

An Audit of Infection Control Measures and their Relationship with Infection Rate among Burn Patients at Ayub Teaching Hospital, Abbottabad

Infection Control
and Infection
Rate among Burn
Patients

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ABSTRACT

Objective: To assess the infection control protocols followed in our unit and see their impact on infection rate and patient outcome.

Study Design: Retrospective observational study

Place and Duration of Study: This study was conducted at the Department of Plastic Surgery and Burns Unit, Ayub Teaching Hospital, Abbottabad over a period of six months from January 1st, 2024 to June 30th, 2024.

Methods: A review of infection control protocols currently followed in our unit was made using a structured Performa. Data was collected only for those burn patients who developed signs of sepsis 48 hours after admission. Compliance to various protocols was determined and their relationship with infection rate was analyzed using Pearson Chi-square test with P value ≤ 0.05 taken as significant.

Results: Various lapses in infection control have been identified, including the lack of PPE and autoclave, inadequate use of hand sanitizer by staff and attendants, and non-compliance with proper cleaning and dressing practices. The overall infection rate was 68.8%. Appropriate cleaning of dressing room reduced infection rates to 30.9%, while reusing linen and inappropriate dressings increased rates to 87.3% (p value = 0.03 and 0.000 respectively). Attendants visiting multiple patients carried an infection rate of 89.1% (p value=0.000).

Conclusion: This audit underscores the critical role of rigorous infection control measures in determining outcomes for burn patients. Gaps in infection preventions were identified. Recommendations include ongoing education of staff, doctors and patient's attendants, adherence to protocols and repeated audits.

Key Words: Multi Drug Resistant Organisms, Infection Control Measures, Infection Rate

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INTRODUCTION

Burn injuries are a major form of accidental trauma. They are considered to be the fourth most common cause of injury after accidental falls, physical assaults and road traffic accidents¹. Approximately 265,000 people die from burn injuries each year. The majority of these injuries are reported from developing countries². When burn injury occurs first organ to be damaged is skin, it acts as a protective barrier in humans. Loss of barrier leads to increased susceptibility to colonization by bacteria, which leads to increased infections³.

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It is important to treat burns adequately. If proper treatment is not given bacterial colonies overgrow and form biofilms on the wound surface. These biofilms hinder the process of re-epithelialization and also cause persistent inflammation in the burn wound⁴. If untreated, surface infections can progress to systemic infections, leading to sepsis. It has been seen that up to 75% of burn patients may die from sepsis within the first two weeks after burn⁵.

Nosocomial infections in burn patients pose significant treatment challenges for clinicians. Effective pre-hospital management, appropriate hospital treatment, choice of dressings, and wound care are crucial factors that influence the outcome in these infections⁶. Early in the course of burn injury wounds are mainly colonized by gram-positive organisms, which are later replaced by gram-negatives as the infection progresses⁷.

Infection control in burn units is one of the major challenges a physician faces. It requires strict measures to overcome this burden. Less physical contact, use of protective precautions, appropriate use of antibiotics, and careful monitoring to prevent the emergence of multidrug resistant strains is necessary⁸. Ideally, burn infections can be managed through patient isolation,

effective wound coverage by surgical and non-surgical methods, and frequent cultures to determine the specific flora associated with wound infections and adjust treatment accordingly⁹. Prolonged hospital stays and increased morbidity are often exacerbated by factors such as lack of resources, unavailability of appropriate dressings, and a lack of aseptic environment¹⁰.

METHODS

This was a retrospective study done at Department of Plastic Surgery & Burns, Ayub Teaching Hospital Abbottabad for duration of 6 months (1st January, 2024 to 30th June, 2024) following ethical approval. An Audit tool (Proforma) was made using infection control guidelines by World Health Organization (WHO), Center of Disease Control (CDC) and American Burn Association (ABA). The tool recorded variables such as hand hygiene, environmental cleaning, cross contamination and appropriate dressing changes. Infection control protocols were observed for only those burn patients who developed fever (>38°C) and other signs of sepsis (tachycardia, tachypnea, thrombocytopenia, unable to continue enteral feeding for more than 24 hours), 48 hours or more after being admitted to burn unit despite receiving prophylactic antibiotics. Wound and blood cultures were collected from these patients to identify infections, with positive cultures indicating infection or sepsis, and negative cultures ruling out infection. Patients who had fever or signs of sepsis at the time of admission, as well as plastic surgery patients with infections, were excluded from the study. Data was collected using patient charts,

hospital records, and daily progress reports and cleaning logs. Out of total 224 patients admitted during study period (102 plastic surgery, 122 burns patient), 80 met the inclusion criteria. Data was analyzed using SPSS v. 27. Compliance to various protocols is expressed in terms of percentages and relationship between various infection control measures and infection rate is determined using Pearson Chi-square test and P value ≤ 0.05 is taken as significant.

RESULTS

Table 1 shows various infection control practices within the burn unit. **Hand sanitizer** was available all the time (100%) but its use while visiting the patients was observed in only 70% of the cases by staff, while attendants never used it before entering or after leaving patient's room.

Personal Protective Equipment (PPE) and autoclave were not available in the unit. Antimicrobial soaps were available in 80% of the cases, separate containers for soiled articles are largely lacking (92.5%). Non-compliance was observed in the proper cleaning of dressing rooms (62.5%) and changing linen after each dressing (85%). Additionally, inappropriate dressing materials were used in 67.5% of cases. It was observed that a high percentage of attendants (67.5%) visited other patients, further risking infection spread. Routine fumigation or decontamination of patient rooms and sterilization of dressing material containers is not performed at all. Overall infection rate was found to be 68.8% which is quite high.

Table No.1: Percentages of compliance with various infection control protocols.

Sr. No.	Variable	Response N=80	
		Yes (%)	No (%)
1	Is hand sanitizer available in the unit?	100%	0%
2	Is Personal Protective Equipment (PPE) available in the department?	0%	100%
3	Is there an autoclave in your unit?	0%	100%
4	Is your unit near the operation theater?	0%	100%
5	Are antimicrobial soaps available?	80%	20%
6	Are separate containers available for collecting soiled articles?	7.5%	92.5%
7	Is alcohol-based sanitizer used after entering/leaving a patient's room or after any procedure?	70%	30%
8	Is the dressing room cleaned properly after changing the dressing of each patient?	37.5%	62.5%
9	Were there two patients in the dressing room simultaneously during dressing change?	40%	60%
10	Was the linen changed after changing the dressing of each patient?	15%	85%
11	Was appropriate dressing according to wound type used?	32.5%	67.5%
12	Do attendants of one patient visit other patients?	67.5%	32.5%
13	Do patient attendants use sanitizer before touching or visiting the patient?	0%	100%
14	Is routine fumigation/decontamination of patient rooms carried out when a patient is discharged?	0%	100%
15	Is equipment used for changing the dressing of patients set up immediately prior to procedure?	2.5%	97.5%
16	Are containers containing dressing material (surgical gauzes, crape bandages etc.) frequently sterilized?	0%	100%
17	Cultures reported to be positive	N=55 (68.8%)	

Table No.2: Association between Infection Control Protocols and Infection Rate.

Infection Control Protocols		Percentage	Infection rate	P Value
Is the dressing room cleaned properly after changing the dressing of each patient?	Yes	37.5%	30.9%	0.07
	No	62.5%	69.1%	
Were there two patients in the dressing room simultaneously during dressing change?	Yes	40%	52.7%	0.001
	No	60%	47.3%	
Was the linen changed after changing the dressing of each patient?	Yes	15%	12.7%	0.39
	No	85%	87.3%	
Was appropriate dressing according to wound type used?	Yes	32.5%	12.7%	0.000
	No	67.5%	87.3%	
Do attendants of one patient visit other patients?	Yes	67.5%	89.1%	0.000
	No	32.5%	10.9%	
Is equipment used for changing the dressing of patients set up immediately prior to procedure?	Yes	2.5%	0.00%	0.03
	No	97.5%	100%	

Table 2 depicts the relationship of various infection control protocols and infection rate along with statistical significance. The data reveals that when the dressing room was cleaned after each patient's dressing, the infection rate was 30.9%. However, when cleaning was not performed, the infection rate increased significantly to 69.1%. Similarly, when more than one patient underwent dressing changes simultaneously in the same room, the infection rate was 52.7%, but this rate decreased to 47.3% when such practices were reduced (p value=0.001). The practice of changing contaminated linen with fresh linen after each dressing resulted in a lower infection rate of 12.7%. In contrast, reusing the same linen for multiple patients led to a much higher infection rate (87.3%). The use of appropriate dressings was associated with a much lower infection rate of 12.7%, whereas inappropriate dressing choices resulted in an infection rate of 87.3% (p value=0.000). Furthermore, the practice of attendants visiting multiple patients was linked to a high infection rate of 89.1% (p value=0.000). It is also observed when dressing materials were set up immediately before the dressing change, the infection rate was 0%. In contrast, when pre-set materials were used, the infection rate jumped to 100% (p value=0.03). This data highlights the importance of adherence to infection control protocols in minimizing infection rates.

DISCUSSION

This study highlights the compliance to various infection control measures being followed in Burn unit of Ayub Teaching Hospital and identifies differences from guidelines put forward by the WHO, CDC and ABA. Relationship of such practices with infection rates was also determined.

We observed that despite the availability of hand sanitizer in our unit, only 70% of the times it was used by staff while patient's attendants never used it. Educating both staff and attendants on maintaining 100% hand hygiene is essential for reducing infection rates, as supported by Boora et al¹¹.

The lack of PPE and an autoclave indicates significant lapses in infection control. PPE is crucial to prevent microbial transmission, and an autoclave is necessary for eradicating multi-drug resistant organisms. Hospital administration must ensure these are provided. Instruments are currently washed with Povidone-iodine, which is insufficient for eliminating resistant organisms. Burn patients acquire infections from close environment for example bedrails, door handles, mattress, water tap, side tables¹². These all are sources of infection as multiple people touch them and they are never sterilized. Limiting patient transport is also crucial, as excessive movement out of burn unit increases contamination risk. Ideally, the operating theater should be close to the burn unit to reduce environmental contamination, as suggested by Palmieri TL¹³.

We observed that appropriate cleaning of dressing room was done in only 40% cases and bed linen was changed after 24 hours. Each day multiple patients undergo dressing change on same bedsheet which increases cross contamination. We observed when fresh linen was used for each patient, infection rate reduced from 85% to 15%. Practically it is not possible to have that many linen changes in a day, we recommend use of disposable dignity sheets for each patient which can be easily disposed of. Due to the high patient load and the availability of only one dressing room, dressing changes for two or more patients simultaneously occurred 40% of the times, resulting in an infection rate of 52.7%. However, when dressing changes were conducted for only one patient at a time, the infection rate decreased to 47.3%. Inappropriate dressing materials were used in 67.5% of cases, leading to an infection rate of 87.3%, whereas appropriate dressings reduced the rate to 12.7%. We are still using liquid paraffin, surgical gauzes and Silver Sulphadiazine ointments covered by crape bandage on all types of burns. Shingleton S et al. recommends use of dressings that do not adhere to wound bed and not cause pain or bleeding upon removal¹⁴. Specialized dressings could

not be used because most patients have financial constraints and cannot bear the cost of such dressings. In this regard hospital should make efforts to provide such dressings through Sehat Sahulat Program (SSP), which is a social welfare reform introduced in health care system of Pakistan in 2015 for under privileged citizens to get access to appropriate health care without any financial burden¹⁵. In addition to using traditional dressings, we noted that materials such as surgical gauzes and crape bandages were pre-prepared and stored in containers within the dressing room for quick access, often remaining open and stocked for up to two to three days. Our observations revealed that using pre-prepared materials led to an infection rate of 100%, whereas using freshly opened materials resulted in a drop in infection rate to 0%. Furthermore, the containers containing these materials had never been sterilized. These practices must be urgently addressed, and frequent sterilization of all equipment should be implemented as a mandatory procedure. Various studies have shown the efficacy of newer dressings compared to traditional ones. Kumar et al. compared collagen dressing with Silver Sulphadiazine (SSD). Healing time was 15.91 days with collagen dressing as compared to 22.08 days with SSD¹⁶. Another study compared hydrogels with SSD. Hydrogels had 68.9% efficiency while SSD had 55.3%¹⁷. A large proportion of attendants visit other patients as a gesture of sympathy but this contributed to an infection rate of 89.1%. Limiting such visits would help in controlling infection transmission. Routine fumigation or decontamination is not performed, which can significantly increase the risk of infections in newly admitted patients. Gus et al. recommended use of Ultraviolet light, Hydrogen peroxide vapors and Narrow Spectrum Light Environmental Decontamination System. All of these are superior to traditional disinfectants¹⁸. Ladhani et al. recommends that nothing should go in or out of a room where Multidrug Resistant organisms are present without decontamination¹⁹.

CONCLUSION

In conclusion our study highlights the key infection control measures and their compliance in our unit. Various flaws have been identified like lack of hand hygiene, Unavailability of PPE and autoclave. Improper decontamination of dressing room and patient rooms, use of non-specialized dressings and too many attendant visits. All these are contributing to a high infection rate (68.8%). It is important that strict compliance to protocols is ensured so that good standard care can be provided to the patients.

Recommendations:

1. Regular education of staff and doctors regarding infection control measures should be done.

2. Separate rooms should be dedicated for burn and plastic surgery patients without using them interchangeably.
3. PPE and autoclave should be made available in the unit.
4. Dressing changes of patients with high exudate should be carried out in their own rooms instead of common dressing room.
5. Introduce a policy to provide specialized burn dressings in Sehat Sahulat Program.
6. Written guidelines regarding decontamination of instruments, floor and linen should be introduced and compliance should be monitored using daily logs/charts.
7. Use of dignity sheets should be mandatory during dressing changes.
8. One attendant per patient policy should be introduced.
9. We recommend strict adherence to the infection control measures for an extended period of time and then do re-audit to see improvements in patient outcome.

Abbreviations:

Personal Protective Equipment (PPE), World Health Organization (WHO), Center of Disease Control (CDC), American Burn Association (ABA), Sehat Sahulat Program (SSP), Silver Sulphadiazine (SSD).

Author's Contribution:

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