groups involve neonates and the elderly; those with underlying diseases such as diabetics, renal failure, chronic obstructive pulmonary disease (COPD), blood disorders, immunosuppressed (HIV/AIDS), malignancy, and transplants; those having therapy such as immunosuppressive drugs, antineoplastic agents (chemotherapy- radiotherapy), gastric acid suppressants, anti-rejection drugs, steroids and antimicrobials drugs and those having treatments and procedure being carried out, especially invasive techniques such as surgery, endotracheal tubes, central venous and arterial catheters, urinary catheterization and intravenous therapy<sup>(13)</sup>.

Hospital infection is one of the socio-medicine and economic problems in developing countries. It is associated with high prevalence of infectious diseases, length of hospitalization and death of patients, a related term is nosocomial infections (NI), which refers to iatrogenic illness due to or acquired during hospital care<sup>(14-17)</sup>.

Nursing staff form the largest sectors of the multidisciplinary burn team, responsible for performing the daily continuous care of the burn patient. Burned patients can be very challenging to care for, requiring intensive physical and emotional support. Burn nurses require a range of skills from advanced wound dressing techniques, to emotional support for patients besides their families<sup>(18)</sup>.

Nurses on a burn care unit will often be the first to bring a regard to any changes in the condition of a patient and institute remedial action. Due to the nature of the injury, burn patients often need a prolonged duration of recovery in the acute and rehabilitative phases. Experience and knowledge of burn injury can be implemented in many varied roles including patient case management, operating room practitioners, doing research studies and procedures, and developing wide teaching programs as burn management courses for non-specialists<sup>(19)</sup>.

#### **Aim of the study:**

The study was conducted to assess relationship between local signs of burn wound infection and nurses' practice.

## **II. SUBJECTS AND METHOD**

#### **Research design:**

Analytical cross sectional study research design was utilized to achieve the aim of the study.

#### **Setting:**

The study was carried out in Plastic, Reconstructive and Burn Surgery Center - Mansoura University.

#### **Subjects:**

The present study included 100 adult burned patients of both sexes. The sample size was calculated by using (EPI) information program version and all available nurses (30) who accepted to participate in the study.

The patients were selected based on the following criteria inclusion criteria: Adult patients with burn injuries, who admitted immediately after burn injury, age ranging from 21-60 years, able to communicate verbally and who consented to participate in the study. Exclusion criteria: Patients with burn injury admitted to intensive care unit and patients with mental limitations.

#### **Tools:**

The following tools were utilized to collect data pertinent to the study:

I. **The first tool** was patients' sociodemographic & clinical data: structure interview schedule. It consisted of three parts:

**Part I:** A socio-demographic data for patient. It was comprise of patient age, sex, and marital status, level of education, occupation, duration of burn (minutes), and length of hospital stay.

**Part II:** Patient's Health Relevant Data. This part used to assess patient's past history of immunosuppressive drugs, underlying diseases, presence of invasive devices, body temperature.

**Part III:** Signs of infection. Local signs of burn wound infection, sepsis, pneumonia, blood stream infection, catheter related infection and urinary tract infection.

II. **The second tool was** nurses' questionnaire. It consisted two parts:

**Part I:** A socio-demographic data for nurses. It was comprised nurses' socio-demographic characteristics e.g. age, gender, marital status, level of education, and number of experience years in burn unit.

**Part II:** Observational checklists for procedures adopted in burn unit. This tool aimed to explore nurses practice that increase risk for infection 1-Hand washing (22 items) / 2-hand scrubbing before burn wound dressing (21 items)/ 3- burn wound dressing (22 items) ,and /4- proper use of personal protective equipment (PPE) 35 items.

**Scoring system:** *The rating score for nurses' practice was distributed as follows:* Above 75% represented good, 50- 74% represented fair and below 50% represented poor practice.

#### **Methods:**

Once the necessary approvals were granted, the proposed study proceeded. The subjects who met sample criteria and agreed to participate in the study were interviewed by the researcher to collect the necessary data and aim of the study was explained to each member of the participants. The present study included 100 adult with burn injury of both sexes and 30 nurses. The data were collected throughout the assessment tools. The data collection covered a period of six months.

#### **Statistical analysis:**

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 16.0; Descriptive statistics was done using numbers, percentages, arithmetic mean, standard deviation as well as medians. Analysis of data was conducted using: Mont Carlo exact probability, fisher exact probability and independent samples t-test. The P value of < 0.05 indicate a significant result while, P value > 0.05 indicates a non significant result.

### **III. RESULTS**

The data collected were analyzed statistically and the results are represented as the following.

#### **Table 1: Relation between local signs of burn wound infection and Sociodemographic characteristics of studied patients**

This table illustrates that there was statistically significant difference between local signs of infection and age group , middle age group had higher percent than older adults(P=0.001).

There was statistically significant difference in local signs of infection between male and female (P=0.004) and also married and single (P=0.004). Furthermore a statistical significant difference was found between wound infection and level of education (P=0.021). Patients who work had local signs of burn wound infection higher than those who didn't work (P=0.001). For length of hospital stay, there was statistically significant difference between patients who stay more than one month and less than one in hospital (P=0.001).

Table 1: Relation between local signs of burn wound infection and sociodemographic characteristics of studied patients

Patient demographic data	Local signs of burn wound infection				MCP
	Yes		No		
	No	%	No	%	
<b>Patient age (years)</b>					
▪ 20-	1	2.7	36	97.3	0.001*
▪ 30-	3	10.3	26	89.7	
▪ 40-	24	82.8	5	17.2	
▪ 50-60	0	0.0	5	100.0	
<b>Gender</b>					
▪ Male	25	36.8	43	63.2	0.004*!
▪ Female	3	9.4	29	90.6	
<b>Marital status</b>					
▪ Single	1	4.3	22	95.7	0.004*!
▪ Married	27	35.1	50	64.9	
<b>Education</b>					
▪ Illiterate	8	61.5	5	38.5	0.021*
▪ Read and write	8	32.0	17	68.0	
▪ Secondary education	10	19.2	42	80.8	
▪ Baccalaureate	2	20.0	8	80.0	
<b>Occupation</b>					
▪ Working	28	35.9	50	64.1	0.001*!
▪ Not working	0	0.0	22	100.0	
<b>Length of hospital stay</b>					
▪ 1-	2	8.7	21	91.3	0.001*!
▪ 15-	1	1.9	51	98.1	
▪ 30-	25	100.0	0	0.0	

MCP: Mont Carlo exact probability !: Fisher exact probability \* P < 0.05 (significant)

Figure (1) Distribution of patients with local signs of burn wound infection (No=100)

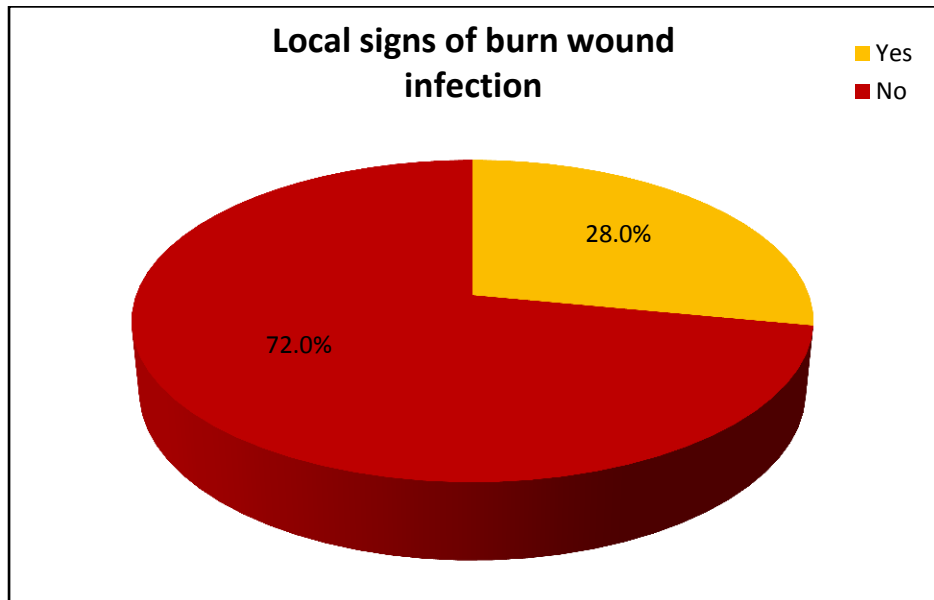


Figure (1) Local signs of burn wound infection were affected (28%) of studied patients from admission to third week.

Figure (2) reflecting Levels of nurses' performance related to most common practices (n=30). Their practice regarding hand washing, scrubbing were poor as they didn't follow ideal steps of these procedures , while their practice concerning burn wound dressing were relatively fair (6.7%) with mean of 17.1 ± 3.0. otherwise their performance regarding proper use of personal protective equipment were fair (76.7%) with mean of 20.5 ± 2.7.

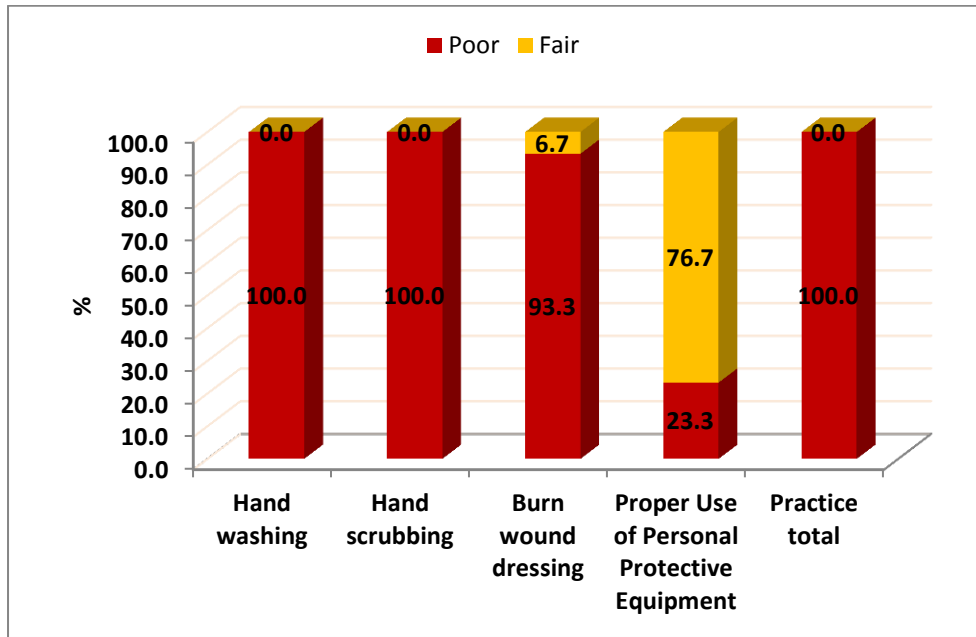


Figure (2) reflecting Levels of nurses' performance related to most common practices (n=30).

Table (2) Shows relation between nurses, observed total practice and socio-demographic characteristics (n=30).

Where there was a statistical significant relationship between total practice and years of experience ranged from 5-10 years with mean  $49.82 \pm 10.76$  ( $p = 0.004$ ).

Nurse demographic data	Practice total		t (P)
	Mean	SD	
<b>Age of nurse</b>			
▪ 20-	49.11	11.01	0.47 (0.640)
▪ 30+	47.24	9.48	
<b>Gender</b>			
▪ Male	50.00	5.29	0.40 (0.690)
▪ Female	47.56	10.22	
<b>Marital status</b>			
▪ Single	48.00	5.66	0.03 (0.977)
▪ Married	47.79	10.10	
<b>Education</b>			
▪ Bachelor	52.00	12.78	F= 1.2 (0.527)
▪ Technical health institute	47.05	10.13	
▪ Nursing school	47.50	7.31	
<b>Years of experience</b>			
▪ <5	42.25	1.83	3.1 (0.004)*
▪ 5-10	49.82	10.76	

t: independent samples t-test      F: One Way ANOVA      \* P < 0.05 (significant)

Table3: Shows relation between practice of both burn wound dressing & proper use of personal protective equipment (PPE) and local signs of burn wound infection.

There was a significant relationship between poor and fair burn wound dressing among patients with local signs of burn wound infection ( $p=0.035$ ) and also there was no significant relationship between poor and fair proper use of personal protective equipment among patients with local signs of burn wound infection ( $p=0.527$ ). Concerning patients who haven't local signs of infection, a significant relationship existed between poor and fair burn wound dressing ( $p=0.042$ ) and also a significant relationship was obvious between poor and fair proper use of personal protective equipment ( $p=0.047$ ).

**Table3: Relation between practice of both burn wound dressing& personal protective equipment (PPE) and local signs of burn wound.**

Item				Practice total		t (P)
				Mean	SD	
Local signs of burn wound infection	Yes	Burn wound dressing	Poor	45.25	7.26	3.1 (0.035)*
			Fair	60.00	0.0	
	Proper Use of Personal Protective Equipment	Poor	42.75	11.87	0.98 (0.527)	
		Fair	46.71	6.78		
No	Burn wound dressing	Poor	49.75	11.59	2.5 (0.042)*	
		Fair	71.00	0.0		
Proper Use of Personal Protective Equipment	Poor	48.33	6.35	2.0 (0.047)*		
	Fair	54.00	15.47			

t: independent samples t-test

\* P < 0.05 (significant)

#### IV. DISCUSSION

Burn wound infections are one of the most potentially serious complications that happen after injury. Patients with areas of necrotic deep partial-thickness or full thickness burn wound are at risk of an invasive infection. Burn wound sepsis was predominantly because of invasive wound infection<sup>(20)</sup>.

Nosocomial infections are a worthy problem for health services in all countries, with serious outcomes on the survival of high-risk patients, as burn patients. Infections of burn sites are very hazardous problems that can compromise the patients' survival and the outcome of reconstructive treatment<sup>(21)</sup>.

Despite enucleation of infection in burn patients is impossible, a well conducted surveillance, infection control and prevention program can help decrease the incidence. It is obvious that effective surveillance and infection control may reduce infection, mortality rates, and length of hospitalization and associated costs<sup>(22)</sup>.

The present study showed that, there was a significant relation between age group 40-50 years and local signs of burn wound infection. It should be pointed that such a result was observed in a previous study carried out by Wai-sun & Ying (2001)<sup>(23)</sup>.

In respect to sex, this study shows that males are significantly prone to occurrence of burn wound infections than females. This is in accordance with Ghassan (2011) who reported that males are more liable to burn wound infection than females<sup>(4)</sup> in contradiction with similar study from Iran Panjeshahin et al. (2001) illustrate that females were the victims of burns injuries more than males<sup>(24)</sup>.

Regarding to marital status, this study revealed that married patients were prone to infection greater than singles. This may be related to the fact that more than two third were in the age group between 40-50 years, and usually most males at that age are married. This may indicate that marriage problems may lead to burn injury either by suicide ideas or loss of concentration when contacting with dangerous items as results of increasing work load. On the other hand, Bayumi (2006) found that single adults are most commonly affected with burn injury than married ones<sup>(25)</sup>.

As for education, the present study showed a significant relation between illiterate patients and wound infection. This result was in the agreement with Abbass (2009)<sup>(8)</sup> and contradict with Abdel-hamid (2009) who stated that no significant difference was found between levels of education and infection occurrence<sup>(26)</sup>.

Regarding occupation above one third of patient with local signs of burn wound infection was working. This may be due to the majority of patients were males. This result in the same point with Abdel-hamid (2009) who found that the majority of patients with burn injury were workers<sup>(26)</sup>.

This study revealed that there was a significant relation between increased length of hospital stay & burn wound infection. This was in accordance with two studies Oncul et al., (2009) and Ghassan (2011)<sup>(4, 22)</sup>.

In relation to nurses' practice of hand washing the study showed poor performance, this might be due to time limitation, workload and work pace in agreement with Asare et al. (2009) reported about the effect of work pace on non-compliance with proper hand washing<sup>(27)</sup>. On the contrary, Parmeggiani et al. (2010), in Italy, demonstrated that most health care workers complied with proper hand hygiene measures<sup>(28)</sup>.

The current study showed that nurses' practice regarding hand scrubbing before burn wound dressing was poor. This was supported by Creedon (2005) who stated that hand scrubbing performance by nurses was unsatisfactory and implies a high risk for hospital-acquired infection<sup>(29)</sup>.

Regarding burn wound dressing, nurses' performance was poor which can increase risk for burn wound infection. In accordance with Ashry (2008) who reported inadequate burn wound dressing in burn unit by nurses where aseptic techniques are not strictly followed<sup>(30)</sup>.

Nurses' performance regarding proper use of personal protective equipment was fair in this study. It may be due to availability of supplies and nature of work. This is congruent with Flores and Pevalin (2006) who reported that proper use of personal protective barriers by nurses were poor<sup>(31)</sup>.

In the current study there was a statistically significant relationship among burn wound dressing and local signs of burn wound infection ( $p=0.035$ ) in accordance with Ashry (2008) who revealed that burn wound dressing is an important risk factor for wound infection<sup>(30)</sup>. On the other hand there was no significant relationship between proper use of personal protective equipment and local signs of burn wound infection ( $p=0.527$ ). This result agreed with Ghassan (2011), where the majority of health care workers complied to wear personal protective equipments<sup>(4)</sup>.

## V. CONCLUSION

The study concluded that risk for burn wound infection attributed to nurses' performance concerning burn wound dressing and proper use of personal protective equipment where they play a pivotal role in nosocomial infection.

## VI. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are suggested;

- Apply infection control program in burn unit.
- Develop and apply infection control guidelines.
- Recommended for training program should be available for nursing staff.

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