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The Most Common Isolated Pathogen Bacteria from Post-Surgical Operation Cases

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Abstract:

In this study, 300 patients who had undergone surgery and were admitted to the surgical department of the University Teaching Hospital in middle Iraq cities between March 2022 and December 2023 were included; pus is a white to yellow fluid produced after surgical procedures that contain necrotic tissues, dead WBCs, and cellular debris. 75 (40%) were in the 15 to 60 age range. The current study is expected to regulate the occurrence of surgical sites and to assess the bacteriological outline and antibiotic susceptibility of surgical site pathogens among isolates. Common pathogens isolated were the pathogens revealed different levels of antibiotic resistance; Ampicillin 95%, Bacitracin88%, Ceftriaxone80%, Ciprofloxacin 77% Chloramphenicol 65%, Erythromycin57%, Gentamicin 50%, Kanamycin 45%, Nalidixic acid35% andNitrofurantoin30%. Interestingly, there were 50 (35%) more male instances than female cases. Pathogen bacteria were detected using samples from suspicious wounds and bacteria growth media. The SSI overall incidence was 15 %. The associated risk factors were the surgeon's skills and experience, an increased age, wound classification, longer duration of surgery (> 3 h), blood transfusion, prolonged hospital stay and emergency surgery. *Pseudomonas aeruginosa* 22% (44/200), *Acinectobacte* 21% (42/200), *Klebsiella ssp.* 17.5% (35/200), *Staphylococcus aureus* 15% (30/200), *Escherichia coli* 13% (26/200) and *Proteus mirabilis* 7% (14/200).

Introduction:

Nosocomial infections, or healthcare-associated infections (HAI), are illnesses that develop while receiving medical care but are not present at admission. In factions, surgically opened wounds after surgery are a huge concern that affects the entire world and increases morbidity and mortality. Hospital-acquired infections represent the majority of post-surgical wound infections, and they differ between hospitals [1].

They can happen in many care settings and impact patients and medical staff [2]. 5–10% of patients experience

HAI globally [2]. The most significant HAI are *Clostridia difficile* colitis (CDI), ventilator-associated pneumonia (VAP), surgery site infection (SSI), infections of soft tissue and skin (SSTI), and infections of the urinary tract brought on by catheters, and central line-associated bloodstream infections (CLABSI), with bacteria accounting for about 90% of HAI [3]. According to estimates, 80,000 hospitalized patients in Europe experience at least one HAI per day, adding 16 million hospital days to the calendar year [4]. The prevalence of HAI is approximately 7.5% in high-income nations, but it ranges from 5.7% to 19.2% in low- and middle-income countries.

Since the skin naturally protects us from infection, any procedure that breaks the skin can result in a post-operative infection. Infection at the surgical site (SSI) is a significant post-operative complication [5]. Exogenous and endogenous microorganisms that enter the surgical wound during the procedure are often the most widespread cause of infection at the surgical site (SSI). Gram-negative microbes have recently been identified as a source of SSI [6].

According to clinical definitions, it is an infection which affects the deep tissue suture or incision at the surgical site and appears within thirty days of the surgery (or during a year if the implant stays in place following the procedure) [2]. These infections may impact organs or bodily areas, or they can be incisional, deep, or superficial infections. The most frequent illnesses connected to medical facilities are SSIs. They are linked to considerable morbidity and have been claimed to be responsible for almost one-third of postoperative deaths [8].

Genotypic techniques are not appropriate for standard clinical testing. Therefore, quantitative MIC (minimal inhibitory concentration) testing is necessary to determine an antibiotic's susceptibility. Antibiotic sensitivity testing is moving away from manual approaches and toward automation as systems result from the rise in clinical specimen volumes. Utilizing such systems is inspired by the shorter turnaround time for laboratories than that needed for Standardized procedures, reduced costs, and easy hospital and laboratory interfaces. Informational technologies direct doctors toward effective antimicrobial therapy [9]. The quick results availability, reproducibility, the capacity to follow outcomes, and potential effects on the Workflow in the microbiology lab also favour the adoption of automatic systems. A few investigations have shown several automated systems' faults when various organism-antimicrobial combinations were used [10].

The most common aerobic Gram-negative bacterium isolated from initial infections was Escherichia coli, followed by Klebsiella pneumoniae in that sequence. Pseudomonas aeruginosa was the most common infection following surgery. E. coli and *Enterobacter* are most frequently isolated after that. as well as *K. pneumoniae*. The new danger is that widespread vancomycin resistance is a very serious problem. Given that vancomycin has raised concerns regarding public health, Antibiotic-resistant bacteria have long been treated with a preference for Gram-positive microbes [11,18]. Therefore, this study sought to evaluate the bacterial profile and antibiotic susceptibility patterns of isolates among patients in hospitals in middle Iraqi cities who had been diagnosed with surgical site infection.

Subjects and methods:

Process of study design and sampling

Between March 2022 and December 2023, 200 surgical pus specimens from patients admitted to the University Teaching Hospital’s surgical department of Middle Iraq cities were collected for this retrospective investigation. The study population was chosen from all individuals who had skin and soft tissue infections. Within 25 days of undergoing a postoperative procedure, doctors plan the study and do the sampling. Considering the estimated sample size of 92% “prevalence (20), 5% precision, and 95% confidence level, together with 10% contingency”, 128 patients were examined for the analysis. The study involved 300 patients, all of whom had undergone surgery, and swab samples were taken from them from 200 patients who displayed clinical signs of the position of a surgical wound.

Patients undergoing surgery with open fractures, episiotomies that had become infected, or community-acquired pyogenic infections, including abscesses, furuncles, or carbuncles, were excluded from the study. A tissue infection around the incision and the surgical site is a postoperative wound infection

between the fifth and the thirty-first day following surgery.
References Data gathering and laboratory techniques.
Patients' demographic and clinical traits were gathered using a standardized questionnaire. The infected site was cleansed with sterile gauze and regular saline. Then, two sterile cotton wound swabs were taken. Samples from each patient are sent right away to the research lab.

Identification of bacteria

Injury swabs were examined in a bacteriology laboratory one hour after being collected. While the first wound swab was utilized to make Gramme stain smears, the additional wound swab was placed into blood agar mannitol-salt agar and incubated at 37°C for 24-48 hours, and MacConkey agar. Gram stain, haemolytic activity on blood agar plates, protonate, starch utilize, nitrate reaction, coagulase test and catalase for Gram-positive bacteria were used to identify gram-positive bacteria. The Gram-negative based on the morphology of the bacteria colonies, MacConkey agar and blood agar is followed by TSI (triple sugar iron), biochemical oxidase, and sulphur reaction tests for indomethacin motility citrate and urease.

Testing for drug susceptibility

Upon recognizing the isolates of bacteria, the usual disc diffusion approach for DST (drug susceptibility testing) advised by CLSI (the Clinical and Laboratory Standard Institute) was performed. gA colony of *Pseudomonas aeruginosa, Acinectobacter,* Escherichia coli, *Klebsiella ssp , Staphylococcus and Proteus ssp*. Isolate was added to 10 ml of nutrient broth and cultured for 20 hours at 30 °C. The Mueller-Hinton agar (Sigma, Switzerland) was then covered with 0.1 ml. “antimicrobial sensitivity discs (Sensi Discs, BBL, Becton Dickinson)” set on every plate. Every one of the Fourteen antibiotics has two discs. The discs included Ampicillin, Ceftriaxone, Bacitracin, Ciprofloxacin, Erythromycin, Chloramphenicol, Kanamycin Nalidixic acid, Nitrofurantoin and Gentamicin; after adding the appropriate antibiotics, the plates were incubated at 30°C for 24 hours. The width of the resistance zone surrounding each disc was then measured using interpretive standards procedures [12].

Results

This study enrolled 200 patients with pus or an infection in their wounds. Most 200 patients were between 15 and 50, making up 45 (35.7%) cases. Patients between the ages of 38 and 65 and those under 20 comprised 55 (45.5%) cases and 48 (20.8%), respectively. Out of 200 samples collected from suspected *Pseudomonas aeruginosa*, 22% (44/200), *Acinectobacte* 21% (42/200), *Klebsiella ssp.* 17.5% (35/200), *Staphylococcus aureus* 15% (30/200), *Escherichia coli* 13% (26/200) and *Proteus mirabilis* 7% (14/200) Table 1. The maximum collective *Pseudomonas aeruginosa* is 22% (44/200).
This study showed growth in 71.2%, 68.7%, and 61.9% of the specimens taken from the OPD, ED, and in-patient departments, respectively. In-patient, outpatient, and ED visits increased by 54.9%, 38.8%, and 20.3%, respectively. The low growth rate of the in-patient population may result from the collection of specimens following antibiotic therapy or from incorrect collection and laboratory transfer [13]. The finding agreed with [14]; Sixty-nine (259) specimens were infected, resulting in 269 distinct isolates. Gram positives made up 163 of them (60.6%), while gram negatives made up 104 of them (38.6%). The most common bacteria were *Staphylococcus aureus* (n = 130, 48.3%), *Escherichia coli* (n = 44, 16.3%), and *Klebsiella pneumoniae* (n = 23, 8.5%).
The bacteria colonizing the wounds were isolated on culture media, then purified and divided into four groups based on their morphological characteristics and Gram stain reaction. One hundred twenty pus samples were obtained from post-operative wounds of inpatients in different departments at Egypt hospitals, with the study group consisting of 70 males and 50 females [15]. Simar studies by [16] were found in 24.7% of the samples. Gram-negative organisms made up most of the species (57.9%), with Pseudomonas aeruginosa, Escherichia coli, Proteus mirabilis, and Acinetobacter baumannii/haemolyticus accounting for the majority of those species. Gram-positive bacteria were

found in 36.6% of cases, the most prevalent being Staphylococcus aureus (79.4%).

Table1: Determination of Types of pathogen bacteria

Types of pathogen bacteria	Percentage %	Total isolation
Pseudomonas aeruginosa	22%	44
Acinectobacter	21%	42
Klebsiella ssp.	17.5%	35
Staphylococcus aureus	15%	30
Escherichia coli	13%	26
Proteus mirabilis	7%	14
		200

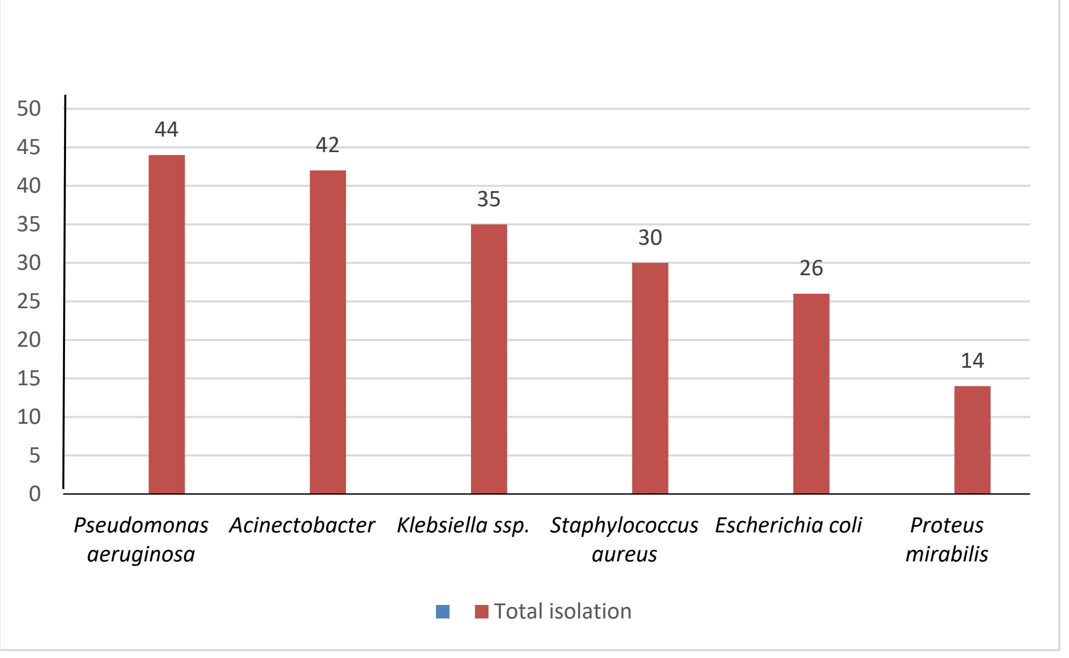

Figure 1: The percentage of pathogen bacteria isolation from surgical sites

This research used the disc diffusion technique to examine the antibiotic susceptibility pattern of 200 bacterial isolates to 18 different antibiotics. The contained antibiotics were Ampicillin 95%, Bacitracin88%, Ceftriaxone80%, Ciprofloxacin 77% Chloramphenicol 65%, Erythromycin57%, Gentamicin50%, Kanamycin 45%, Nalidixic acid35%, Nitrofurantoin30% The results shown in table 2 and figure 2. The results of our study Ampicillin were the antimicrobial toward which the isolated strains showed the higher percentage of resistance, amounting to 56.1% (134 isolates), followed by Gentamicin 32.2 (77 isolates), Penicillin 27.6% (66 isolates), trimethoprim/Sulfamethoxazole 25.9% (62 isolates), and penicillin.24.3% of the 58 isolates included piperacillin [16]. Vancomycin appears to be the most efficient antibiotic against Gram-positive bacteria [17].

Discussion & Conclusions:

In conclusion, *Pseudomonas aeruginosa* is the most often isolated bacterium following aerobic pus culture. However, there are fewer gram-negative cocci than gram-positive bacilli. *Staphylococcus aureus* is the most frequent bacterium responsible for wound infection among Gram-positive bacilli. A thorough examination should be done to see the genuine situation regarding the wound infection.

Table 2: Resistant and susceptible Pattern of Isolated pathogen bacyeria

Types of pathogen bacteria	Total isolation	Resistant	Sensitive
Pseudomonas aeruginosa	44	20/44	22/44
Acinectobacter	42	11/42	29/42
Klebsiella ssp.	35	15/35	20/35
Staphylococcus aureus	30	18/30	12/30
Escherichia coli	26	8/26	18/26
Proteus mirabilis	14	5/14	9/14
	200		

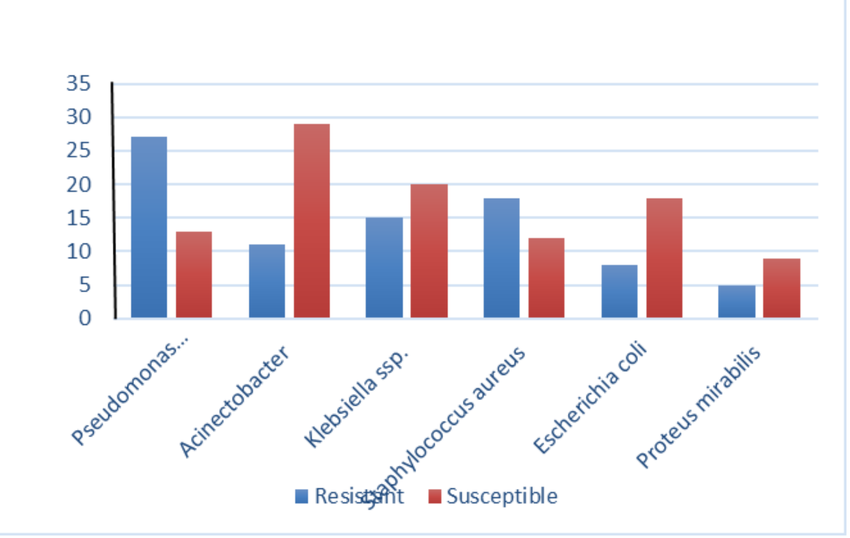

Figure 2: Resistant and susceptible Pattern of Isolated pathogen bacteria from surgical sites

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