Introduction:

Respiratory tract infections are the most frequent of all the infections and account for the large number of workdays lost in the general population. Among them, pneumonia is the commonest disease with a high prevalence in the community and a cause of significant mortality and morbidity. Pneumonia is broadly defined as an infection of lung parenchyma [1]. Pneumonia is clinically divided into community-acquired pneumonia (CAP) and nosocomial pneumonia. Infectious Diseases Society of America (IDSA) defines CAP as “an acute infection of the pulmonary parenchyma that is associated with at least some symptoms of acute infection, accompanied by the presence of an acute infiltrate on a chest radiograph or auscultatory findings consistent with pneumonia in a patient not hospitalized or residing in a long-term care facility for more than 14 days before onset of symptoms” [2,3]. Aetiology of CAP is generally bacterial but the microbial pattern varies from place to place and so does the antimicrobial sensitivity and emerging resistance pattern. CAP is the leading cause of death in the world. But the seriousness of CAP, despite being a reasonably common and potentially lethal disease, often is underestimated by physicians and patients alike [4]. The treatment of CAP is complicated by growing threat of antimicrobial resistance and the tendency to rely on empirical therapy. Recent years have witnessed the emergence of new pathogens and also newer antibiotics designed to combat them [5]. Various studies have been done in different countries for example in Jordan [6], Thailand [7], New York [8] and Chile [9] regarding the microbial etiology and bacterial resistance. But there is limited published data describing microbiological causes of pneumonia in India [10]. Although a wide variety of recognized pathogens cause CAP, the precise etiology, pattern of microbial flora in various settings, antibiotic sensitivity and resistance in India is still not comprehensively studied. Our study is a sincere attempt to look into the microbiological profile of the various causative agents of CAP and sensitivity pattern of organisms to plan therapy among patients in limited facility settings.

Materials and Methods:

It was a Hospital based Cross sectional study conducted in a tertiary care hospital in Guwahati, Assam. A total of 192 culture positive consecutive respiratory samples received in the Microbiology department of the hospital from August 2016 to July 2017 were included in the study. The study population were assessed for symptoms, signs and laboratory data diagnostic of pneumonia.

Diagnosis was made on the basis of history, clinical examination, routine blood parameters (complete blood count, ESR) and chest radiograph. On diagnosis, samples were collected as

per standard recommended protocols. Respiratory samples included sputum, endotracheal tube aspirate, brochoalveolar lavage samples were collected before the patients received first course of antibiotics. The samples thus obtained were sent for Gram staining and pyogenic culture and sensitivity to antibiotics.

Characterization of bacterial isolates:

The samples were aseptically inoculated on to Blood, Chocolate and Mac Conkey agar plates and incubated overnight at 37oC. Klebsiella pneumoniae (K.pneumoniae) isolates were identified by their morphology and biochemical characteristics. Morphology of Klebsiella identified were large dome shaped colonies on Blood, Chocolate agar and lactose fermenting mucoid colonies on Mac Conkey agar. Gram staining revelaed Gram negative, short, stout, blunt rods. Negative Indole test, positive Voges-Proskauer test, positive Citrate utilization test, positive Urease test, acid and abundant gas production from glucose, lactose, sucrose, maltose and mannitol sugar fermentation tests were the biochemical tests used in the interpretaion .

Antimicrobial Susceptibility Testing:

The isolates were screened for antimicrobial susceptibility testing by Kirby-Bauer disc diffusion method on Mueller-Hinton agar (Hi-Media) and interpreted as per CLSI guidelines [7]. A log phase broth culture inoculums of the isolate with a turbidity equivalent to McFarland 0.5 standard (1.5×10^8 CFU/ml) was prepared and lawn cultured on the Mueller-Hinton agar and allowed to dry. Antibiotic discs were applied to the Mueller Hinton agar surface with the help of sterile forceps. A panel of antibiotics (Hi-media) as per the CLSI guidelines were selected . All antibiotics used were on ATCC strains, to ensure satisfactory quality control.

The plates were then incubated at 37°C for 24 hours. Antimicrobial activity was indicated by an inhibition zone. The diameter of the inhibition zones was measured in millimeter using a calibrated scale based on the CLSI guidelines and were tagged as sensitive or resistant.

Results:

In our study the most frequent pathogen was *Klebsiella pneumoniae* (43.2%; n=83) followed by *Pseudomonas aeruginosa* (23%; n= 44) and *Staphylococcus aureus* (10%; n= 19). *Esherichia coli* (7.8%;n= 15), *Streptococcus pneumonaie* (3.1%; n= 6) and *Moraxella catarrhalis* (2%; n=4) were the other organisms. For the Gram negative organisms causing

pneumonia, most of them were sensitive to colistin followed by carbapenems (meropenem 90%) followed by aminoglycosides (amikacin 83%). Aminoglycosides (Tobramicin 100%), macrolides , quinolones and 3rd generation cephalosporins showed good sensitivity pattern against the Gram positive organisms. For the most common pathogen, *Klebsiella pneumoniae,* apart from colistin(100%), meropenem (89%) followed by amikacin (81%) and imepenem (80%) showed the best sensitivity patterns. *Pseudomonas* showed a similar preference for meropenem (90%) and amikacin (81%) apart from colistin (100%). *Staphylococcus aureus* with good sensitivity for linezolid (100%) , *Streptococcus pneumoniae* (Ceftriaxone 100%) *and Moraxella catarrhalis* (3rd gen cephaosporins) were the other results obtained.

Discussion:

In hospital setting, empirical management for cases of CAP should be based on local bacteriological profile. The present study has shown *K.pneumoniae* as the most common pathogen in hospitalized patients with CAP. Choosing the proper antibiotics as initial empiric therapy & later streamlining as per the culture sensitivity pattern is critical in outcome of CAP. Patients with signs of shock should empirically be started with carbapenems along with a aminoglycoside or quinolones whichever is clinically feasible. If patient is relatively stable, instead of carbapenems, beta-lactams/beta lactamase inhibitors are advised. 3rd generation cephalosporin together with quinolones is also a good alternative for the stable CAP cases. Later on based on sensitivity reports, the antibiotics are to be de-escalated. Indiscriminate use of carbapenams can be avoided in these patients, since beta-lactams/beta lactamase inhibitors also caters to the need, leading to better antibiotic stewardship. Colistin is a restricted antibiotic and should only be reserved for hospital acquired pneumonia cases and are in no way justified for CAP.

Conclusion:

Interestingly we find klebsiella to be most common pathogen (43.2%), followed by *Pseudomonas aeruginosa* (23%; n= 44) and *Staphylococcus aureus* (10%; n= 19). *Esherichia coli* (7.8%;n= 15), *Streptococcus pneumonaie* (3.1%; n= 6) and *Moraxella catarrhalis* (2%; n=4) were the other organisms. These changing trends needs to be keep in mind while choosing empirical coverage in this area.

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