J. Dhaka National Med. Coll. Hos. 2024; 30 (02): 42-46

Original Article

Study of Bacteriological profile and their Antibiotic susceptibility profile of Bacterial respiratory tract infection among patient visiting outpatient department of respiratory medicine in a Tertiary Care Hospital in Bangladesh.

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Abstract

Background: Respiratory tract infections are the most commoninfectious diseases in human. It is a significant health concern for mortality and morbidity in many developing countries. Antibiotic susceptibility varies from country to country and even among the health centers. Proper identification of causative pathogens and their antibiotic susceptibility testing is needed to select appropriate antibiotic therapy for management of patient suffering from Respiratory tract infections.

Objectives: This study was aimed to determine the correct spectrum of bacterial pathogen causing respiratory tract infections with whir antimicrobial susceptibility profile of patient visiting outpatient department of respiratory medicine in Dhaka National Medical Institute Hospital, Bangladesh.

Methods: This cross sectional observational sturdy was conducted in Dhaka National medical Institute hospital form October 2020 to March 2021. A total of 135 sputum sample were collected aseptically from patients who were clinically suspected to have respiratory infection. Sputum sample received from the patient were culture, identified and antibiotic sensitivity pattern performed by standard methods.

Result: Out of 135 processed specimens 64(47.4%) yielded significant growth of Organism. Among 64 culture positive, 12 (18.75%) were gram positive Cocci, 52 (81.25%) were gram negative organism. The prevalence of the bacterial species among the gram positive were as fallows staphylococcus aureus 8 (66.67%) and streptococcus pneumonia 4(33.33%) among the gram negative isolates Klebsiellaspecies 25(48.07%) was the predominant followed by E.Coli 14(2692%), pseudomonas species 11(21.57%). Antimicrobial susceptibility pattern shown in total organism found that they are highly sensitive to Imipenem(100%), Amikacin (89%) Levofloxacin (88%), Ciprofloxacin (84%). Moxifloxacin (81%) and highly resistant to Amoxycillin (91%), Cefixime (66%) and Co-Amoxyclav (61%)

Conclusion: Gram negative bacteria were predominant, most of the bacteria showed high resistant to commonly used antibiotics and this antimicrobial resistances is a matter a concern for the treatment of respiratory tract infections.

Keywords: Antibiotic susceptibility, Respiratory tract infection (RTI), Culture sensitivity, Bangladesh.

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Received: 23.08.2024 **Accepted:** 21.09.2024

Introduction

Respiratory tract infections are termed as infectious diseases of the respiratory tract and are the leading illness globally.[1] These infections are classified as upper and lowerrespiratory tract infection and are the leading

cause of mortality and morbidity especially in developing countries. Respiratory infections are the leading cause of heavy burden to public health.[2] RTI is a spectrum of infections each with a different epidemiology, clinical presentation, pathogenesis and prognosis. The etiology, clinical features of respiratory disease very with age, gender, seasons, the type of population at risk and various other factors.[3] Respiratory infections impose a serious financial burden to the economy due to loss of productivity and cost of antimicrobial agent prescribed by physician even when bacteria are not the main cause of respiratory infection.[4] The etiological agents of respiratory tract infections cannotbe determine clinically and differ from area to area as well as their antibiotic susceptibility.[5] In developing countries the situation is more complicated and management is oftendifficult due to the problem associated with the identification of etiological agents and the administration of appropriate treatment in cases requiring antibiotic therapy.[6]

The Common bacterial causes of respiratory tract infections include Klebsiellapneumonia, Staphylococcus aureus, and streptococcus pneumonia, pseudomonas aeruginosa, Actionobacter spp. and Haemopnilusinfluenza, The responsible pathogens are identified in about half of the patents and physician usually rely on clinical signs and symptoms of the patient to diagnosis respiratory tract infection.[6,7]

Methods

This descriptive Cross Sectional study was carried out between the month of October 2020 to March 2021. A total of 135 patient of aged between 15 to 75years irrespective of sex clinically suspected to have respiratory tract infection and those who had not taken antibiotic for a week prior to symptoms were randomly sampled from outpatient department of Respiratory Medicine of Dhaka National Medical Institute Hospital , Bangladesh.

Patient age below, 15 years and those who had antibiotics a week prior to symptoms and those whose sputum smear were positive for acid fast bacilli were excluded from the study. Sputum samples were collected aseptically for processing. Every patient was instructed on how to collect the sputum sample. Samples were taken to the microbiology laboratory immediately for analysis.

Processed sputum samples were cultured on sterile sheep blood agar, MacConKeys's agar and Chocolate agar plates. The identification ofsignificant isolates were carried out using the standard microbiological techniques, which involved morphological study of colonies. Gram staining reactions and a battery of biochemical test as required.

Antimicrobial susceptibility pattern of isolated organisms were done by the modified Kirby-Bauer disc diffusions method on Mueller-Hinton agar plates as per the CLSI guidelines using commercially available antibiotic discs, such as Amoxicillin, Co- Amoxyclav, Cefuroxime, Cefixime, Ceftriaxone, Co-trimoxazole, Ciprofloxacin, Levofloxacin, Moxifloxacin, Azithromycin, Clarithromycin, Amikacin, Doxycycline, Clindamycin, Imipenem, Lenizolide.

Result

One hundred and thirty five sputum samples were collected from OPD who presented with symptom of respiratory tract infections. The age of the study population ranged from 15to 75 years. Among 135 sputum samples positive bacterial growth was recorded in 64 (47.40%) of the samples. Most of the bacterial pathogens were obtained from male patients 40 (62.5%) while female patients contribute only 24 (37.5%);this showing a male sex predilection (FigureII), the highest isolation rate was observed in above 64 years of age group (Figure I).

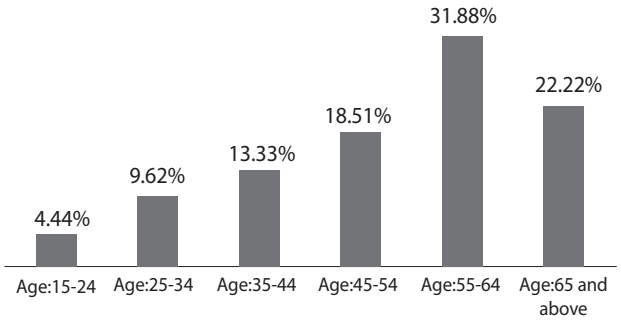

Figure-I : Age distribution of cases (n=135)

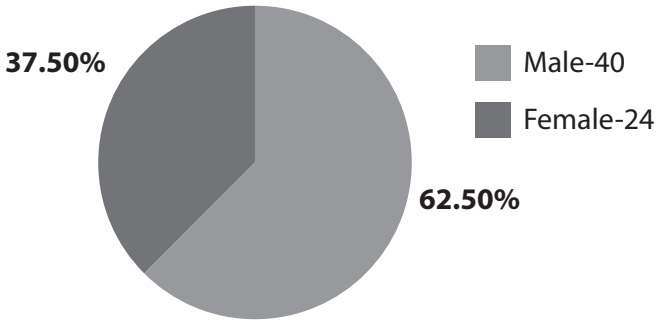

Figure-II: Gender Distribution Of Culture Positive Cases (n=64)

Among the 12 Gram positive cases staph. Aureus 8 (66.67%) was the predominant followed by strep. Pneumoniae 4 (33.33%) (Figure IV).

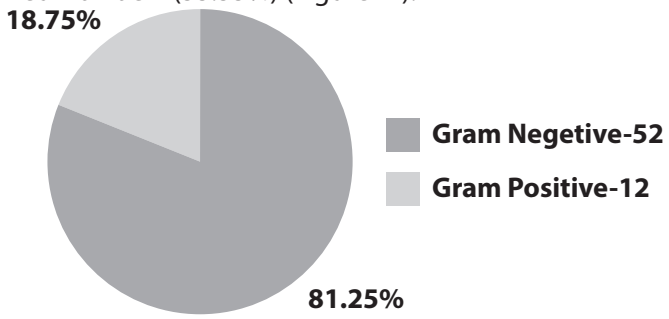

Figure-III: Distribution of culture positive cases (n=64)

Among the 64 culture positive 12 (18.75%) were Gram positive Cocci and 52 (81.25%) were Gram negative organism (Figure III).

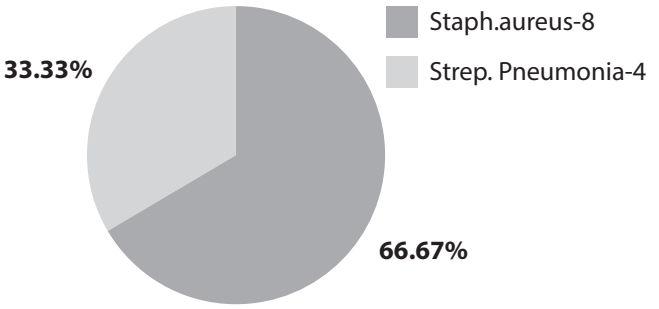

Figure-IV: Distribution of gram positive cases (n=12)

Among the Gram Negative organism ,Klebsiella species 25 (48.07%) was the predominant followed by E.Coli 14 (26.92%) and pseudomonas species 11(21.5%) (Figure IV).

Antimicrobial susceptibility pattern showing intotal organism found to be highly sensitive to Imipenem (100%), Amikacin (89%),

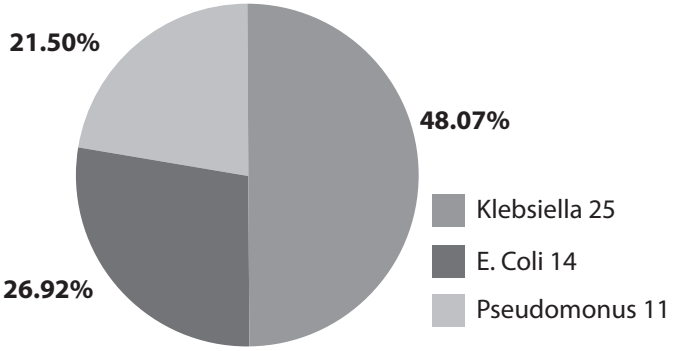

Figure-V: Distribution of predominant Gram Negetive Bacteria

Among the 12 Gram positive organism staphylococcus aureus showed 100% susceptibility to Lenizolide and most gram negative organism exhibited higher sensivity to carbapenems.

Levofloxacin (88%), Ciprofloxacin (84%), Moxifloxacin (81%) and highly resistance toAmoxycillin (91%), Cefixim e (66%) and Co-Amoxyclav (61%) (Table-I)

Table-I: Antimicrobial susceptibility pattern

SL. NO.	Name of Antibiotic	Sensitivity Total %	Moderate Total %	Resistant Total %
1.	Imipenem	64	100	0000
2.	Amikacin	57	89	2358
3.	Levofloxacin	56	88	4646
4.	Ciprofloxacin	54	84	43813
5.	Moxifloxacin	52	81	6935
6.	Cefuroxime	41	64	581828
7.	Cefixime	91	41	3204266
8.	Ceftriaxone	33	961	582037
9.	Co-Amoxyclav	15	23	10163961
10.	Cotrimoxazole	26	41	8133047
11.	Azithromycin	38	59	15231117
12.	Clarithromycin	32	50	21331117
13.	Doxycycline	45	70	691523
14.	Clindamycin	20	31	23362133
15.	Amoxycillin	00	69	5891
16.	Lenizolide	10	16	235281

Discussion

Respiratory tract infections are among the most common infectious disease causing significant morbidity and mortality. An expanded variety of emerging pathogens provides challenges for the respiratory physicians. In recent years, there has been substantial rise in antibiotic resistance among respiratory pathogens. The main objective of this study was to ascertain the current prevalence of bacteria responsible on respiratory tract infection and their antibiotic sensitivity pattern among patient visiting respiratory medicine outpatient department in DNMIH, Bangladesh.

In this present study 64 (47.4%) were found positive for bacterial growth among 135 patients. The negative result of the sputum culture among the respiratory tract infections patient could be due to the fact that this patient might have been infected by other a etiologicalagents such as virus, Legionellapneumoniae,

Among the 12 Gram positive cases staph. Aureus 8 Chlamydia pneumonia or Mycoplasma pneumonia which cannot be routinely cultured in the laboratory. Another possibility could be due to previous treatment with antibiotic that was hidden in the history. It was reported that one-fifth of the patients in the rural area of Bangladesh uses antibiotics before coming to a hospital.[8] Limitations of the study was that serological tests for Legionella pneumoniae, Mycoplasma pneumoniae and common respiratory viruses were not performed and thus, these organisms which are common causative agents in atypical pneumonia might just remain as possible diagnosis in the culture negative cases. Besides DNA of this organisms could be detected by PCR.

In this present study, among 135 patients 64 (47.40%) were found to be positive for bacterial growth, which was similar with other study, 40% in an Irany study,[9] 47.7% in Ludiana study.[10] But several studies showed higher isolation rate. 53.1% in China,[11], 59.4% Turkey.[12] Among the 64 positive cases 52 were gram negative 81.25% and gram positive were 12 (18.75%).Among the gram negative cases, Klebsiellapneumoniae was predominant 25 (48.07%) followed by E.Coli 14 (26.9%).

Among total 64 culture positive cases most predominant was also Klebsiella (48.07%) followed by E.Coli 14 (26.92%). The result was similar with other studies as done by Olugbueet V, al el[13] and Akingbade, Oetal.[14]

Incident of bacterial respiratory infections were more prevalent in age group 55 to 74 years (52.59%) which was similar with the finding study done by Shahet al,[15] and Mandell et al.[16] The increased vulnerability in the geriatric population may be due to their age related physiological and immunological changes and other co-morbidities like DM, COPD.

The organisms showed higher sensitivity to Imipenem (100%), Amikacin (89%), Levofloxacin (88%), Ciprofloxacin (84%), and Moxifloxacin (81%). Regarding resistance pattern high resistance to Amoxycillin (91%), Cefixime (66%), and Co-Amoxyclav (61%) was recorded.

Conclusion

Gram negative organisms were the predominant isolates of respiratory tract infections with Klebsiellapneumoniae as the most common isolates. Gram negative bacteria as well as gram positive bacteria were highly resistance to commonly used antibiotics, should be considered as a cause of concern. So routine approach of antimicrobial susceptibility, continuous surveillance of microbial aetiolog of RTI with their resistance pattern and good infection control practices will help to reduce the burden of drug resistance and thereby helps medical practioners to better management of patients.

Recommendations

Recommendations of initial therapy are based on the severity of illness; the probabilities of pathogens in specific geographical areas, resistance patterns of the most commonly implicated ethological agents and co morbidities. The dramatic rise in the antimicrobial resistance among the respiratory pathogens is a matter of potential concern Worldwide . Excessive and inappropriate use of antibiotic is considered as a major cause of antibiotic resistance in developing country.The increase use of over-the-counter antibiotic not only produces resistance at the individual level but can also threaten the whole community. Therefore, the main objective of this study is to find out the common bacterial agent of RTI and their antibiotic susceptibility pattern among patients in Respiratory medicine OPD of Dhaka National Medical Institute Hospital.

Limitations

This study did not include the inpatient as study population because majority of them were on antibiotics. Serological tests for Legionella pneumoniae, Mycoplasma pneumoniae and common respiratory viruses were not performed. DNA of these organisms not detected by PCR.

Acknowledgement

The authors are grateful to the entire staff of Respiratory medicine and Microbiology Department of the Dhaka National medical College and hospital for their cooperation and also outdoor patients for their participation.

Conflict interest

None.

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