

ORIGINAL ARTICLE

Cultural Sensitivity of Sputum Bacteria Involved in Chronic Lung Disease and Type of Bacteria Involved in Chronic Lung Disease SputumZAHRA IMDAD¹, TEHMINA MAQBOOL², ABDUL REHMAN³, IRAM NAZ⁴, SUNDAS IKRAM⁵¹Registrar, Pediatric Medicine, The Children's Hospital & University of Child Health Sciences, Lahore²Assistant Professor, Pediatric Medicine Emergency, Mayo Hospital, Lahore³Senior Registrar, Pediatric Medicine Unit-1, Mayo Hospital, Lahore⁴Senior Registrar, Pediatrics Medicine, Ghurki Trust Teaching Hospital, Lahore⁵Consultant ER, Child Life Foundation Children's Emergency, Mayo Hospital, LahoreCorresponding author: Abdul Rehman. Email: dr_abdul_rehman@hotmail.com**ABSTRACT****Objective:** To determine the type of bacterium involved in sputum of patients with chronic lung disease and to determine the culture sensitivity of bacterium involved in sputum of chronic lung disease patients**Methodology:** This Cross-sectional study, at Deptt of Pediatric Medicine, The Children's Hospital, Lahore during 2020 to 2021. Total 160 children meeting the criteria of inclusion were the part of this trial. Then the children were given a petri dish to spit in and the samples were submitted to the medical lab to be analysed for bacteria. Penicillin, Ampicillin, Amoxicillin-clavulanic acid, Erythromycin, Tetracycline, Ciprofloxacin, Cefuroxime, Ceftazidime, Cefepime, Piperacillin-tazobactam, Amikacin, Gentamycin, and Vancomycin were tested on all cultured bacteria after they were identified.**Results:** we recorded 8.60 ± 2.54 years mean age. The most frequent isolated organism was H-influenza (43.1%) followed by H-Parainfluenza (36.9%) and S. Pneumonia (20%). Sensitivity of Ciprofloxacin, Cefuroxime, Amikacin, Gentamycin, Piperacillin / Tazobactam, Ceftazidime, Cefepime and Vancomycin was significantly higher for H parainfluenza as compared to other isolated bacterium.**Conclusion:** Results of this study showed that among children with chronic lung disease the most frequency isolated bacterium was H-influenza (43.1%) followed by H-Parainfluenza (36.9%) and S. Pneumonia (20%). Antibiotic sensitivity was significantly higher for H-parainfluenza as compared to other isolated bacteria.**Keywords:** Bacterium, Sputum, Chronic, Lung disease, Culture, Sensitivity**INTRODUCTION**

Chronic lung disorders are characterised by obstructive or restrictive deficiencies, which lead to a reduced capacity for functional tasks such as activities of daily living and leisure, as well as a poor quality of life as it relates to one's overall health. A worsening of clinical symptoms, lung function, physical function, health-related quality of life, and acceleration in disease progression are all associated with exacerbations of lung diseases. These exacerbations carry significant clinical and health cost implications as a result of these associations. Infectious exacerbations might be connected with bronchopneumonia, which would lead to further morbidities and mortalities. However, this is not always the case.¹⁻⁴

Intermittent exacerbations of chronic lung illnesses are linked to increased symptoms and decreased lung function. Exacerbations have a significant impact on patients' quality of life and increase the risk of morbidity and death in those with chronic lung illnesses.⁵ The lungs create sputum, a viscous fluid, when a person has a lung-related illness or a respiratory infection. This sputum may make it difficult to breathe, may make you cough, and may include germs.⁶ In cases of chronic lung illnesses exacerbations, antibiotics are often recommended. It is debatable whether bacteria play a part in these exacerbations, however.⁵

One study has reported that in patients with chronic pulmonary disease including asthma, COPD, the Haemophilus influenza was found in 13–50% cases, Streptococcus pneumoniae in 7–26% cases and Haemophilus parainfluenza in 2–32% cases.⁷ Another study has showed that Haemophilus influenza was found in 20-30% cases, Streptococcus pneumoniae in 10-15% cases and Haemophilus parainfluenza in frequent cases but unlikely cause.⁸

One study conducted in Karachi showed that S. pneumonia was isolated from sputum culture of 31.4% patients, while 12.4% patients showed growth of H. influenza. Out of sputum specimens of S. pneumonia, 97.0% were sensitive to levofloxacin. H. influenza cultures were sensitive to levofloxacin. The cumulative sensitivity of S. pneumonia and H. influenza was 97.8%.⁹

One more study showed that Haemophilus influenza was found in 30.7% cases, Streptococcus pneumoniae in 5.3% cases and Haemophilus parainfluenza in 4% cases. H. influenza was sensitive to penicillin, ampicillin, Amoxicillin-clavulanic acid,

Erythromycin, Tetracycline, Ciprofloxacin, Cefuroxime, Cefepime, Piperacillin-tazobactam. S. pneumonia was also sensitive to these antibiotics but H. parainfluenza showed more resistance to penicillin and ampicillin.¹⁰

Rationale of this study is to determine the type of bacterium isolated from sputum of patients with Chronic lung diseases and its culture sensitivity. In children, the correct diagnosis and administration of appropriate antibiotic is necessary. But in developing country like Pakistan, where resources are poor, patients with lung diseases are hardly managed. So, through this study we want to know the most common bacterium isolated from sputum culture and pattern of its sensitivity with commonly used antibiotics. So that the extent of most common organism can be evaluated and the most effective antibiotic can be identified. So that in future, at the time of presentation of children with lung disease, can be managed early and appropriately.

METHODOLOGY

Total 160 children of 5-13 years of age of either gender presenting with Chronic lung diseases diagnosed for >6 months, those with treatment with any antibiotic within 48 h before admission (medical record) were included in the study whereas those with absence of an adequate sputum specimen as determined by Gram stain and having evidence of bronchiectasis or need for mechanical ventilation were excluded from the study. These cases were enrolled from emergency of Department of Paediatric Medicine, The Children's Hospital & Institute of Child Health, Lahore. An informed consent was taken from parents. Demographic information (name, age, gender, duration of chronic disease) was obtained. Then children were asked to spit the sputum on petri dish and was sent to the laboratory of the hospital for assessment of bacterium. Sputum samples were plated on blood, eosin-methylene blue, and chocolate agar and incubated for 24 and 48 hours at 37 °C. E-test (AB Biodisk, Solna, Sweden) was used to identify all bacteria isolated. This is a commercially available test that uses a plastic test strip impregnated with a progressively decreasing dose of a specific antibiotic. The strip also displays antibiotic concentration contained therein. Culture Sensitivity of isolated Bacteria was checked with following antibiotics: Penicillin, Ampicillin, Amoxicillin-clavulanic acid, Erythromycin, Tetracycline,

Ciprofloxacin, Cefuroxime, Ceftazidime, Cefepime, Piperacillin-tazobactam, Amikacin, Gentamycin and Vancomycin.

RESULTS

Mean age of patients in this study was 8.60±2.54 years, study population consists of 75(46.9%) male and 85(53.1%) female patients, mean duration of disease was 9.47±1.73. The most frequent isolated organism was H-influenza (43.1%) followed by H-Parainfluenza (36.9%) and S-Pneumonia (20%). Penicillin was sensitive for 125(78.1%) samples, ampicillin was sensitive for 136(85%) samples, Amoxicillin- Clavulanic Acid was sensitive for 152(95%) samples, ciprofloxacin and cefuroxime was sensitive for 150(93.8%) samples, Amikacin was sensitive for 136(85%) samples, Gentamycin was sensitive for 144(90%) samples, Piperacillin/Tazobactam was sensitive for 120(75%) samples, Ceftazidime and Cefepime were sensitive for 130(81.3%) and 150(93.8%) samples respectively and Vancomycin was sensitive for 144(90%) samples.

Table 1: Frequency distribution for Isolated Bacterium

	Frequency	Percent
H. parainfluenza	59	36.9
H. influenza	69	43.1
S. pneumoniae	32	20.0
Total	160	100

Table 2: Culture sensitivity of bacterium involved

	Sensitivity of Antibiotics for Isolated Bacterium				p-value
	H-parainfluenzae	H-influenza	S-pneumoniae	Total	
	59	67	32	160	
Penicillin	49(83.1%)	51(76.1%)	25(78.1%)	125	0.460
Ampicillin	52(88.1%)	57(85.1%)	27(84.4%)	136	0.679
Amoxicillin/Clavulanic Acid	57(96.6%)	65(97%)	30(93.8%)	152	0.771
Ciprofloxacin	59(100%)	61(91%)	30(93.8%)	150	0.026
Cefuroxime	59(100%)	61(91%)	30(93.8%)	150	0.026
Amikacin	58(98.3%)	54(80.6%)	24(75%)	136	0.001
Gentamycin	59(100%)	57(85.1%)	28(87.5%)	144	0.004
Piperacillin/Tazobactam	56(94.9%)	45(67.2%)	19(59.4%)	120	0.000
Ceftazidime	58(98.3%)	49(73.1%)	23(71.9%)	130	0.000
Cefepime	59(100%)	61(91%)	30(93.8%)	150	0.026
Vancomycin	59(100%)	57(85.1%)	28(87.5%)	144	0.004

DISCUSSION

Common and arguably the most often reported human illnesses are those that affect the respiratory system. Upper respiratory infections are often separated from lower respiratory infections (LRTIs). Individuals with these infections often ignore their symptoms since they are often mild, short-lived, and self-limiting.¹¹

Due to the difficulty in identifying the etiological agents and administering a suitable treatment in instances needing antibiotic therapy, the situation is more complex and care is typically tough in underdeveloped nations.¹²

The practitioner has to be guided by data on the antimicrobial resistance patterns of the etiological agents while treating patients who require antibiotics. It is well known that bacteria may cause either primary or secondary infections, and that in both situations, specific treatment is necessary. Even while antibiotics are effective against respiratory tract infections, overusing them might eventually contribute to antibiotic resistance since these diseases are so common, especially in poor nations.¹³

In humans, especially school-aged children, these isolates have been identified as a leading cause of respiratory infections by several authors.^{11,14-15}

In this study H.influenza (43.1%) was the commonest isolated bacteria followed by H-parainfluenza (36.9%) and S-

Pneumoniae (20%) respectively. One study has reported that in COPD subjects including asthma, COPD, the Haemophilus influenza was found in 13–50% cases, Streptococcus pneumoniae in 7–26% cases and Haemophilus parainfluenza in 2–32% cases.⁷ Another study has showed that Haemophilus influenza was found in 20-30% cases, Streptococcus pneumoniae in 10-15% cases and Haemophilus parainfluenza in frequent cases but unlikely cause.⁸

Result of this study is consistent with the findings of above mentioned studies but with slight variation is seen for the frequency of H.i

Influenza. In this study the sensitivity pattern of antibiotics showed that for H-parainfluenza all antibiotics showed higher sensitivity as compared to other isolated bacterium i.e. (H-influenza & S-Pneumonia). For H-influenza sensitivity of Penicillin, Piperacillin/Tazobactam and Fortum was lower as that of other drugs. For S-Pneumoniae sensitivity of Penicillin, Amikacin, Piperacillin/Tazobactam and Fortum was lower compared to other drugs.

One study conducted in Karachi showed that S. pneumonia was isolated from sputum culture of 31.4% patients, while 12.4% patients showed growth of H. influenza. Out of sputum specimens of S. pneumonia, 97.0% were sensitive to levofloxacin. H. influenza cultures were sensitive to levofloxacin. The cumulative sensitivity of S. pneumonia and H. influenza was 97.8%.⁹

One more study showed that Haemophilus influenza was found in 30.7% cases, Streptococcus pneumoniae in 5.3% cases and Haemophilus parainfluenza in 4% cases. H. influenza was sensitive to penicillin, ampicillin, Amoxicillin-clavulanic acid, Erythromycin, Ciprofloxacin, Tetracycline, Cefuroxime, Piperacillin-tazobactam and Cefepime, S. pneumonia was also sensitive to these antibiotics but H. parainfluenza showed more resistance to penicillin and ampicillin.¹⁰

In order to ascertain the patterns of antimicrobial resistance to a panel of ten medications, Nweze EI and his colleagues examined the bacteria that cause respiratory tract infections in 280 schoolchildren in South East Nigeria. Their research revealed that the most common strain was Haemophilus influenza (16.1%), which was then followed by Streptococcus pyogenes (13.9%), Klebsiella pneumoniae (12.5%), Streptococcus pneumoniae (6.8%), Staphylococcus aureus (5.4%), and Corynebacterium diphtheriae (2.5%).¹⁶

CONCLUSION

Results of this study showed that among children with chronic lung disease the most frequency isolated bacterium was H-influenza (43.1%) followed by H-parainfluenza (36.9%) and S. Pneumonia (20%). Antibiotic sensitivity was significantly higher for H-parainfluenza as compared to other isolated bacteria.

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