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Bacteriological analysis of wound infections from Sukkur, Sindh

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Abstract: Wound is a physical injury where the skin or another external surface including mucus membrane is damaged. The development of chronicity and delay healing of a wound are mainly caused by bacterial infections. The aim of the present study was to find out that which bacteria, causing wound infections, are more common in Sukkur region. This cross sectional study was carried out for the duration of six months. Samples were collected using standard aseptic methods, and then cultured on selective and differential media. The bacterial isolates were identified using microscopic and conventional biochemical methods. Out of forty six culture positive specimens, 20% (n=14) yielded growth of mixed cultures containing two or three types of bacteria, hence a total of sixty six bacterial isolates were recovered altogether. Results of the present study demonstrated that the most predominant wound pathogen was *Staphylococcus aureus* with 34.84% (n=23) followed by *Pseudomonas aeruginosa* with 15.15% (n= 10) and *β hemolytic streptococci* with 13.63% (n=10).Other isolated bacteria were *Escherichia coli* (9.09%), *Proteus vulgaris* (7.57%), *Enterococcus* spp. (6.06%), *Klebsiella pneumoniae* (4.54%), *Streptococcus* spp(6.06%) and *Acinetobacter* spp(3.03 %). In conclusion, the commonest wound pathogen at area of the present study was *S. aureus*. Second and third most common wound pathogens were *P. aeruginosa* and *β hemolytic Streptococci*.

Keywords: Antibiotic resistance, Bacterial pathogens, Empirical treatment, Wound infections

1. INTRODUCTION

Wound infections are the most frequent bacterial infections affecting many individuals annually worldwide and pose significant morbidity and high healthcare costs (Allegranzi *et al.* 2016). Recently, a prospective, multi-centre has reported a higher incidence rate of post surgical wound infections in developing countries (Bhangu *et al.* 2018). Consequently, wound infections account a majority of the nosocomial infections and have been considered as a significant cause of morbidity and mortality in hospitalized patients (Anderson 2011; Pawar and Biswas 2016; Qayyum *et al.* 2018). However, outdoor patients also acquire wound infections (Perencevich *et al.* 2003).

Wound infections often occur when a person suffer from a surgery (post surgical infections), any burn (burn infections), war (war related infections), or any accident to skin (Korol *et al.* 2013; Saaiq *et al.* 2015; Sahli *et al.* 2016). Based on the duration of the healing process, the infections are classified as acute or chronic wound infections (McGuckin *et al.* 2003), and microbiology of the both types of the infections differ in the respect of microbial type, microbial load and ability of biofilm formation (Rahim *et al.* 2017).

Surveillance studies are important tools to guide physicians in treatment procedures and management of infections (Masterton 2000). Therefore, current study was conducted in order to determine the bacteriology of wound infections and know about common wound pathogens circulating in Sukkur, Sindh to assist doctors/clinicians in making decisions for use of the available therapeutics options. Knowing and isolating common wound pathogens are also important for future studies focusing on the patterns of antibiotic sensitivity and resistance of the pathogens.

2. MATERIALS AND METHODS

This study was approved by the Advanced Studies and Research Board (ASRB) of University of Sindh, Jamshoro, Pakistan. It was a cross sectional study carried out for six months. Sample taken from same patient at different occasion was also was excluded, while samples taken from the patients (indoor and outdoor) visiting any clinical facility located at Sukkur city and were suffering from any wound infection described by a local physician were included.

Sample collection and processing

The pus, tissue or wound aspirate specimens were collected by convenient method from wound patients.

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All specimens were collected from different health care facilities at district Sukkur including government, semi government and private institutions and general practitioners clinics. The samples were collected and processed immediately following collection. Pus specimens were inoculated directly in semi solid media as nutrient agar, chocolate agar and MacConkey agar. Segments of the tissues were chopped by sterile cutter and the fluid specimens were centrifuged at 3000rpm for 10 minutes prior to inoculation on the media plates. Plates were incubated at 37°C for 24 to 48 hours in aerobic environment.

Isolation and identification of bacterial isolates of wound infections

Samples that demonstrated pure growth of bacteria isolate following overnight incubation were considered as growth positive. The bacteria isolates were initially characterized on the basis of their cultural, morphological, and biochemical characteristics. Gram-staining was used for determination of morphological characteristics of the isolates through microscopic observation while biochemical tests included catalase test, coagulase test, oxidase test, reaction on triple sugar iron medium, urease test, hemolytic reaction, citrate utilization test and SIM test .

Statistical analysis

Values in percentage are given for each of wound sample with reference to type of isolated bacteria. The statistical analysis of variables (i.e., age, gender, and site of infection) was performed using SPSS-16, Microsoft Excel 2010, or manually where applicable.

2. RESULTS

A total of seventy pus, tissue or wound aspirate specimens from various sites of infections were collected over a time period of six months and investigated for bacteriological profiling. Among them 75.71% (n=53) were from male patients while 24.29% (n=17) were from female patients. Among the male patients 22.64% (n=12) were indoor and 77.36% (n-41) were out door, however, only 06 (35 .29%) female patients of this study were indoor and rest of them (n=11) were out door. Demographic data with respect to age and gender of all patients is listed in **Table 1**. The positivity of samples for growth of bacteria (culture positive) appeared to be 65.71% (n=46) whereas 34.29% (n=24) of the samples yielded no growth thus considered as culture negative **(Table 2).** It was observed that 43.75% (n=14) of patients with culture positive specimens were having mixed type infection indicating that the specimens were contaminated with more than one type of bacteria. Frequency of all bacterial isolates (n= 66) from recovered from various parts/organs of body are presented in **(Table 3).** Bacteriological analysis of the infected wounds revealed that *S. aureus* was the most common pathogen followed by *Pseudomonas aeruginosa* **(Table 4)**. Other isolated bacteria were *β hemolytic streptococci*, *Escherichia coli*, *Proteus vulgaris*, *Enterococcus spp*. *Klebsiella pneumoniae* and others **(Table 4).**

Table 1- Age and gender wise distribution of total and culture positive wound specimens

	Total Specimens from male patients		Total Specimens from female patients		Culture positive specimens from male patients		Culture positive specimens from female patients	
Age (years)	**Frequency**	**%age**	**Frequency**	**%age**	**Frequency**	**%age**	**Frequency**	**%age**
0-10	6	8.57	0	0.00	5	7.14	0	0.00
11-20	7	10.00	5	7.14	6	8.57	4	5.71
21-30	8	11.43	3	4.29	5	7.14	2	2.86
31-40	6	8.57	1	1.43	5	7.14	1	1.43
41-50	10	14.29	6	8.57	5	7.14	2	2.86
51-60	7	10.00	2	2.86	6	8.57	0	0.00
61 and above	9	12.86	0	0.00	5	7.14	0	0.00
Total	**53**	75.71	**17**	24.29	**37**	52.86	**9**	12.86

Table 2 – A summary of wound pathogens isolated and characterized in this study

Total No. of samples	Culture Positive		Culture Negative	
70	Number	%age	Number	%age
	46	65.71	24	34. 29

Table3– Distribution of wound specimens according to site and type of wound infections

Site of infection	Frequency	%age	Gender	Infection type			Total
				Single (45.71%)	**Mixed (20.0%)**	**Negative (34.28)**	
Abdomen	19	27.14	Male	6	3	7	16
			Female	1	0	2	3
Arm	11	15.71	Male	3	2	3	8
			Female	1	1	1	03
Breast	1	1.42	Male	0	0	0	0
			Female	1	0	0	1
Chest	4	5.71	Male	3	0	1	3
			Female	0	0	0	0
Ear	2	2.85	Male	2	0	0	2
			Female	0	0	0	0
Foot	6	8.57	Male	4	1	0	5
			Female	0	0	1	1
Hand	4	5.71	Male	0	0	2	2
			Female	0	0	2	2
Head	3	4.28	Male	1	0	1	2
			Female	1	0	0	1
Knee	3	4.28	Male	3	0	0	3
			Female	0	0	0	0
Leg	12	17.14	Male	2	3	2	7
			Female	1	3	1	5
Neck	2	2.85	Male	1	1	0	2
			Female	0	0	0	0
Shoulder	3	4.28	Male	2	0	0	2
			Female	0	0	1	1
Total	70	100	Male	27	10	16	53
			Female	5	4	8	17
			Total	**32**	**14**	**24**	**70**

Table 4- Distribution of total bacterial isolates of this study

S. No.	Organism	No.	%
Gram-negative (n=26)			
1	*E. coli*	06	9.09
2	*P. vulgaris*	05	7.57
3	*K. pneumoniae*	03	4.54
4	*P. aeruginosa*	10	15.15
5	*Acinetobacter spp*	02	3.03
Gram-positive (n=40)			
1	*Enterococcus spp.*	04	6.06
2	*Streptococcus spp.*	04	6.06
3	*Beta hemolytic streptococci*	09	13.63
4	*Staphylococcus aureus*	23	34.84
Total		66	100

3. DISCUSSION

Bacteriological investigations of bacterial infections are very important for (i) knowing common bacteria causing the infections in a particular locality and (ii) precise prescription for empirical therapy, (iii) reason that type of common bacteria causing particular infection may vary place to place, and time to time (Bano *et al.* 2014). Consequently, determining the bacteria which colonize wounds and causing wound infection is of paramount importance. Therefore, the present study was carried out to generate the local data about wound pathogens for the proper therapeutic interventions of the wound infections and to help in the modification of infection control strategies.

In this study it was observed that) out of 53 specimens from male patients, n=37 were positive for bacterial growth, from which 27 were found with single growth of single organism whereas 10 samples yielded the growth of multiple pathogens indicating polymicrobial wound infections. Similarly among 17 female patients, 05 samples yielded growth of single pathogenic bacteria while 04 specimens showed the polymicrobial infection having growth of multiple bacterial isolates. Furthermore, among the 66 isolates of wound pathogens, *S. aureus* was the most frequent and predominant isolate accounting 34.84%. These findings are in agreement with the published data from other regions indicating that *S. aureus*, Gram-positive cocci, remained most frequent isolate among wound pathogens from Lahore and Hyderabad, Pakistan (Zaib *et al.* 2017; Bano *et al.* 2015). However, in contrast of the previous studies wherein *E. coli* was found as second most common wound pathogen (Zafar *et al.* 2008; Malik 2015; Zaib *et al.* 2017), whilst the present study demonstrated that *P. aeruginosa* was the second most common wound pathogen. In conclusion, this study provide insight into the data about the bacteriology of locally infected wounds to fill out the gap in available data regarding wound infections at Sukkur because no study of similar nature has been carried out before in this locality.

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Conflict of interest

Authors declare “no conflict of interest”.

REFERENCES:

Allegranzi, B., B. Zayed, P. Bischoff, N. Z. Kubilay, S. de Jonge, F. de Vries, S. M. Gomes, S. Gans, E. D. Wallert and X. Wu. (2016). New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: an evidence-based global perspective. *The Lancet Infectious Diseases* (16), e288-e303.

Anderson, D. J. (2011). Surgical site infections. *Infectious disease clinics of North America* (25), 135-153.

Bano, S., S. Tunio, S. Mal and A. Jatt. (2015). Frequency of Methicillin Resistant Staphylococcus aureus Among Isolates of Wound Infections from Hyderabad. *Sindh University Research Journal-SURJ (Science Series)* (44), 683-686.

Bano, S., S. A. Tunio, A. A. Memon, H. Detho, R. Bano and K. Kumari. (2014). Evaluation of Antibiotic Susceptibility Patterns of Uropathogens circulating in Hyderabad, Pakistan. *Khyber Medical University Journal* (6), 110-115.

Bhangu, A., A. O. Ademuyiwa, M. L. Aguilera, P. Alexander, S. W. Al-Saqqa, G. Borda-Luque, A. Costas-Chavarri, T. M. Drake, F. Ntirenganya and J. E. Fitzgerald. (2018). Surgical site infection after gastrointestinal surgery in high-income, middle-income, and low-income countries: a prospective, international, multicentre cohort study. *The Lancet Infectious Diseases* (18), 516-525.

Korol, E., K. Johnston, N. Waser, F. Sifakis, H. S. Jafri, M. Lo and M. H. Kyaw. (2013). A systematic review of risk factors associated with surgical site infections among surgical patients. *PloS one* (8), e83743.

Malik, A. Z. (2015). Surgical site infections after elective surgery in Pakistan: Surgipak Study. *Journal of Rawalpindi Medical College* (19), 209-214.

Masterton, R. G. (2000). Surveillance studies: how can they help the management of infection? *Journal of Antimicrobial Chemotherapy* (46), 53-58.

McGuckin, M., R. Goldman, L. Bolton and R. Salcido. (2003). The clinical relevance of microbiology in acute and chronic wounds. *Advances in skin and wound care* (16), 12-23.

Pawar, A. Y. and S. K. Biswas. (2016). Postoperative spine infections. *Asian spine journal* (10), 176Pp.

Perencevich, E. N., K. E. Sands, S. E. Cosgrove, E. Guadagnoli, E. Meara and R. Platt. (2003). Health and economic impact of surgical site infections diagnosed after hospital discharge. *Emerging infectious diseases* (9), 196Pp.

Qayyum, S. F., Q. Ali, M. Ayyaz and M. Imran. (2018). Frequency of post-operative surgical wound infection in patients at Ayub Teaching Hospital, Abbotabad, Pakistan. *Pakistan Journal Of Health Sciences* (2), 80-84.

Rahim, K., S. Saleha, X. Zhu, L. Huo, A. Basit and O. L. Franco. (2017). Bacterial contribution in chronicity of wounds. *Microbial ecology* (73), 710-721.

Saaiq, M., S. Ahmad and M. S. Zaib. (2015). Burn wound infections and antibiotic susceptibility patterns at Pakistan Institute of Medical Sciences, Islamabad, Pakistan. *World journal of plastic surgery* (4), 9Pp.

Sahli, Z., A. Bizri and G. Abu-Sittah. (2016). Microbiology and risk factors associated with war-related wound infections in the Middle East. *Epidemiology and Infection* (144), 2848-2857.

Zafar, A., N. Anwar and H. Ejaz. (2008). Bacteriology of infected wounds-A study conducted at Children's Hospital Lahore. *Biomedica* (24), 71-74.

Zaib, N., S. Ali, A. P. Qasim, J. A. Qasim and N. Imdad. (2017). Bacterial Isolates of Infected Wounds and Their Sensitivity to Antibiotics. *Annals of Punjab Medical College* (11), 287-290.