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PREVALENCE OF ANTIBIOTICS RESISTANCE AMONG PATIENTS UNDERGOING BRONCHOSCOPY IN CHEST DEPARTMENT AT AL-SHIFA MEDICAL COMPLEX IN GAZA STRIP, PALESTINE

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Background: *This study was conducted to determine the prevalence of antibiotics resistance among patients undergoing bronchoscopy in Chest Department at Al-Shifa Medical Complex.* ***Method:*** *This cross-sectional study was conducted in year 2021. A total of 88 patients who were admitted to the Chest Department to undergo bronchoscopy during the study period were included. A 176-bronchoalveolar lavage (BAL) samples were stained and cultured for bacteria and fungi. Isolated bacteria from the BAL samples were identified, and antimicrobial susceptibility testing was conducted. Statistical analysis was performed using the SPSS version 22 program.* ***Results:*** *Fifty-five (62.5%) of the patients were males, and 33(37.5%) were females. About 47(53.4%) of the BAL samples were positive bacterial cultures; 32(36.4%) of the BAL samples were positive fungal cultures. Among the isolated 39(83%) gram-positive bacteria, Streptococcus pneumoniae bacteria was the predominant pathogen in 35(89.7%) isolates. Among the isolated eight (17%) gram-negative bacteria, Pseudomonas aeruginosa was found to be the predominant organism in four (50%) isolates. Among the total of 32 fungal isolates samples, 15(46.9%) were Candida fungi detected, making it the most predominant pathogen.* ***Conclusion:*** *All bacteria as Streptococcus pneumoniae, Staphylococcal aureus, Pseudomonas aeruginosa, and Klebsiella pneumoniae were multiple drug resistance bacteria. Streptococcus pneumoniae is mainly susceptible to Rifampicin, whereas Gentamicin and Rifampicin are effective antimicrobial agents against Staphylococcal aureus. The effective antimicrobial agents against Pseudomonas aeruginosa were Amikacin, Colistin, Ceftazidime and Ciprofloxacin. Colistin and Doxycycline were the best effective drugs against each of Klebsiella pneumoniae and Escherichia coli. Additionally, Candida fungi were the most predominant pathogens.*

Keywords: *Antimicrobial resistance, Bronchoalveolar lavage, Chest Department, Gaza Strip, Multi-drug resistance*

INTRODUCTION

The lower respiratory tract infections (LRTIs) are the leading causes of morbidity and mortality worldwide, especially in developing countries[1,2]. The etiological agents of LRTIs are challenging to determine clinically and differ from area to area[2,3]. Diagnosis of the etiologic pathogen is made through isolating a compatible organism from respiratory tract secretions or blood or pleural fluid cultures. While positive blood or pleural fluid culture identifies the pathogen, an organism growing from a respiratory specimen

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is not as readily implicated as the etiologic agent[3]. Many organisms may be *Normal flora* or *Colonizers* of the respiratory tract may be responsible for the clinical syndrome. As a result, there is considerable controversy about the diagnostic value of many respiratory specimens[4]. Monitoring the antimicrobial resistance patterns of the etiological agents are needed to guide the clinician when managing cases requiring antibiotic therapy and to survey the trend of these infections[5]. Bacteria are known to cause primary or superinfections, and in most cases, they need targeted therapy. Patients with respiratory tract infections respond to antibiotic treatment. However, since respiratory tract infection is widespread mainly in developing countries, miss and massive use of antibiotics in medical practice may often lead to resistance[2,6]. One of the major problems worldwide is the increase in antibiotic resistant strains of bacteria, mainly in hospitals and the community, which has proved challenging to control without considerable resources and cost[7]. Highly resistant strains of gram-negative bacilli continue to spread in hospitals, causing therapy problems in many parts of the world, and isolation facilities for resistant organisms are often insufficient[1]. The development and spread of multidrug-resistant nosocomial pathogens, such as the Extended-spectrum β-lactamases *Klebsiella pneumoniae* (ESBL-KP) are promoted by the widespread use of extended-spectrum cephalosporins. Poor infection control methods and broad-spectrum antimicrobial agents support the emergence of Vancomycin-Resistant Enterococci (VRE) within institutions. Therefore, antibiotic utilization measures appear to contribute to the control of the emergence of multidrug-resistant pathogens such as ESBL-KP and VRE. In addition, strict adherence to well-accepted infection control guidelines, along with caution in using broad-spectrum antimicrobial agents, represents the best strategy for preventing the emergence and spread of nosocomial multidrug-resistant pathogens[8].

Although pulmonary fungal infections have increased over the years, advances in diagnostic techniques and treatments have also increased[9]. With the development of antifungal treatment options, pharmacists should be aware of specific recommended doses, available drug formulations, drug-drug interactions, and potential side effects while assisting with prescribing antifungal agents[10]. Therefore, the main objective of the present study was to determine the prevalence of antibiotics resistance among patients undergoing bronchoscopy in Chest Department at Al-Shifa Medical Complex in Gaza Strip, Palestine.

MATERIAL AND METHODS

Ethical approval and consent to participate

The study protocol was approved by the Palestinian Health Research Council (Helsinki Ethical Committee of Research Number: PHRC/HC/377/18). Furthermore, informed consent was obtained from each participant.

Study design

This cross-sectional study was conducted to determine the prevalence of antibiotics resistance among patients undergoing bronchoscopy in Chest Department at Al-Shifa Medical Complex.

Study settings and period

The study was conducted from January 29, 2020, to February 26, 2021 in Chest Department at Al-Shifa Medical Complex in Gaza Strip, Palestine. The current study was conducted at 50-beds Chest Department of Al Shifa Medical Complex[11].

Study population

All patients admitted to the Chest Department at Al-Shifa Medical Complex and undergoing bronchoscopy procedures during the study period. Males and females patients, aged ≥ 18 years, and who were admitted for a bronchoscopy procedure were included in the study. Absolute contraindication to bronchoscopy (cases of bleeding abnormalities, severe cardiac disease, acute asthma, allergy to local anesthetics, age > 80 years, and severe hypoxia [pa O2 < 8k pa]); patients with symptoms of emergency admission, pregnant and lactating women were excluded from the study.

Sample size and sampling technique

After application of the inclusion and exclusion criteria, a total of 88 patients were included in the present study, using a census sampling method. Furthermore, a total of 176 cultures samples were collected using the bronchoalveolar lavage (BAL) procedure, and were used for bacterial and fungal cultures.

Data collection

Flexible fiberoptic bronchoscopy

In the present study, the flexible fiberoptic bronchoscopy was performed to obtain bronchoalveolar lavage fluid (BALF) using a standard protocol[12]. Two samples of the BALF were sent immediately in the icebox to the Departments of Clinical Microbiology at Al Shifa Medical Laboratory and Holmead Medical Laboratory. The BALF was stained and cultured for aerobic, anaerobic bacteria, and fungi (Aspergillus and Candida species)[13].

The BAL samples were submitted for Gram stain and culture. Agitation of 0.5 ml of BAL was diluted 1:10 with sterile saline 0.9% (4.5 ml), using Vortex mixer VX 200 at 1000 rpm in 30 s, and incubated at 35 °C for 30 min. A 10-µl sample diluent 10^{-1} was inoculated onto 5% blood agar, chocolate agar Haemophilus influenzae, and MacConkey Agar media. Plates were incubated at 37 °C in 5% CO2 for 18–24 h. Methods used for confirmation of identification included the examination of colonial morphology and hemolytic characteristics on appropriate agar media, Gram stain, and rapid tests (catalase, oxidase, coagulase, bile solubility, spot indole, and latex agglutination). A sample culture was classified as positive if there were more than 10^4 CFU per milliliter of BAL (i.e., ≥ 1 colony on either medium from the 10^{-1} dilution) [14].

Antimicrobial susceptibility test (the Kirby-Bauer method)

Impregnated small filter paper disks (6 mm) with a standard amount of antibiotic (commercially available) were placed onto Muller Hinton agar plates to which test bacteria have been swabbed. The plates were incubated overnight at 37 °C; the zone of inhibition of bacterial growth was used to measure susceptibility. Interpretation of results was made according to the Clinical and Laboratory Standards Institute[15].

Fungal culture and characterization

The fungal culture and characterization were performed on fresh specimens using standard procedures at the Holmead Clinical Microbiology Laboratory. Yeast-form fungi were identified according to conventional standard clinical laboratory methods, including the germ tube test, the Phoenix Yeast ID system, and the API 20E system. Mold-form fungi were identified using colony morphology and microscopic findings [16].

Data analysis

The results were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22. Descriptive statistics were used to describe continuous and categorical variables. The chi-square test was used to determine the significant differences between different categorical variable. The differences between means were tested by independent samples t-test. P value less than 0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

Results

A total of 88 patients were included in the present study. The results revealed that 55 (62.5%) of the patients were males, 33 (37.5%) were females. The mean of age (years) for males was 50.1±17.41, and for females was 45.1±16.14. The majority 80.7% of the study participants were married, 67.1% have a low educational level (none and < 12 years), 53.4% were from Gaza city, 43.2% have a history of smoking, 21.6% have a history of hypertension, 14.8% have a history of diabetes mellitus, 34.1% were overweight and 22.7% were obese. A significant difference in the history of smoking was found between males and females (P value = 0.012) (Table 1).

Culture results of the BAL samples

A total of 176 samples were collected using the BAL procedure, 47 (53.4%) of the BAL samples were positive bacterial cultures, while 41 (46.6%) of the BAL samples were negative bacterial cultures. 32 (36.4%) of the BAL samples for fungal identification were positive fungal cultures, while 56 (63.6%) of the BAL samples were negative fungal cultures (Table 2).

Table 1: Characteristics of the study population by gender

Variables		Total (n= 88)		Male (n= 55)		Female (n= 33)		P Value
		No.	%	No.	%	No.	%	
Age (years)	Mean±SD	48.2±17.03		50.1±17.41		45.1±16.14		0.183
Marital status	Single	10.0	11.4	7.0	12.7	3.0	9.1	0.341
	Married	71.0	80.7	42.0	76.4	29.0	87.9	
	Divorced/ Widow	7.0	7.9	6.0	10.9	1.0	3.0	
Educational level	None	18.0	20.5	10.0	18.2	8.0	24.2	0.752
	< 12 years	41.0	46.6	27.0	49.1	14.0	42.4	
	University/postgraduate	29.0	32.9	18.0	32.7	11.0	33.4	
Governorate	North-Gaza	25.0	28.4	17.0	30.9	8.0	24.2	0.391
	Gaza city	47.0	53.4	31.0	56.4	16.0	48.5	
	Middle-Area	11.0	12.5	5.0	9.1	6.0	18.2	
	South-Gaza	5.0	5.7	2.0	3.6	3.0	9.1	
History of smoking	Yes	38.0	43.2	30.0	54.5	8.0	24.2	0.012
	No	50.0	56.8	25.0	45.5	25.0	75.8	
History of hypertension	Yes	19.0	21.6	12.0	21.8	7.0	21.2	0.953
	No	69.0	78.4	43.0	78.2	26.0	78.8	
History of diabetes mellitus	Yes	13.0	14.8	7.0	12.7	6.0	18.2	0.497
	No	75.0	85.2	48.0	87.3	27.0	81.8	
Body mass index (kg/m^2)	Normal weight	38.0	43.2	24.0	43.6	14.0	42.4	0.705
	Overweight	30.0	34.1	20.0	36.4	10.0	30.3	
	Obesity	20.0	22.7	11.0	20.0	9.0	27.3	

The chi-square test was used to determine the significant differences between different categorical variable. The differences between means were tested by independent samples t-test. The body mass index (kg/m^2) for normal weight is 18.5-24.9, for overweight is 25-29.9, and for obesity is ≥ 30

Table 2: Frequency of culture results of the BAL samples

Culture results (N=176)	Positive cultures		Negative cultures	
	Frequency	%	Frequency	%
Bacteria	47.0	53.4%	41.0	**46.6%**
Fungi	32.0	36.4%	56.0	**63.6%**
Total	79.0	44.9%	97.0	**55.1%**

Bacterial culture results (isolated bacteria)

As shown in Table 2, 47 (53%) bacterial culture results of BAL samples were positive, while forty-one (47%) were negative. Table 3 show the distribution of gram-positive and gram-negative bacteria. Among the 47 bacterial isolates, 39 (83%) were gram-positive organisms. *Streptococcus pneumoniae* bacteria was the predominant pathogen: 35 (74.5%) samples, followed by *Staphylococcal aureus*: four (8.5%). Among the isolated bacterial, eight (17%) were gram-negative bacteria, *Pseudomonas aeruginosa* was found to be the predominant organism: four (8.5%), followed by *Klebsiella pneumoniae*: two (4.25%) and *Escherichia coli*: two (4.25%).

Table 3: Distribution of gram-positive and gram-negative bacteria

Bacteria	Gram stain	Frequency	Percent
Streptococcus pneumoniae	Positive	35.0	74.5
Staphylococcal aureus	Positive	4.0	8.5
Pseudomonas aeruginosa	Negative	4.0	8.5
Klebsiella pneumoniae	Negative	2.0	4.25
Escherichia coli	Negative	2.0	4.25
Total		47.0	100

Resistance profile of *Streptococcus pneumoniae* to antimicrobial agents

As shown in Figure 1. The results show that *Streptococcus pneumoniae* was highly resistant to most antibiotics with a percentage exceeding (50.0%) and even reaching (85.8%) to some antibiotics such as Clindamycin and Teicoplanine.

Resistance profile of *Staphylococcus aureus* to antimicrobial agents

As shown in Figure 2. *Staphylococcus aureus* was highly resistant to most antibiotics with more than (50.0%), and its resistance reached (100.0%) with Clindamycin, Teicoplanine, and Co-trimoxazole. However, it showed zero resistance to Rifampicin and Gentamycin.

Resistance profile of *Pseudomonas aeruginosa* to antimicrobial agents

The resistance profile of *Pseudomonas aeruginosa* to antimicrobial agents graded from zero resistance to Amikacin, Ciprofloxacin, Ceftazidime and Colistin up to (100%) resistance to Doxycycline, Co-trimoxazole and Metronidazole as illustrated in Figure 3.

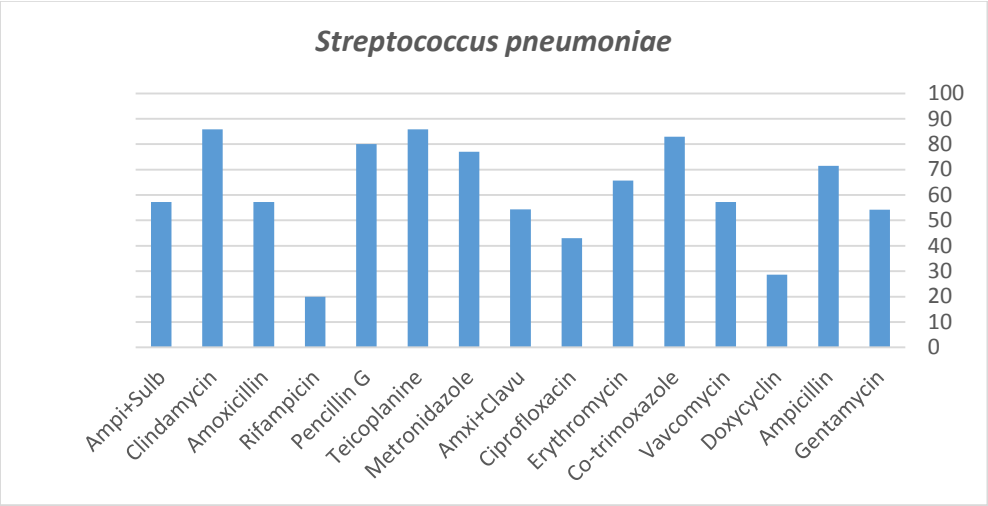

Fig. 1: Resistance profile of *Streptococcus pneumoniae* to antimicrobial agents

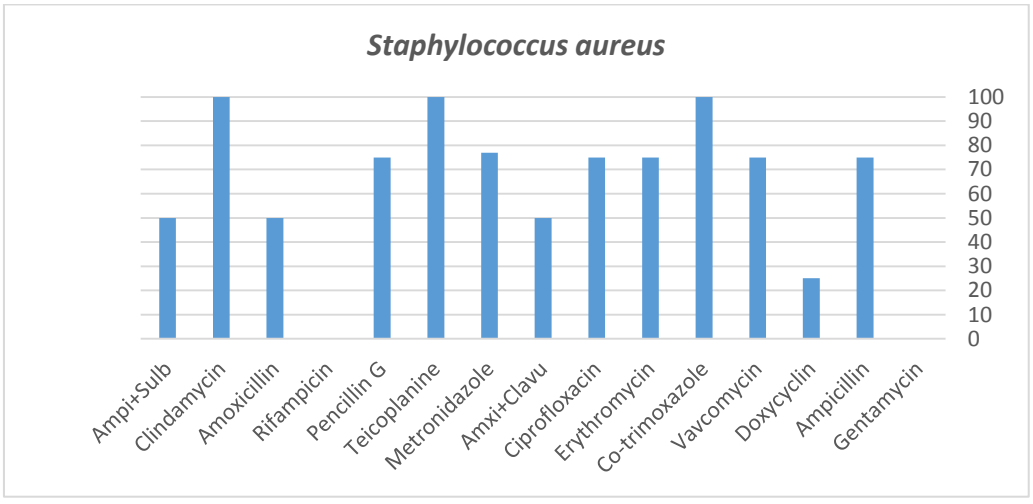

Fig. 2: Resistance profile of *staphylococcus aureus* to antimicrobial agents

Resistance profile of *Klebsiella pneumoniae* to antimicrobial agents

The resistance profile of *Klebsiella pneumoniae* to antimicrobial agents graded from zero resistance to Colistin, Ceftazidime, and Doxycycline and reached (100%) to Imipenem, Metronidazole, Meropenem, Co-

trimoxazole, Ceftriaxone, and Gentamycin as illustrated in Figure 4.

Resistance profile of *Escherichia coli* to antimicrobial agents

The resistance profile of *Escherichia coli* to antimicrobial agents graded from zero resistance against Amikacin, Doxycycline, and Colistin and reached (100.0%) resistance against Ceftriaxone, Gentamycin, Imipenem and Meropenem as illustrated in Figure 5.

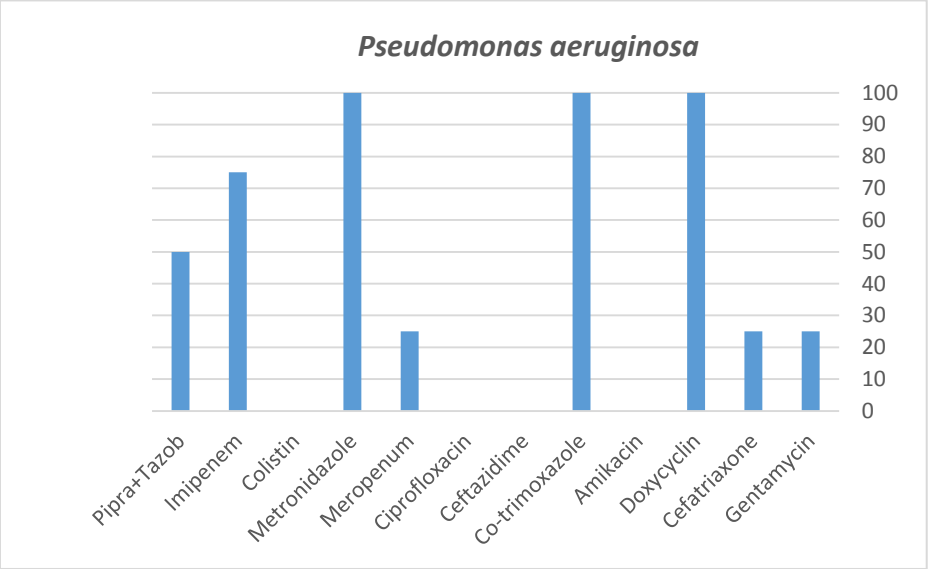

Fig. 3: Resistance profile of *Pseudomonas aeruginosa* to antimicrobial agents.

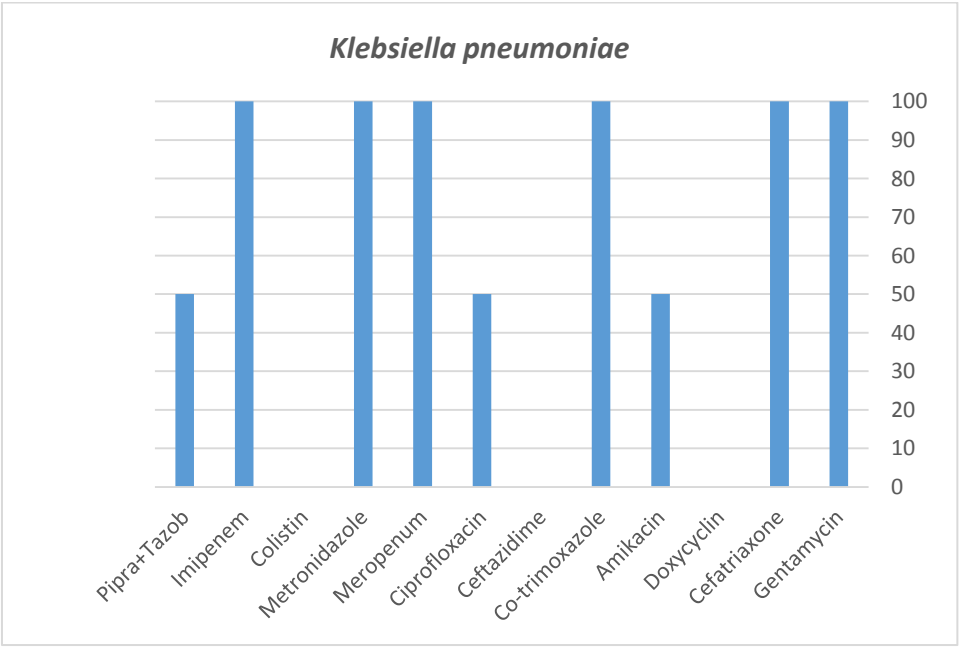

Fig. 4: Resistance profile of *Klebsiella pneumoniae* to antimicrobial agents.

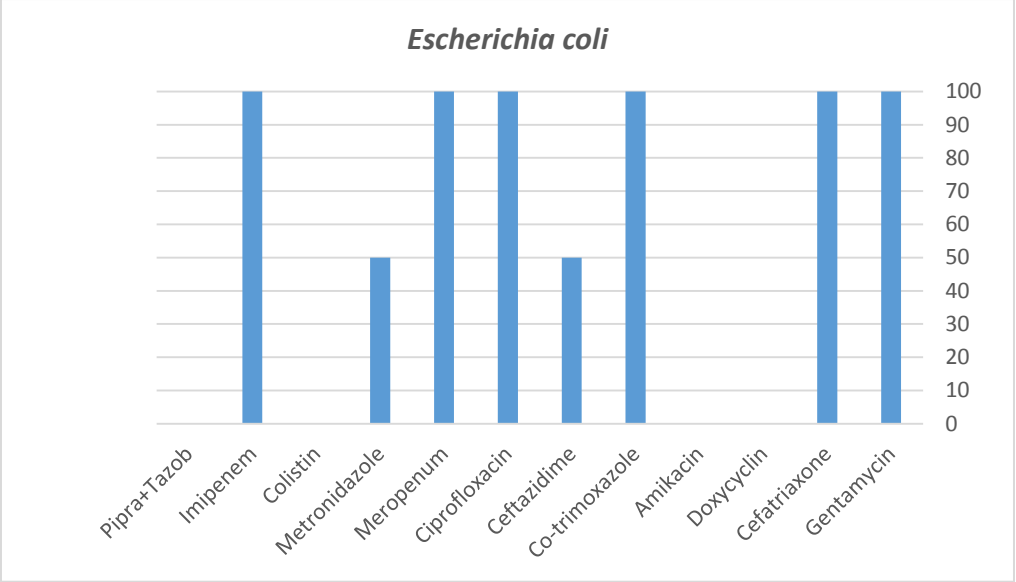

Fig. 5: Resistance profile of *Escherichia coli* to antimicrobial agents.

Fungal culture results (isolated fungi)

The results revealed that thirty-two (36.4%) fungal culture results of the BAL samples were positive, while fifty-six (63.6%) samples were negative as shown in Table 2.

Distribution of fungal isolates

As shown in Table 4 among the total of 32 fungal isolates samples, 15 (46.9%) were *Candida fungi* detected, making it the most predominant pathogen. It was followed by *Penicillium fungi* in seven samples (21.9%); and *Aspergillus fungi* in ten samples (31.3%) as shown in table 4.

Table 4: Frequency of fungal isolates from the BAL samples

Fungi	Frequency	%
Candida	15.0	**46.9**
Penicillium	7.0	**21.9**
Aspergillus	10.0	**31.2**
Total	32.0	**100**

Discussion

A total of 88 patients (patients with pneumoniae and other LRTIs) were included in the present study.

Gram-positive bacteria isolates

A total of 176 samples were collected using the BAL procedure. Of them, 47 (53.4%) were positive bacterial cultures, while 41 (46.6%) of the BAL samples were negative bacterial cultures. Among the isolated 39 (83%) gram-positive bacteria. *Streptococcus pneumoniae* bacteria was the predominant pathogen in 35 (89.7%) isolates, followed by *Staphylococcal aureus* in four (10.3%). This finding was in line with that of a study from New Delhi, which investigated samples from 124 cases of community-acquired pneumoniae (CAP) at the Medicine and Pediatric Department. It was found that the bacterial pathogens in CAP were *Streptococcus pneumoniae* (35.3%) and *Staphylococcal aureus* (23.5%) but in low percentage. In addition, five (33%) of the 15 isolates of *Staphylococcal aureus* obtained from the BALF were Methicillin-Resistant Staphylococcal Aureus (MRSA)[17]. While the current study found *Staphylococcal aureus* found in four (10.3%) isolates, but we did not investigate for (MRSA), because the kit of the antibiotics Methicillin and Oxacillin was unavailable due to the siege on Gaza Strip.

Gram-negative bacteria isolates

Among the isolated eight (17%) gram-negative bacteria. *Pseudomonas aeruginosa* was found to be the predominant organism in four (50%) isolates, followed by *Klebsiella pneumoniae* in two (25%) and *Escherichia coli* in two (25%). These findings are congruent with the previous study, which concluded that

Pseudomonas aeruginosa was the most common bacterial isolate, at a percentage of (35.7%), followed by *Klebsiella pneumoniae* at (19.4%)[17]. In contrast to the current study findings, Khan et al.[2] show that gram-negative bacteria accounted for 77.61% of all isolated bacteria. The most common isolate was *Pseudomonas aeruginosa* among the gram-negative bacteria, at a percentage of (35, 32%), and upon including the total isolates (27, 41%). The prevalence of *Pseudomonas aeruginosa* in the present study was higher than that in a survey carried out in Nepal, in which *Pseudomonas aeruginosa* accounted for 7.5% of LRTIs cases[18]. In the current investigation, monomicrobial growth was found in 100% of the cases. In another study, monomicrobial growth was found in 91.3% of the cases, and 8.7% were polymicrobial[19]. The exact rate of polymicrobial infection is dependent on the laboratory technique. The tested pathogen has been documented to differ from 3% to 40%, and *Chlamydophila pneumoniae* appears to be the most common organism of coinfection[20]. In the current study, Al-Shifa Medical Complex does not test for *Chlamydia* species, *Mycoplasma* species, or *Legionella* species because the test is unavailable. According to a study conducted by Khan et al.[2], a total of 36 (17.91%) *Klebsiella pneumoniae* isolates obtained, constituting the third major gram-negative bacteria. In the current study, *Klebsiella pneumoniae* was the second major gram-negative bacteria with two (25%) occurrences. Khan et al.[2] show that *Escherichia coli* found to comprise 10.0% of the total acute LRTIs cases. In our study, *Escherichia coli* found in two samples (25%). The ratio was not high because it is two cases, so it is considered a false pathogen, as illustrated in another study[21].

Antimicrobial resistance patterns of the isolated bacteria

The findings of the current study have important clinical implications in treating and managing patients, particularly those with the common pathogen *Streptococcus pneumoniae* and where multiple drug resistance (MDR) is a reality. The high rate of MDR observed in the current study was a severe concern in the management of patients. It calls for a more systematic approach to reduce antibiotic resistance rates and minimize the use of broad-spectrum antibiotics. In the presence of MDR, developing rapid diagnostic tests for prompt-targeted therapy is an important priority[14].

Streptococcus pneumoniae

The current study found that the MDR bacteria *Streptococcus pneumonia*e had resistance rates for Penicillin G (80.0%), Co-trimoxazole (82.9%), Amoxicillin (57.2%), Ampicillin (71.5%), Vancomycin (57.2%), Erythromycin (65.7%), Amoxicillin + Clavulanic acid (54.3%), Teicoplanin (85.8%), Clindamycin (85.8%), Ampicillin + Sulbactam (57.2%), but low resistance for Rifampicin (20.0%). This result was due to antibiotic abuse, which was in agreement with the study conducted by Khan et al.[2]. In a previous study by Siegel et al.[22], *Streptococcus pneumoniae* was found resistant to Penicillin and other broad-spectrum agents such as Macrolides and Fluoroquinolones[13]. In the current study, the resistance of *Streptococcus pneumonia*e to Co-trimoxazole was (82.9%), more than that obtained in a previous study by Khan et al.[2], where resistance to Co-trimoxazole was (63.33%) due to the misuse of the antibiotic, as Co-trimoxazole was used without culture in immunocompromised patients.

Staphylococcus aureus

Staphylococcus aureus was found highly resistant to all antibiotics, including Penicillin G, Ampicillin, Vancomycin, and Erythromycin (75.0%), Amoxicillin, Amoxicillin + Clavulanic acid, Ampicillin + Sulbactam (50.0%), and very highly resistant to Teicoplanin, Co-trimoxazole, and Clindamycin (100.0%). Rifampicin was the only antibiotic that had zero resistance. The result of the current study regarding the resistance to Penicillin G (75.0%) was comparable to that found by[2], where resistance to Penicillin in *Staphylococcus aureus* was observed at a percentage of (92.86%). The researcher observed the increased resistance in Teicoplanin and Clindamycin (100.0%) due to antibiotic abuse. These two antibiotics are used empirically to cover gram-positive bacteria and anaerobic bacteria, respectively, without culture. Weems et al.[23] indicates that *Staphylococcus aureus* causes approximately 20% of nosocomial lung infections. In the current study of LRTs, only 14% of the patients had an infection with *Staphylococcus aureus*.

Pseudomonas aeruginosa

In a previous study by Khan et al.[2] regarding *Pseudomonas aeruginosa*, the overall increased resistance was observed for Gentamicin (47.89%), Ciprofloxacin (28.17%), and Amikacin (18.31%). However, in the current study, the resistance against Gentamicin was (25.0%), but (0.0%) against Ciprofloxacin and Amikacin. In the same study, resistance to Piperacillin-tazobactam was (16.9%) and to Imipenem was (0.0%), both less than the results obtained in the current study. Amikacin is used sparingly in the chest department due to its poor penetration into the respiratory tract and bad effect on the kidneys. Therefore, we found zero resistance to Amikacin. Colistin resistance was also zero due to its high cost and unavailability in the Palestinian Ministry of Health. Aminoglycoside-resistant strains are more frequent at sites with poor penetration of the drugs. The serum therapeutic toxic ratio of aminoglycosides was low. Therefore, penetration into the infected respiratory tract may be insufficient to act on the infecting organisms[2].

Klebsiella pneumoniae

*Klebsiella pneumonia*e strains are resistant to the antimicrobial agents, Imipenem, Metronidazole, Meropenem, Co-trimoxazole, Ceftriaxone, and Gentamycin with as high resistance rates as (100%). Therefore, in the current investigation, we did the same[24] and considered *Klebsiella pneumonia*e as MDR if the bacterial strain is resistant to at least one agent in three or more antimicrobial categories. This means that a specific drug is no longer able to kill or control the bacteria. Additionally, Khan et al.[2] concluded that *Klebsiella pneumoniae* resistance to gentamicin was (69.44%), to Co-trimoxazole (52.78%), and ceftriaxone (8.33%); all less than the findings of the current study where resistance to the three of them was (100.0%). According to a study conducted by Khan et al.[2], resistance to ciprofloxacin was (22.2%), but in the current study, it was (50.0%). We obtained excellent results in our study that Ceftazidime had zero resistance by each of *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, thus giving us great hope for the effectiveness of this agent.

Escherichia coli

In the current study results, *Escherichia coli* was (100.0%) resistant to Ceftriaxone, Gentamycin, Ciprofloxacin, and Co-trimoxazole. The results observed by Khan et al. (2) were quite different as *Escherichia coli* resistance to Ceftriaxone was (11.54%), to Gentamycin (23.08%), to Ciprofloxacin (61.54%), and Co-trimoxazole was (57.69%). MDR gram-negative bacilli included *Klebsiella*, *Enterobacter cloacae*, and *Escherichia coli* resistant to at least three of the following antimicrobial groups: third- or fourth-generation Cephalosporins, Aminoglycosides, Fluoroquinolones, Piperacillin, or Ampicillin/Sulbactam[13].

Isolation of Fungal Infection among Patients

In the current study, among the total of 32 fungal isolates samples, 15 (46.9%) were *Candida fungi* detected, making it the most predominant pathogen. It was followed by *Penicillium fungi* in seven samples (21.9%); and *Aspergillus fungi* in ten samples (31.3%). Quick and accurate detection and identification of pathogenic fungi can enhance the diagnosis and treatment of pulmonary fungal infections. Even though the conventional fungal culture method remains the gold standard, it is time-consuming and may have difficulty identifying some mold-form fungi by morphology[16]. The main limitations of this study is its cross sectional design which limits the generalizability of our results. However, we could not conduct the PCR/ESI-MS analysis to identify fungal species, which represents a significant weakness of the current study. The main strength of our study was its being the first study, which shows the prevalence of antibiotics resistance among patients undergoing bronchoscopy in Chest Department at Al-Shifa Medical Complex, and its census sample.

Conclusion

Our study demonstrates that all bacteria as *Streptococcus pneumoniae, Staphylococcal aureus, Pseudomonas aeruginosa,* and *Klebsiella pneumoniae* were multiple drug resistance bacteria. *Streptococcus pneumoniae* is mainly susceptible to Rifampicin, whereas Gentamicin and Rifampicin are effective antimicrobial agents against *Staphylococcal aureus.* The effective antimicrobial agents against *Pseudomonas aeruginosa* were Amikacin, Colistin, Ceftazidime and Ciprofloxacin. Colistin and Doxycycline were the best effective drugs against each of *Klebsiella pneumoniae* and *Escherichia coli*.

Additionally, *Candida* fungi were the most predominant pathogens. Further future studies are required to confirm these findings.

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نشرة العلوم الصيدليـــــة
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انتشار مقاومة المضادات الحيوية لدى المرضى الذين خضعوا لتنظير القصبات الهوائية في قسم الصدر في مجمع الشفاء الطبي بقطاع غزة – فلسطين

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محتوي المقدمة: أجريت هذه الدراسة لتحديد مدى انتشار مقاومة المضادات الحيوية لدى المرضى الذين خضعوا لتنظير القصبات الهوائية في قسم الصدر في مجمع الشفاء الطبي .

منهجية الدراسة: أجريت هذه الدراسة المقطعية في عام ٢٠٢١. تم تضمين ما مجموعه ٨٨ مريضًا تم إدخالهم إلى قسم الصدر للخضوع لتنظير القصبات الهوائية خلال فترة الدراسة. تم صبغ ١٧٦عينة من سائل غسل القصبات الهوائية وزرعتها للبكتيريا والفطريات. تم تحديد نوع البكتيريا المعزولة من عينات السائل، وتم إجراء اختبار الحساسية لمضادات الميكروبات. تم إجراء التحليل الإحصائي باستخدام برنامج SPSS الإصدار ٢٢.

النتائج: خمسة وخمسون (٦٢.٥٪) من المرضى كانوا من الذكور و ٣٣ (٣٧.٥٪) من الإناث. حوالي ٤٧ (٥٣.٤٪) من العينات كانت عبارة عن مزارع بكتيرية إيجابية. ٣٢ (٣٦.٤٪) من العينات كانت عبارة عن مزارع فطرية إيجابية. من بين البكتيريا المعزولة ٣٩ (٨٣٪) موجبة الجرام، كانت بكتيريا العقدية الرئوية هي العامل الممرض السائد في ٣٥ (٨٩.٧٪) عزلة. من بين ثمانية (١٧٪) بكتريا سالبة الجرام المعزولة، وجد أن الزائفة الزنجارية هو الكائن السائد في أربع عزلات (٥٠٪). من بين إجمالي ٣٢ عينة عزلة فطرية، تم الكشف عن ١٥ (٤٦.٩٪) من الفطريات الفطرية، مما يجعلها أكثر مسببات الأمراض انتشارًا.

الخلاصة: كانت جميع أنواع البكتيريا مثل العقدية الرئوية والمكورات العنقودية الذهبية والزائفة الزنجارية والكلبسيلة الرئوية عبارة عن بكتيريا مقاومة للأدوية المتعددة. تعتبر العقدية الرئوية حساسة بشكل رئيسي للريفامبيسين، بينما يعتبر الجنتاميسين والريفامبيسين من العوامل الفعالة المضادة للميكروبات ضد المكورات العنقودية الذهبية. كانت العوامل الفعالة المضادة للميكروبات ضد الزائفة الزنجارية هي الاميكاسين والكوليستين والسيفتادين والسيبروفلوكساسين. كان كوليستين ودوكسيسيكلين أفضل الأدوية الفعالة ضد كل من الكلبسيلة الرئوية والإشريكية القولونية. بالإضافة إلى ذلك، كانت فطريات المبيضات هي أكثر مسببات الأمراض انتشارًا.