Study the Wide Variety of Prospective Bacterial Pathogens in Infections of Burns and Wound Patients in Baghdad City.

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Abstract

The purpose of the study is to analyze the range of potential pathogenic bacteria that could infect skin-related burns and wounds in the governorate of Baghdad. In total, fifty wound swabs and burn samples were gathered for this study, examined under a microscope, and cultured on Blood, MacConkey, and Chocolate Agar media. Additionally, the isolates' antibiotic sensitivity was assessed using the disc diffusion test, the Vitek method, and biochemical testing. Fifty samples of burns and wounds were collected from hospitalized patients and were divided into two groups (twenty-eight men and twenty-two women) of all ages who were examined in the dermatology department at Al-Imam Al-Kazemi Medical City. The most microorganisms were Staphylococcus sp prevalent bacterial specie identified; Pseudomonas aeruginosa has also been isolated in a little number. The most isolated bacteria were resistance to the most selected antibiotics. Shigella sonnei and Klebsiella species were the most resistance strains, While Staphylococcus aureus and Staphyococcus epidermidis were susceptible to some antibioticsTracycline and fusidic acid had the highest resistance rate among the isolated bacterial species, followed by oxacillin, β-lactamase, and gentamicin. Finally we conclude from the current study that most styles of bacteria compelling which burns and wound infections are Gram-negative and Gram-positive bacteria, and most of them are multi-resistant to commonly used antimicrobial agents. This research furnishes the road for additional studies into in-depth metagenomics analysis and interactions between hosts and pathogens.

1. Introduction

Skin microbiotas are intrinsically connected. Both areas have long known that bacteria, fungi, and viruses inhabit the skin surface and that these microbial ecosystems are inextricably related to human health and condition (Kong & Segre, 2012). The microbial residents that maintain epidermal may be impacted by the skin microenvironment, such as humidity and sebaceous environment, in addition to intrinsic characteristics such as gender and age, including well like external factors such as personal hygiene, temperature, moisture, ultraviolet (UV) radiation, climate, and geographical localization(Shami et al., 2019; Suellen Ferro de Oliveira & Kekhasharú Tavaria, 2023). The carried on by trauma, incident, surgical procedures, or burn, a crack in the surface of the intact skin provides the possibility for infections caused by bacteria (Ohalete, 2019). The incidence of injury infection grows with the intensity of pollution and it has been estimated that approximately 50% of wounds exposed to bacterium acquire clinically infected (Tom et al., 2019).

The epidermis is an ecosystem made up of 1.8 m2 that contains different environments that are numerous in folds, biological processes, and cavities that are supported to host a broad variety of bacteria. The appearance of skin's primary purpose is to act as a physical barrier, shielding the human body from potential damage from toxic substances or foreign microbial(Kong & Segre, 2012). The skin acts as an interface between the internal and external environments and is home to a diverse range of bacteria, including viruses, bacteria, fungi, and mites (Chiller et al., 2001; Cogen et al., 2008). In certain cases, it could be fatal because there was no suitable substitute antibacterial agent available for the patients who were admitted (Bessa et al., 2015). Therefore, the goal of the current investigation was to identify the microbiology of burns and wounds, the sensitivity to antibiotics features of the grown bacteria, and the rate of pathogens in relation to the length of the wound in our patients who had

suffered burns. The majority of these microbes, as we have shown, is innocuous and, in certain situations, even serves essential roles that the human genome has not been able to enhance. In a variety of skin niches, symbiotic bacteria provide defense against the invasion of additional dangerous or infectious organisms. This study was carried out to evaluate the diversity of potential bacterial pathogens involved in the infection of burns and wounds among hospitalized patients by isolating skin bacteria, identifying them using Vitek, and assessing antibiotic resistance to these microorganisms. The objective of this study was to look into the variety of potential infections affected via bacteria infecting burns and wounds in the province of Baghdad.

2. Material and method

The instructions provided by the manufacturer were followed in preparing all microorganism growth media. Prior to autoclaving, each media's intended pH was examined and, if needed, corrected. Prepared culture plates were maintained at 4°C, and liquid media were kept at room temperature.

2.1. Samples Collection

Bacteriological disposable sterile cotton swabs and transport media were employed for obtaining specimens from skin burns and wounds from the hospital. After that, these specimens were sent immediately to the College of Health and Medical Technologies' Microbiology Laboratory, where they were processed via the utilization of bacterial cultures, isolation, and recognition.

2.2. Isolation of Bacterial Strains

The different strains of bacteria were obtained from bacteriology laboratory of AL-Imamaien AL-Kadhimaien Medical City has previously diagnosed with Vitek system and directly used for experiments.

2.3. VITEK® 2 System

The **VITEK® 2** Compact (30 card capacity) system employs a turbidimetric approach in addition to a fluorogenic methodology for the identification for microorganisms

2.4. Susceptibility test (St)

Employing the disc diffusion technique, the antimicrobial susceptibility of seven different strains was assessed. In short, each bacterial strain's suspension was changed to complete the McFarland standard of 0.5. A cotton swab was then soaked in the adjusted suspension and equally distributed on nutrient agar. Tetracycline, Vancomycin, Ampicillin, Oxacillin, Gentamicin, Ciprofloxacin, Erythromycin, Clindamycin, Fusidic acid, Rifampicin, Beta-lactamase, Fosfomycin, Linezolid, Livofloxacin, Tobramycin, Colistin, and Clindamycin were among the antibiotic discs that were approved. These discs were equally placed on an agar surface, and the cultures were incubated for overnight. The diameters of the inhibition zones were measured and assessed.

2.5. Statistical analysis.

Excel from Microsoft 2016 and the Statistical Program for the Social Sciences, version twenty-six were utilized to enter and analyze the data. Tables and/or graphs were used to display the results. ANOVA, chi-square, and T-test were all used in the statistical analysis of the definite variables. The level of relevance (P-value) was fixed at 0.05 for all statistical analyses.

3. Results

The majority of the isolates discovered were 13 *Staphylococcus aureus* (26%), 10 *Staphylococcus hominus* (20.0%), nine *Staphylococcus hemolytic* (18.0%), eight Staphylococcus epidermidis (16.0%), four Pseudomonas aeruginosa (8.0%), three *Staphylococcus warneri* (6.0%), two *Klebsiella species* (4.0%), and one *Shigella sonnei* (2.0%) out of the total number of 50 wound swab and burn specimens that were collected, dealt with and cultured on Blood, Mac Conkey, and Chocolate Agar. Five different types of bacteria were isolated from wound swabs, and three different types of bacteria were isolated from burn swabs, according to the research as showed in table 1 and figure 1.

Table 1. List of Bacteria spp which found in this study.

| Organism	Type of sample	number	Percentage
Staphylococcus aureus	Wound swab	13	26.0
Pseudomonas aeruginosa	Burns swab	4	8.0%
Shigella sonnei	Wound swab	1	2%
Staphylococcus epidermidis	Wound swab	8	16%
Staphylococcus warneri	Wound swab	3	6.0%
Klebsiella species	Wound swab	2	4.0%
Staphylococcus haemolyticus	Burns swab	9	18.0%
Staphylococcus hominis	Burns swab	10	20.0%
Total		50	100%
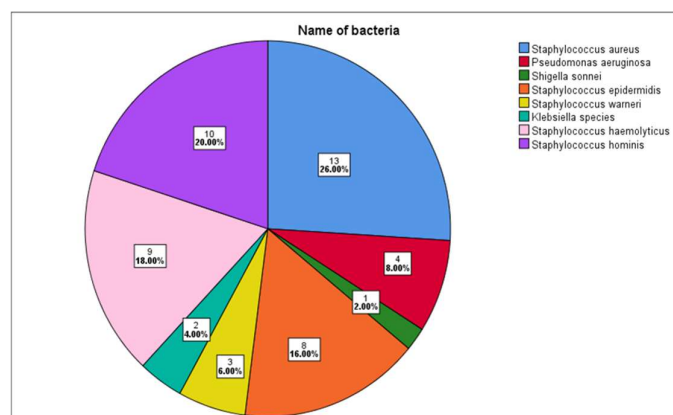
Figure 1. A list of the microbial genera discovered during the current study

Table 2 with figure 2. Records the results of the study with a total of infected 50 patients with a percentage of 28 which represents 56.0% for males and 22 (44.0%) for females, at P-value >0.05 was non-significant.

Table 2. Demographic description of study according to Gender.

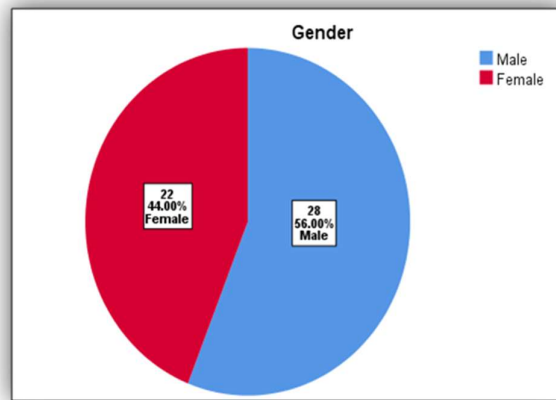| Type	Frequency	Percenteg
Male	**28**	**56.0%**
Femal	**22**	**44.0%**
Total	**50**	**100%**

Figure 2. Demographic description of study according to Gender.

Table 3: Demographic description of study according to Socioeconomic Level.

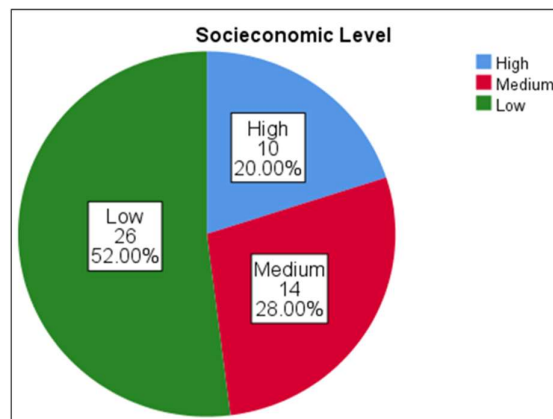| Frequency	Frequency	Frequency
High	10	20.0
Medium	14	28.0
Low	26	52.0
Total	50	100.0

Figure3. Demographic description of study according Socioeconomic Level. (20% High, 28% Medium & 52% Low) at P-value >0.05 (NS).

Table 4. Demographic description of study according Age.

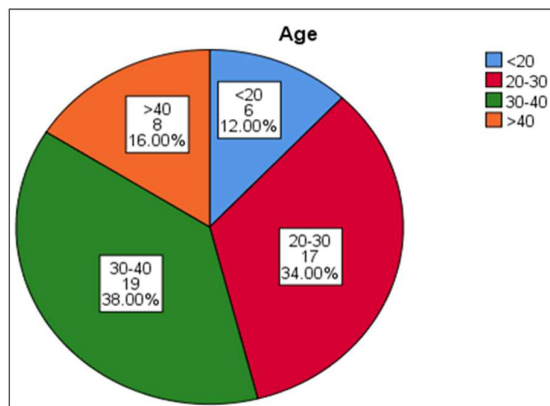| Age	Frequency	Percent
<20	6	12.0
20-30	17	34.0
31-40	19	38.0
>40	8	16.0
Total	50	100.0

Figure 3. Demographic description of study according to Age.

The Table 3 and Figure 3 above show demographic description of study according Age in four gropes (12% Age <20, 34% Age 20-30, 38% Age 30-40, 16% Age >40) at P-value P<0.01 (HS).
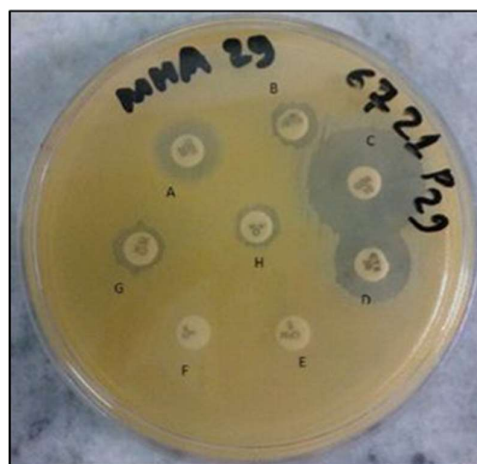

Figure 5. Methicillin-resistant Staphylococcus aureus (MRSA) antibiotic susceptibility test conducted in Mueller Hinton agar medium against various antimicrobial agents.

Table 5 Results of antibiotic sensitivity test of clinically isolated Bacteria.

Bacteria / Antibiotic[1]	S. aureus	P. aeruginosa	S. sonnei	S. epidermidis	S. warneri	Klebsiella spp	S. haemolyticus	S. hominis
Ampicillin	S	R	R	S	R	R	S	R
Oxacillin	R	S	R	R	R	R	R	R
Gentamicin	R	R	R	R	R	R	R	S
Ciprofloxacin	R	S	R	R	R	S	R	R
Erythromycin	S	S	R	S	R	R	R	R
Vancomycin	S	R	R	S	S	R	S	S
Tetracycline	R	R	R	R	R	R	R	R
Fusidic acid	R	R	R	R	R	R	R	R
Rifampicin	S	R	S	S	S	R	S	S
β-lactamase	S	R	R	R	R	R	R	R
Fosfomycin	S	R	S	R	R	R	R	R
Linezolid	S	R	R	S	S	R	S	S
Levofloxacin	R	S	R	S	R	S	R	R
Tobramycin	R	R	R	S	R	R	S	R
Colistin	R	S	S	S	R	R	R	S
Clindamycin	R	R	R	S	S	R	S	S

The Table .5 & the Figure .5 revealed that the most isolated bacteria were resistance to the most selected antibiotics. *Shigella sonnei* and *Klebsiella species* were the most resistance strains, While *Staphylococcus aureus* and Staphylococcus epidermidis were sensitive to some antibiotics.

4. Discussion

The study's discovered bacterial species comprise both classical and opportunistic infections, with the majority believed to have additional characteristics enhancing their pathogenic potential. Among these traits is the capacity to create biofilm (Ibrahim et al., 2021; Swanson et al., 2016). In another study, we found that male patients in their second and third generations of life had the highest infection rate. our current result is unmatchable with the findings of (Mohammed et al., 2013) , but it is consistent with the literature on related studies carried out in various regions of Nigeria (Brouwer et al., 2016) Certain people proposed that the majority of wound infections originate from the patient's own intrinsic flora on their skin or mucous membranes.. Staphylococcus spp (*epically Staph. aureus, Staph. haemolyticus, Staph. epidermidis, Staph. hominis, & Staph. warneri*), and *Pseudomonas* spp. are among major bacterial species incriminated in nosocomial wound infection and are associated with bacteraemia, septicaemia, shock and prolonged hospital stay. Virulence in *S. aureus* is mediated by the release of several virulence factors like invasins, hyaluronidase, catalase, coagulase, hemolysins, leukotoxin, and leukocidin (Bessa *et al*., 2015). Similar study found the Tetracycline, & Fusidic acid recorded the highest resistivity rate with all isolated bacteria, then Oxacillin, β-lactamase, & Gentamicin are at second. This is contrary to the finding of (Umoru et al., 2018) who record that Ampicillin has the highest resistivity rate with an average of 84.7% among

Gram-negative bacteria identified. Rifampicin & Vancomycin antibiotics were found to be most effective in this study.

5. Conclusion

The current research should stimulate carefully designed provincial studies to validate and enhance our results. We discovered that bacterial pathogens, primarily *Staphylococcus species* and *Pseudomonas aeruginosa*, were responsible for a high infection rate in wounds. Male adolescents exhibited the highest infection rate among the specimens. Additionally, the isolates have demonstrated significant resistance to gentamicin, Oxacillin, β-lactamase, and Tetracycline as well as Fusidic acid. Vancomycin and Rifampicin were the antimicrobial agents that performed the best in this investigation. As a result, in the future, metagenomic studies of skin flora, particularly anaerobes, will take into account larger specimen sizes and additional cofactor variables. This discovery will encourage future research on the correlation between flora and systemic diseases.

6. Acknowledgment

Ethical clearance: None

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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