

## ORIGINAL PAPER

### Burn Wound Infections in Medical Hospital Burn Unit in Bursa, Turkey

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#### Abstract

**Background:** Burn wound infection is a leading cause of morbidity and mortality and it remains one of the most challenging concerns in burn patients. The aim of this study was to determine the types of burn wound infections in patients who were hospitalized in burn unit.

**Methods:** Cross sectional retrospective survey was performed on 257 patients' swab cultures who were hospitalized in Burn Unit. A period of three years from 2003 to 2005 hospital records of the patients who were admitted in to Burn Unit. The data were collected by using patient records.SPSS 11.0 program was used for data analysis. Results were given in numbers and percentages.

**Results:** The ages of patients treated in burn unit were ranged between the ages of 0-92 years. More than half of our burn patients were between the ages of 15-64 (57.2%, n=147). Major causes of burn injuries were flame (42.4%), hot liquids (32.7%), and electrical burns. Close to half of the patients (47.9%) had second degree, 38.5% of them had second and third degree burns.42.4 % of the patients had at least one burn wound infection during their hospitalization period. *Pseudomonas aeureginosa* and *staphylococcus aurous* were mostly detected microorganisms. Statistically positive correlations were found between the degree of burn injury and burn wound infection ( $r=.198$ ,  $p<0.001$ ). TBSA affected was positively correlated with burn wound infections ( $r=.216$ ,  $p<0.0001$ ).

**Conclusions:** Effective hand washing, isolation methods, multidisciplinary care of the burned patient, collaboration among health care staff are important factors in preventing burn wound infections.

**Key words:** Burn, wound infections

#### Introduction

American Burn Association National Burn Repository (ANBR) reports that (2013) 175.099 burn cases detected between the years of 2003-2012 in USA and 3.4% of them died as a result of burn injury. Since there is not any reliable database available regarding the burn injury incidence in Turkey, According to Turkish National Health Statistics results 13.173 people died due to injuries related to outside factors and poisoning in year of 2012 (tuik.gov.tr. 2012). Especially injuries caused by fire, hot liquids and

contact with hot surfaces have been recognized as a significant public health problem (Haznedaroğlu et.al, 2003). Home environment (73.2%) followed by industrial areas are the common places for burn injuries to occur (ANBR,2013). The burn is not a condition that only affects the skin it is a big trauma that affects the whole human body which is an important factor in prognosis of the burn patient (Zor et al.,2009). The treatment and care of the burn patient is time consuming and compelling experience both for patients, their care givers and

health care professionals. Although survival of the patients correlates too many factors, burn wound infection is a leading cause of morbidity and mortality and it remains one of the most challenging concerns for the burn care professionals. Particularly large open wound areas containing necrotic tissue make burn patients more susceptible to infection and septicemia that results from burn wound infections one of the common causes of these deaths. It has been reported that burn wound infections are among the top ten complications seen in burned patients by the rate of 7.4% (ANBR,2013). Patients who have large burn wounds (TBSA> 30%) have high mortality rates compared the ones who have not (Yasti & Kabalak, 2012). According to research findings *S aureus* and *P.aeruginosa* (Agnihotri 2003, Aldemir et al.,2000, Asti & Kabalak 2012, Haznedaroğlu et al 2003, Oncül at al 2002),*acinetobacter* (Polat et al, 2010) are the most common causes of serious infection in burn patients. The main cause of infection in burn wounds is patient's own flora, skin, respiratory and gastrointestinal tract (Knighton, 2011), environment and hands of health care staff (Haznedaroğlu et al 2003, Weber 2004). Lack of skin and mucosal barriers, impaired immunity, the length of the hospitalization increases the risk for burn wound infections. Characteristics of microbial flora on burned wound tend to change from gram positive to gram negative flora after two weeks from burn injury. If the burn wound is not treated properly there is high risk for microorganisms which are located under eschar tissue to expand to living tissues.

### Aim of the study

The aim of this study was to determine the types of burn wound infections in patients who were hospitalized in burn unit.

### Material and Methods

#### *The procedure*

Cross sectional retrospective survey was performed on 257 patients' swab cultures who were hospitalized in Burn Unit. A period of three years from 2003 to 2005 hospital records of the patients who were admitted in to Medical Teaching Hospital Burn Unit, in Northwestern Turkey, were analyzed. The data collected included: age, gender, and hospitalization period of the patients, cause of burn injury, severity and location of the burn injury, seasonal variation, types of burn wound infections and outcomes regarding mortality and morbidity.

### *Statistical Analysis*

SPSS 11.0 program was used for data analysis. Results were given in numbers and percentages. Spearman correlation was used to determine correlations between variables.

### Results

#### *Socio demographic variables of the patients*

The ages of patients treated in burn unit were ranged between the ages of 0-92 years (mean=25 years). More than half of our burn patients were between the ages of 15-64 (57.2%, n=147) and 29.2% (n=75) of the patients were between the ages of 0-6 years. Hospitalization period ranged between 1-103 days (mean:  $22.7 \pm 19.3$  days). Seventy four point three percent of the patients (74.3 %) were males and 25.7 % ( n=66) of them were females.

#### *Descriptive data related to cause of burn injury, affected body site and recovery*

Major causes of burn injuries were flame (42.4%), hot liquids (32.7%), and electrical burns (20.2%) in our study. Causes of burn injuries were given in Table 1.

Close to half of the patients (47.9%) had second degree, 38.5% of them had second and third degree burns. Upper extremities (79.2%) were the commonly affected parts of the body from burn injuries followed by lower extremities (59.1%), trunk (42.4%), face (37%), back (33.1%) and neck (16.3%). Eighty four percent point eight (84.8 %, n=218) of the hospitalized patients recovered from their burn injuries while 15.2 % (n=39) of them died. In our study sample 42.4 % of the patients had at least one burn wound infection during their hospitalization period.

#### **Mostly isolated burn wound infections and correlations between burn degree, TBSA and burn infections**

*Pseudomonas aeureginosa* (n=48) and *staphilococcus aureus* (n=29) were mostly detected microorganisms followed by *acinetobacter baumonii* (n=22),*enterococcus faecalis* (n=19), *klebsiella pneumonia*( n=15), *escherichia coli* (Table 2). Statistically positive correlations were found;between the degree of burn injury and burn wound infection ( $r=.198$ ,  $p<0.001$ ). TBSA affected was positively correlated with burn wound infections ( $r=.216$ ,  $p<0.0001$ ). Also duration of the hospitalization increased the burn wound infections ( $r= .518$ ,  $p<0.001$ ).

**Table 1.** Causes of burn injuries among patients who were hospitalized in burn unit between the years of 2003–2005

Causes of burn injuries	Years			Total
	2003 n	2004 n	2005 n	
Fire	34	36	39	109
Hot liquids	23	31	30	84
Electrical injuries	9	25	18	52
Chemicals	4	0	1	5
Contact with hot surfaces	1	1	2	4
Others	1	1	1	3
<b>Total</b>	<b>72</b>	<b>94</b>	<b>91</b>	<b>257</b>

**Table 2.** Most frequently detected microorganisms in burn wounds between the years of 2003–2005

Causes of Burn Wound Infections	Years			
	2003	2004	2005	Total
Pseudomonas Aeruginosa	12	21	15	48
Staphylococcus Aureus	8	13	8	29
Acinetobacter Baumannii	-	17	5	22
Enterococcus Faecalis	6	5	8	19
Klebsiella Pneumoniae	4	6	5	15
Escherichia Coli	3	2	6	11

## Discussion

Burn wound infections is a common cause of mortality and morbidity in burn units. Although very simple methods such as hand washing are an effective method in preventing hospital acquired infections, burn wound infection rates among burned patients remain high. According to research findings burn injuries commonly occur in home environment (ABNR 2013,Sakallioğlu et. al. 2007, Tang 2006) which is congruent with the results of our study. Considering that people especially women and children under age six spent most of their time at home they more prone to burn related injuries. Differently most of our study population was males while only 25.7 % of them were females. Flame is the most common cause of burns among adults (Tang et al, 2006) while hot liquids are detected as a common cause for burn injuries among children (Aytaç et al, 2004). In our study major causes of burn injuries were flame (42.4%) followed by hot liquids (32.7%), and electrical burns (20.2%). Children aged between 0-6 years mostly were burned with hot liquids which is similar to the previous research results (Aytaç et al, 2004). Considering their developmental stage curiosity of the young children under age of six is one of the main reasons for burn injury. Mostly upper extremities (79.2%) were affected parts of the body from burn injuries followed by lower extremities (59.1%) in this study. These results are quite different from those of Sakallioğlu et al.(2007) where they reported trunk as the most frequently affected part. Average total body surface affected (TBSA) of the patients in our study was 25.3 %. Close to half of the patients had second and 38.5% of them had second and third degree burns. Degree of burn injury and affected TBSA% are positively correlated with burn wound infections in our study which is consistent with the research findings (Haznedaroğlu 2003, Öncül 2002). Especially burns with TBSA >30% are high risk for developing burn wound infections (Haznedaroğlu 2003, Yasti & Kabalak, 2012).Although one study reported length of hospitalization period as eight days (Saadat ,2005) duration of the hospitalization was calculated as 22.7 days in this study. The length of hospitalization is one of the main factors in developing wound infection in burn units and hospitalization period was fairly high in our study. However considering most of our study population had second and third degree burns the length of hospitalization can be evaluated in acceptable limits. In our study sample 42.4 % of the patients had at least one burn wound infection

during their hospitalization period and pseudomonas aeureginosa and staphylococcus aurous were mostly detected microorganisms. Most of the studies report pseudomonas aeureginosa and staphylococcus aurous as common cause for burn wound infections as it is also a case in our study (Aygit et al. 2012,Öncül 2002, Özbeğ et al 2005, Rastegar et al. 2005). According to Özkurt et al (2012) using new methods and changing some of the practices such as abandoning hydrotherapy tank in care of burned patients reduced pseudomonas strains. Development of new methods both in treatment and the care of burn wound is an important factor in preventing burn wound infections.

## Conclusion

Infection control practices such as hand washing, isolation methods, and education of health care staff are influential in preventing burn wound infections. Multidisciplinary care of the burned patient, collaboration among health care staff and physical conditions of the burn units are also important facts among all others.

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