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TO DETERMINE THE PATHOGENIC PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN BRONCHIECTASIS PATIENTS IN SOUTHERN KPK

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ABSTRACT

Objective: To determine the pathogenic profile and antimicrobial susceptibility pattern in bronchiectasis in southern KPK.

Materials and Methods: This Cross-sectional, descriptive study was conducted in department of Medicine, MTI - DHQ Hospital, Bannu from 1st December, 2024 to 31st May, 2025. Patients included in this study were known to have bronchiectasis on the basis of radiological findings and presenting to pulmonology OPD with fever and copious amount of sputum for more than two weeks. Sputum cultures were collected according to standard laboratory protocol and analyzed as per established guidelines. Data was analyzed through latest SPSS Version.

Results: In this study, a total of 76 patients with bronchiectasis were assessed with sputum culture and antibiotic susceptibility pattern of the common respiratory pathogens were measured. Every respiratory pathogen was assessed for 5 common antibiotics and antibiotic susceptibility pattern was established.

Conclusion: Knowledge of the pathogenic profile and antibiotic susceptibility pattern of common respiratory pathogens in bronchiectasis is important in terms of developing effective treatment strategies. Further research to effectively address the issue of antibiotic resistance and develop novel antibiotics id is needed.

Key words: Bronchiectasis, respiratory pathogens

INTRODUCTION

Bronchiectasis is defined as a chronic pulmonary disease with the characteristic feature of irreversible and permanent dilatation of the Bronchi which are responsible for delivering oxygen to the lungs. Patients with bronchiectasis have chronic persistent cough with large amount of sputum, and recurrent chest infections. It is primarily caused by Pneumonia or tuberculosis but genetic conditions like cystic fibrosis, immunodeficient and connective tissue disorders can predispose to this condition (1). Past history of tuberculous remains the most common cause of bronchiectasis in Pakistan and southern Khyber Pakhtunkhwa (2). This area of Pakistan remains neglected in terms of health care services and faces significant challenge due to recurrent respiratory infections in bronchiectasis patients in the form of financial losses. Knowledge of the causative pathogens and their antimicrobial susceptibility patterns in bronchiectasis patients is of vital importance in terms of developing effective treatment strategies and preventing complications.

Bronchiectasis patients are prone to variety of bacterial pathogens including pseudomonas aeruginosa, staph aureus and haemophilus influenza. These pathogens, along with numerous others, are responsible for recurrent exacerbations leading to progressive lung damage and significantly impaired quality of life (3). These patients develop significant symptoms even with minor infections. Apart from these bacterial pathogens, non-tuberculous mycobacteria, fungi and various viruses are isolated from sputum cultures in bronchiectasis patients. Among non-tuberculous mycobacteria, the most commonly observed pathogens are mycobacterium avium complex, mycobacterium simiae, mycobacterium abscessus and mycobacterium gordonae (4). The commonly isolated fungi are aspergillus and candida species (5). Viruses include coronavirus, influenza A and B, herpes simplex virus and rarely Rhinoviruses (6).

The ever-growing resistance of respiratory pathogens to various antibiotics in alarming and the phenomenon of antimicrobial resistance is even more prevalent in bronchiectasis patients when compared with normal population. In recent times, the emergence of multidrug-resistant pathogens particularly carbapenem-resistant Pseudomonas aeruginosa and ESBL (extended-spectrum beta-lactamase) -producing Enterobacteriaceae, further complicates the situation and poses significant management challenge in bronchiectasis. The primary causes for this changing resistance pattern in bronchiectasis patients are irrational antibiotic selection, inadequate dosage and treatment duration, and probable decline in the quality of the administered antibiotics (7,8).

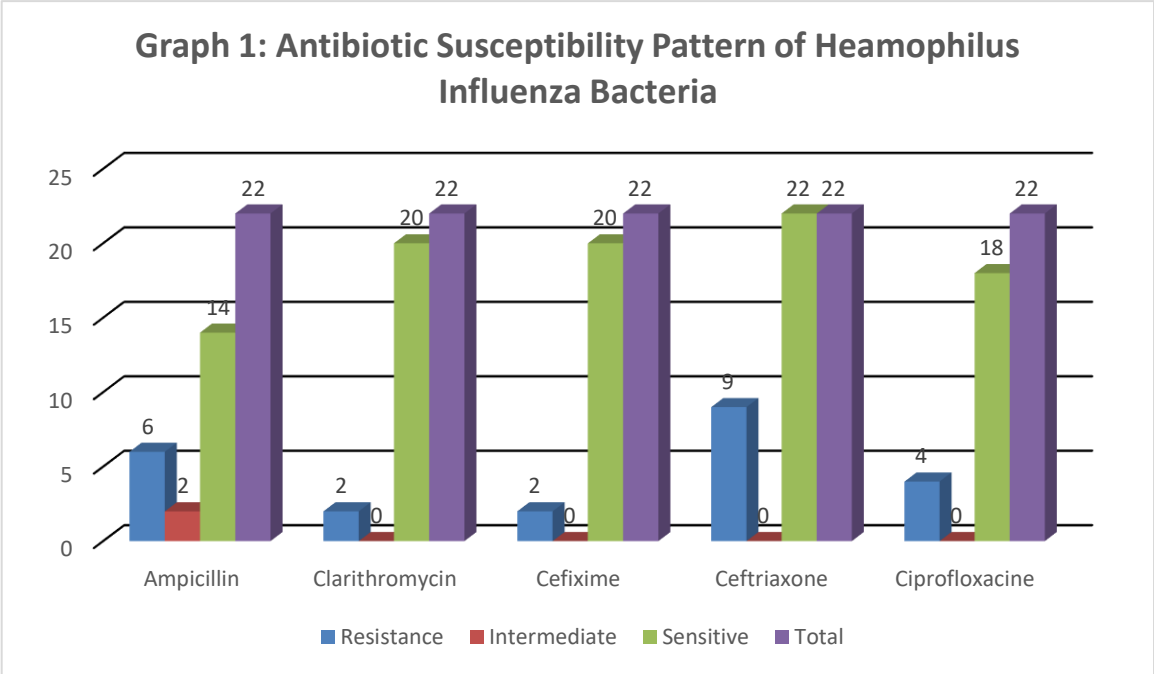
The aim of this study is to determine the pathogenic profile and antimicrobial susceptibility patterns of bronchiectasis patients in southern Khyber Pakhtunkhwa. Knowledge of the common respiratory pathogens and their antibiotic susceptibility patterns will help devise effective treatment strategies in bronchiectasis patients and promote antibiotic stewardship programs in the region. This will also help in curbing the irrational use of antibiotics in bronchiectasis patients. The findings of this study will contribute to a better patient health care in bronchiectasis and significantly reduce the financial and economic burden associated with recurrent respiratory infections in this patient population.

MATERIALS AND METHODS

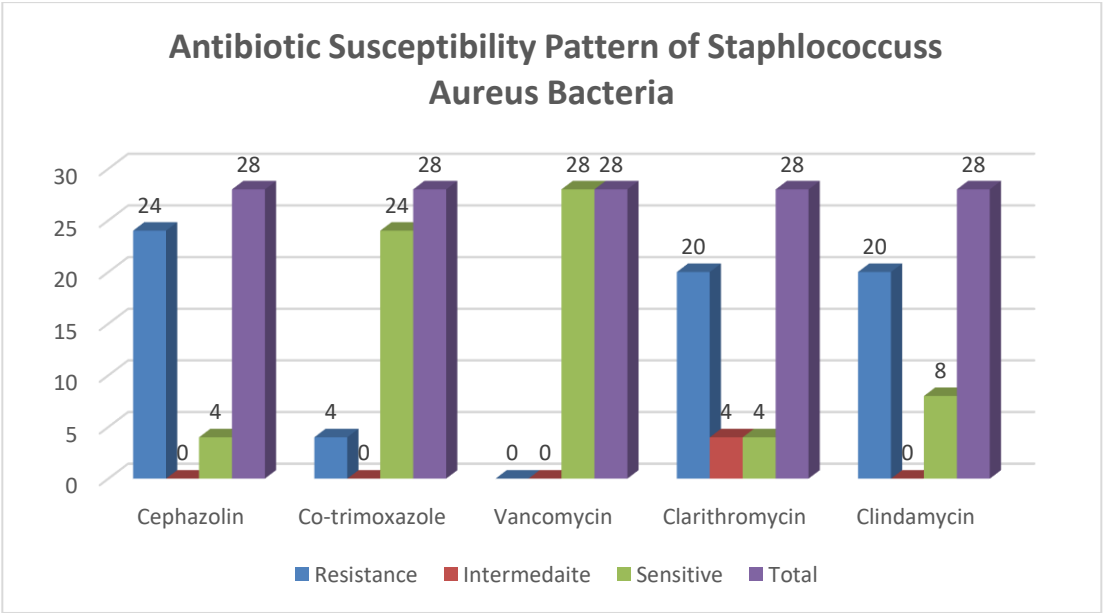
This cross-sectional descriptive study was conducted at Pulmonology Outdoor District Headquarter Hospital (DHQ) from 1st December, 2024 to 31st May, 2025. Patients included in the study were radiologically proven bronchiectasis presenting to the outdoor department with fever and copious amount of sputum for more than two weeks. Demographic data of the patients was collected through a proforma. Sputum cultures were collected in a sterile manner and assessed according to internationally established Laboratory protocols. Sample size was 65 and was calculated according to standard WHO formula. 95% confidence interval used with 5% margin of error. P value <0.05 was considered as statistically significant. Method used for sampling is non-probability sampling technique. Mean + SD were used for quantitative variables while qualitative variables were assessed through Frequencies and percentages. Data was entered in latest SPSS Version and analysed.

RESULTS

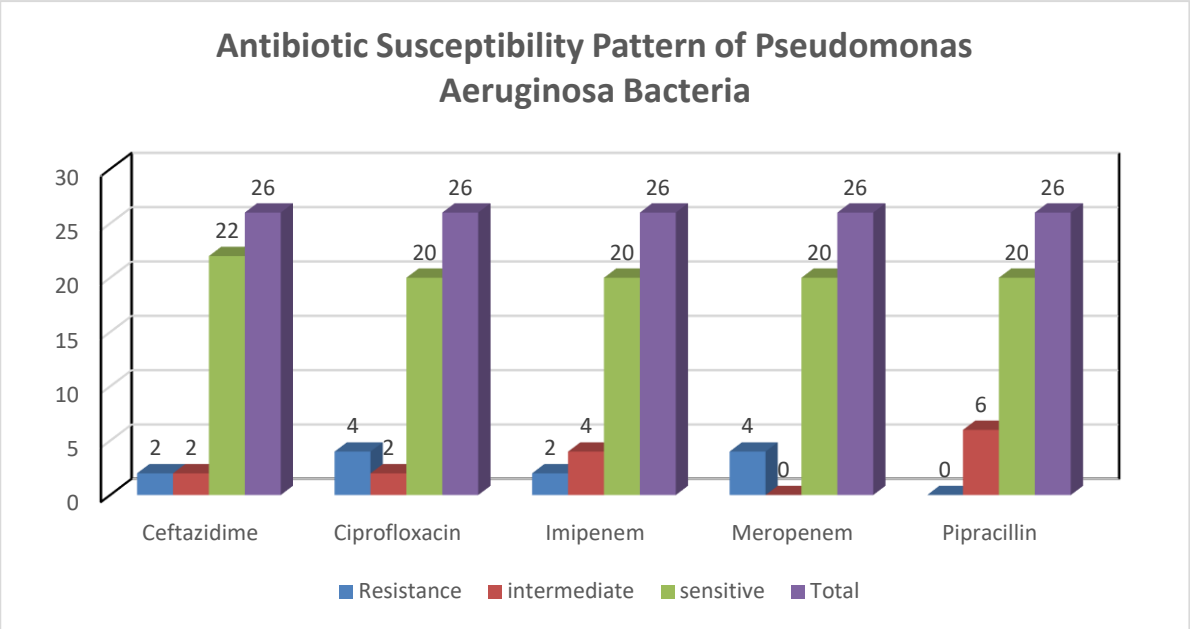
In this study, a total of 76 patients with bronchiectasis were assessed with sputum culture and antibiotic suscetibility pattern of the common respiratory pathogens was measured. Every respiratory pathogen was assessed for 5 common antibiotics. Antibiotics assessed in case of hemophilus influenza were ampicillin, clarithromycin, cefixime, ceftriaxone and ciprofloxacin. Overall 22 samples showed hemophilus influenza growth. Antibiotic susceptibility assessed for these antibiotics were as follows: 16 patients out of 22 (73%) showd susceptibility to ampicilin, 20 out of 22 (91%) to clarithromycin, 20 out of 22 (91%) to cefixime, 13 out of 22 (59%) to ceftriaxone, and 18 out of 22 (82%) to ciprofloxacin as shown in Graph 1.



Antibiotic susceptibility pattern of staph aureus were even more alarming (28 total samples assessed). Only 4 out of 28 (15%) samples showed susceptibility to cephazolin, 24 out of 28 (86%) to co-trimoxazole, 100% susceptibility to vancomycin, 8 out of 28 (29%) to clarithromycin, and 8 out of 28 (29%) to clindamycin as shown in Graph 2.



For pseudomonas aeruginosa, a total of 26 samples were assessed. About 93% (24 out of 26) samples showed susceptibility to ceftazidime, 24 out of 26 (85%) showed susceptibility to ciprofloxacin, 24 out of 26 (93%) susceptibility to imipenem, 22 out of 26 (85%) to meropenem, and 100% susceptibility to piperacilin-tazocin combination as shown in Graph 3.



DISCUSSION

Bronchectasis is a chronic debilitating respiratory illness characterized by irreversible dilatation of terminal broncholes and recurrent respiratory tract infections leading to high morbidity and mortality (9,10). Although chest radiograph and pulmonary function tests are of value in diagnosing bronchiectasis, the gold standard modality for diagnosis is High resolution CT Chest (11). In the study under discussion, we evaluated about 76 sputum culture samples of bronchiectasis patients and assessed antimicrobial susceptibility pattern for 3 common respiratory pathogens comprising of pseudomonas aeruginosa, hemophilus influenza and staph aureus. These organisms were assessed for suscepptibility against commonly used antibiotics. In our study, pseudomonas aeruginosa susceptibility to ceftazidime, cipromycin, imipenem, meropenem and pipercilin-tazocin were 93%, 85%, 93%, 85% and 100 % respectively. These results closely mimic the results of a study conducted in Barcelona, Spain in 2022 where 56% sputum culture isolates were found susceptible to ciprofloxacin, 82% to amikacin, 82% to toramycin, 91% to meropenem, 95% to ceftazidime, and 93% to cefipime(12). However, this study had the advantage over our study in terms of of covering more antibiotics and their susceptibility testing. In another study conducted in cystic fibrosis associated bronchiectasis patients, combination of intravenous tobraycin and sceftazidime led to significant improvement in FEV1 (13). According to a study conducted in Sydney, Australia, about 75% isolates were found resistant to tobramycin, co-trimoxazole, ceftazidime, cefepime, and ticarcillin-clavulanate. Interestingly, no osolate was found susceptible to amikacin or ciprofloxacin. The top two antibiotics in terms of uscptibility were colistin and meropenem in this study (14). Colistin susceptibility, however, was not tested in our study.

In our study, Hemophils influenza was isolated from 22 samples (total 76). Antimicrobial susceptibility was assessd for ampicilin, clarithromycin, cefixime, ceftriaxone and ciprofloxacin and the results were; 73%, 91%, 91%, 59%, and 82% respectively. In another study, about 70% isolates were susceptible to ampicilin, 65% susceptible to co-trimoxazole and 94 % susceptible to amoxi-clavulunate, the later two drugs were not tested in our study (15). In another study, 92 % isolates were susceptible to ampicilin, but all were susceptible to trimethoprimsulfamethoxazole (16).

In our study, Antibiotic susceptibility pattern of staph aureus were even more alarming (28 total samples assessed). About 15 % isolates showed susceptibility to cephazolin, 86 %showed susceptibility against co-trimoxazole, no resistance against vancomycin, 29% suceptibility against clarithromycin, and 29% against clindamycin. According to a study in USA, susceptibility to gentamicin and ceftriaxone were 96%,96 % respectively, 98% to levofloxacin, 100% to vancomycin, 78%to azithromycin, 98% to clindamycin, and 100 % to linezolid (17). These results were slightly different from our study.

Limitations of our study were three-folds, limited data, limited number of respiratory pathogens assessed and limited number of antibiotics used in susceptibility testing. From future prospective, surveillance of antibiotic susceptibility patterns is needed along with development of novel effective antibiotics against respiratory pathogens in bronchectasis patients. By addressing these key aspects, we can greatly improve management of bronchiectasis and reduce the burden of respiratory infections.

CONCLUSION

Knowledge of the pathogenic profile and antibiotic susceptibility pattern of common respiratory pathogens in bronchiectasis is important in terms of developing effective treatment strategies. Further research to effectively address the issue of antibiotic resistance and develop novel antibiotics id needed

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