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Original Research Article

DIAGNOSTIC ROLE OF MICROBIOLOGY AND RADIOLOGY IN DIFFERENTIATING VIRAL AND NON VIRAL COMMUNITY ACQUIRED LOWER RESPIRATORY TRACT INFECTIONS

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ABSTRACT

Background: Infections primarily affecting structures of respiratory tract below the larynx are termed as lower respiratory tract infections (LRTI). Included generally are conditions like pneumonia, bronchitis, bronchiolitis, and viral wheeze. **Objective:** To study the diagnostic role of microbiology and radiology in differentiating viral and non viral community acquired lower respiratory tract infections in children between 2month -59months.

Materials and Methods: The study was conducted on 60 patients admitted with the diagnosis of lower respiratory tract infections in department of pediatric medicine, chacha Nehru bal chikitsalaya, New Delhi from the period November 2018 to October 2019.

Results: Out of 60 patients, 29 patients were fulfilling the criteria for viral LRTI and rest 31 were grouped as non viral LRTI and were started on antibiotics on day 1 of admission. Of the 29 patients diagnosed with viral LRTI, antibiotics were added to 3 patients in view of clinical sickness at the time of admission. Thus there were 26 patients in the study who received no antibiotics and were managed symptomatically, and the rest 34 patients received antibiotics. 2 patients went LAMA and rest of the patient were discharged. Among 60 patients enrolled in the study PCR test could be done for only 46 patients due to non availability of the kit for further testing. And in view of limited availability of the resources and time I'm presenting my results on 46 microbiologically diagnosed LRTI. 46 patients samples were subjected to PCR analysis for 32 respiratory pathogens, and single viral and bacterial pathogen was isolated in 11 and 5 patients respectively, 23 patients showed both viral and bacterial pathogens and 7 tested negative for all the organisms. Thus patients showing isolation of only viral organisms were grouped under viral and rest all were grouped as non viral which includes patients with pure bacterial isolations, with co infection and those tested negative for all organism.

Conclusion: By using a predefined criteria 72% of viral pneumonias were correctly diagnosed and were discharged without antibiotics. Thus it is concluded that it is possible to differentiate viral and non viral LRTI by using clinical and simple investigative methods.

Keywords: Microbiology, Radiology, Viral, non viral, Community acquired, lower respiratory tract infections.

INTRODUCTION

Lower respiratory tract infections are one of the leading causes of morbidity and mortality in children under 5years of age in developing countries. Around 15million children under 5years of age die each year, of which 96% are in developing countries.[1] LRTIs are associated with 33% of these deaths.[2]

Pneumonia accounts for the largest portion of infant deaths in developing countries.

It is estimated that there were over 120 million episodes of pneumonia among children younger than 5 years during 2010–11; of which over 10% were severe episodes.[3] A recent systematic review estimated 0.22 pneumonia episodes per child–year in developing countries alone, with nearly one in eight cases progressing to severe disease.[4] Pneumonia is also estimated to be responsible for almost 1 million deaths among children under 5 years old , India has a high burden of childhood pneumonia and the disease accounts for about a quarter of the under–five mortality in the country.[5]

A significant epidemiological burden in terms of morbidity and mortality in paediatric age group, especially in a resource poor set-up is attributed to LRTIs.

The aetiology includes bacterial, viral and atypical organisms of which viruses are the most common. RSV and streptococcus pneumoniae are the most common viral and bacterial organisms respectively.[6-7]

The clinical hallmark of LRTIs is tachypnea usually with cough and fever (although not specific). Other signs of respiratory distress are frequently present. With increased severity signs like poor feeding, altered sensorium become significant. Radiology further aids in breaking up LRTIs into pneumonias, bronchiolitis, pleurisies etc. To further approach microbiology of LRTIs lab parameters like CBCs, acute phase reactants, cultures etc. are frequently requested.[8,9]

The significance of timely microbiological diagnosis of LRTIs is obvious. It has implications in terms of treatment, prognostication and cost besides others. Rationalisation of antimicrobial use ultimately depends on it. However microbiological diagnosis is often not possible. This highlights the requirement of some clinical and para-clinical parameters that would suggest a microbiological diagnosis of LRTIs in a timely manner.

Hence this study was been planned to utilize simple clinical, radiological and microbiological methods in determining the aetiology of community acquired LRTI.

MATERIALS AND METHODS

This Prospective observational study was conducted among all children aged 2month to 59months admitted in emergency department, Department of Paediatrics, Chacha Nehru bal Chikistalaya, Geeta colony, Delhi. Duration of study was 1 year.

Sample Size:

Sample size $n=\frac{Z^2pq}{d^2}$

Z-Standard normal distribution, with C.I =95% Z =1.96

d-Margin of error-5%-0.05

p-Proportion of all children with LRTI who found to have viral etiology-66%-0.66[8]

q-(1-p)-0.34.

Taking the above values the sample size (n) comes out to be 344.

But considering the duration of study and the resources involved a convenience sample of 60 was taken.

Inclusion Criteria: Children presenting with LRTI as per WHO criteria aged 2month -59months [11-13].

General danger signs include

a. Not able to drink
b. Lethargic/unconscious
c. Persistent vomiting
d. Convulsions
e. Stridor in calm child

Exclusion Criteria:

1. Children who have received antibiotics with in 48hrs prior to admission
2. Children with any secondary cause of LRTI
   - k/c/o- immunodeficiency
   - Congenital heart disease
   - GERD
   - Anatomic defect like cleft palate.
3. H/o of previous hospital administration within 14days.

Primary outcome variable:

1. Proportion of children confirmed to have viral LRTI based on microbiology and radiology.

Secondary outcome variable

1. Proportion of children who received antibiotics

Methodology: 60 children diagnosed as LRTI were included in the study.

1. Informed written consent was taken from all the patients.
2. Detailed history of presenting illness, and clinical findings (temperature, vitals, respiratory system findings etc.) were recorded in a predisgned data sheet for each patient. Past history of LRTI, repeated H/O nebulizations, and hospital admissions were taken.
3. Anthropometry Data, immunization status and dietary history were also recorded.

(The details of the proforma are given in appendix to this thesis.)

4. Blood samples from enrolled patients were taken for complete blood picture, s.crp, procalcitonin, ESR. Blood cultures were taken in Peds plus/F culture media (Becton Dickinson) and placed in FX200 (Becton Dickinson, India).
5. Nasopharyngeal aspirates (NPA) and throat swabs were collected from all the suspected children. Nasopharyngeal aspirates were

obtained using a sterile, disposable suction catheter while throat swabs were taken using pre-sterilized dacron swabs (Hi Media). After proper collection samples were immediately transported in viral transport media to the laboratory services. Samples were cold centrifuged and stored at –80 °C for subsequent PCR analysis.

Multiplex PCR targeting 33 pneumonia pathogens was performed on all the samples using FTD respiratory pathogens (Fast track diagnostic, Luxemberg).

Nucleic acids were extracted using commercially available Magnapure Kits (magnapure compact MPC B0605.) according to the manufacturer's instruction with the addition of pathogen specific primers. Amplification and detection was carried out in Roche LC-480 real-time thermal cycler. Samples were categorized as negative or positive for any pathogen with internal controls (human housekeeping genes β2–microglobulin and β–actin) included in each run as control for DNA and RNA extraction respectively.

4.Chest X ray was obtained on admission and was reported by the radiologist using WHO scheme for interpretation of chest X rays. (REF OF WHO).

X rays were classified into six categories:

a) No significant pathology
b) Hyperinflation
c) Infiltrates (Interstitial/diffuse).
d) Consolidation (Lobar, segmental, broncgopneumonia)
e) Pleural effusion
f) Hilar / paratracheal lymphadenopathy.

Treatment:

All admitted patients were treated as per hospital protocols.

Supportive treatment was given to all the patients in the form of

1) Oxygen therapy
2) Nebulization with adrenaline, asthalin, ipravent, 3% nacl as per requirement.
3) Intravenous fluids.
4) Antipyretics.

Antibiotics were given to

5) Children with non viral LRTI.
6) Children with viral LRTI and appear sick looking to the investigator.
7) Children with viral LRTI who have not responded or deteriorated on supportive line of management.

Follow up

Patients condition was monitored daily and clinical condition is reassessed after 72 hours and details are recorded in the data sheet.

During the course of stay patients in viral group who have either deteriorated (worsening of respiratory distress) or showing no improvement in clinical condition were reinvestigated. A repeat hemogram, CRP and chest X - ray was done. Patients showing increase in TLC, CRP, or appearance of alveolar infiltrates/consolidation were put on antibiotics.

Outcome was measured in terms of number of patients discharged, died, went LAMA and the proportion of patients labelled as viral LRTI discharged without antibiotics.

Statistical Analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Independent t test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups.
2. Qualitative variables were correlated using Chi-Square test/Fisher's Exact test.
3. Diagnostic test was used to find out sensitivity, specificity, NPV and PPV.

A p value of <0.05 was considered statistically significant.

The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS

At the time of admission patients enrolled in the study were classified into viral and non viral LRTI on the basis of a pre designed criteria.

Out of 60 patients, 29 patients were fulfilling the criteria for viral LRTI and rest 31 were grouped as non viral LRTI and were started on antibiotics on day 1 of admission.

Of the 29 patients diagnosed with viral LRTI, antibiotics were added to 3 patients in view of clinical sickness at the time of admission. Thus there were 26 patients in the study who received no antibiotics and were managed symptomatically, and the rest 34 patients received antibiotics. 2 patients went LAMA and rest of the patient were discharged.

Among 60 patients enrolled in the study PCR test could be done for only 46 patients due to non availability of the kit for further testing. And in view of limited availability of the resources and time I'm presenting my results on 46 microbiologically diagnosed LRTI.

46 patients samples were subjected to PCR analysis for 32 respiratory pathogens, and single viral and bacterial pathogen was isolated in 11 and 5 patients respectively, 23 patients showed both viral and bacterial pathogens and 7 tested negative for all the organisms. Thus patients showing isolation of only viral organisms were grouped under viral and rest all were grouped as non viral which includes patients with pure bacterial isolations, with co infection and those tested negative for all organism.

The microbiologically diagnosed viral and non viral groups were compared retrospectively with clinical and paraclinical parameters of the patients to determine whether clinical, laboratory or X ray

findings would reliably differentiate between viral and non viral lower respiratory tract infections.

Children of age from two months to 5years were included in the study. Maximum number of patients were in the age group of less than 1year (58.33) and 95% of the study population was below 3years of age. There was no difference in the mean age of the patients grouped under as viral and non viral.

Table 1: Age (years) distribution of patients in both groups

	Non viral	Viral	P value
Sample size	35	11	0.826.
Mean ± Stdev	1.08 ± 1.04	0.97 ± 0.81	
Min-Max	0.09-4	0.25-3	
Inter quartile Range	0.354 - 1.600	0.458 - 1.429	

There were 28 (60.87%) males and 18(39.13%) females in the present study.

Temperature of each patient was taken at the time of admission and further compared between the two groups. Fever less than 102 deg F was present in 10 (21.74%) patients, while 36 (78.26%) patients had fever greater than 102 deg F (high grade). 88.57% of patients labelled as non viral fever greater than 102 deg F, while 45.45% of the patients labelled as viral had fever greater than 102 deg F. and the difference was statistically significant.

Fever at 72 hours

Temperature was also recorded at 72 hours of admission and compared. Fever was less than 102 deg F in 80% of the total patients.22% of patients under non viral group had fever greater than 102 deg F and only 9% of patients grouped under viral pneumonia had fever greater than 102 deg F, but the difference was not statistically significant.

Feeding at admission

82% of the total patients had poor oral intake at admission and feeding was equally affected in both the groups , among non viral 82% had difficulty in feeding and 81% in viral group had difficulty in feeding.

Feeding at 72 hours

Difficulty in feeding had resolved in 89 % of the total patients . 100 % in viral and 85% of patients in non viral group had no feeding issues after 72hours of admission but the difference was not statistically significant.

Immunization status:

Of the 46 patients 76% were fully immunized ,17% were partially immunized and 6% were unimmunized. But there was significant difference concering to immunization status of the patients between the two groups.

ANTHROPOMETRY

Anthropometry was done at the time of admission. In non viral group WT/AGE of 31%,54% and14% patients were falling below 3rd , 3rd to 50th and 50th to 97th percentile respectively, while WT/AGE of 11(100%) patients found in the viral group were in between 3rd to 50th percentile .The difference was statistically significant.

Among the 46 patients HT/AGE of 8%,63% and 28% of total patients was falling between 3rd , 3rd to 50th and 50th to 97th percentile respectively **.** There was no significant difference with regards to HT/AGE in both the groups.

HEART RATE

The heart rate of all the patients were recorded at the time of admission and at 72hours after admission. The mean heart rate at admission in non viral and viral groups was 136 and 137 respectively. The mean heart rate at 72hours in non viral and viral groups was 115 and 110 respectively. The difference was not statistically significant.

RESPIRATORY RATE

Respiratory rate was recorded at admission and at 72 hours after admission.the mean respiratory rate at admission in both non viral and viral group was 61 and 66 respectively. The mean respiratory rate in non viral and viral group at 72hours was 37 and 37 respectively. The difference was not statistically significant.

Respiratory distress at admission:

Respiratory distress was found in 89% of total patients at the time of admission.88% patients of non viral group and 90% patients of viral group had respiratory distress at admission.

Hence there was no statistically significant difference in both the groups.

Table 2: Data on respiratory distress at admission

Respiratory distress at admission	Non-viral	Viral	Total	P value
No	4 (11.43%)	1 (9.09%)	5 (10.87%)	1
Yes	31 (88.57%)	10 (90.91%)	41 (89.13%)	
Total	35 (100.00%)	11 (100.00%)	46 (100.00%)	

Respiratory distress at 72hours.

Respiratory distress assessed at 72hours in all the patients. There were no signs of respiratory distress in 11(100%) patients of viral group .and 8(22%) patients of non viral group still showed signs of respiratory distress at 72hours of admission. The difference was not statistically significant.

CHEST XRAYS

Chest X ray was done in all the patients at the time of admission. A significant pathology was seen in 97%

of patients among non viral group and 63% of patients in viral group and

Rest 36% patients in viral group had a normal chest X ray findings. This difference is statistically significant.

Table 3: Chest X ray showing significant pathology

Chest xray	Non viral	Viral	Total	P value
Significant pathology	34 (97.14%)	7 (63.64%)	41 (89.13%)	0.009
No significant pathology.	1 (2.86%)	4 (36.36%)	5 (10.87%)	
Total	35 (100.00%)	11 (100.00%)	46 (100.00%)	

HYPERINFLATION

Further characterizing the different features of chest Xrays, hyperinflation was seen in 71% of patients in viral group and 32% of non viral group, however this difference is not statistically significant.

Table 4: Hyperinflation on chest X ray

Hyperinflation	Non viral	Viral	Total	P value
No	23 (67.65%)	2 (28.57%)	25 (60.98%)	
Yes	11 (32.35%)	5 (71.43%)	16 (39.02%)	0.089
Total	34 (100.00%)	7 (100.00%)	41 (100.00%)	

INTERSTITIAL INFILTRATES

Interstitial infiltrates were seen in 71% patients of viral group and 8% of patients of non viral group .There is a statistically significant difference regarding interstitial infiltrates finding on chest X ray in both the groups.

CONSOLIDATION

Consolidation was seen in 61% patients grouped under non viral LRTI and 14% patients of viral group. And the presence of consolidation on chest XRAY is more commonly correlates with non viral LRTI and the difference is statistically significant.

PLEURAL EFFUSION

Among the 46 patients pleural effusion was seen in 7(17%) patients and all of them are grouped under non viral pneumonia. The difference is not statistically significant.

LYMPHADENOPATHY

Hilar and paratracheal lymphadenopathy was seen in 20% patients of non viral group and non of the patients from viral group had lymphadenopathy. The difference is not clinically significant.

NASOPHARYNGEAL ASPIRATES

Nasopharyngeal aspirates were collected at the time of admission from all the patients and samples were subjected to PCR analysis. Out of 46 samples 23(50%) samples showed both viral and bacterial pathogens as a coinfection and among 5 (10%) patients bacteria was isolated and 11(23%) patients had viral isolation of organisms. Rest 7(15%) patients were tested negative for all the organisms.

BLOOD CULTURES

Blood cultures were collected under strict aseptic precautions at the time of admission. 93.8% . of total patients had no growth in there blood cultures. There is no statistically significant difference.

Table 5: Data on Blood cultures results

BLOOD CULTURE	Non viral	Viral	Total	P value
ACINETOBACTER BAUMANNI	0 (0.00%)	1 (9.09%)	1 (2.17%)	
STREPTOCOCCUS	1(2.86%)	0(0.00%)	1(2.17)	
STAPHYLOCOCCUS SAPROPHYTICUS	1 (2.86%)	0 (0.00%)	1 (2.17%)	0.281
NO GROWTH	33(94.29%)	10(90.91%)	43(93.8%)	
Total	35 (100.00%)	11 (100.00%)	46 (100.00%)	

Duration of stay was compared between the two groups. The mean duration of stay was higher in non viral group 6.83 as compared to viral group with mean duration stay of 3.82.

COMPARISION BETWEEN MICROBIOLOGICAL AND CLINICAL DIAGNOSIS

By using clinical and laboratory data 71% of non viral and 81% of viral LRTI were correctly diagnosed with a significant p value of 0.004.

Table 6: Comparison between microbiological and clinical diagnosis

Clinical diagnosis	Non viral	Viral	Total	P value
Viral	10 (28.57%)	9 (81.82%)	19 (41.30%)	
Non viral	25 (71.43%)	2 (18.18%)	27 (58.70%)	0.004
Total	35 (100.00%)	11 (100.00%)	46 (100.00%)	

COMPARISION BETWEEN MICROBIOLOGICAL AND CLINICAL DIAGNOSIS

Based on chest X ray findings 10 (90%) out of 11 patients in viral group and 23(65%) of 35 patients in non viral group were diagnosed correctly with a significant p value of 0.001.

Table 7: Comparison between microbiological and radiological diagnosis

Radiological diagnosis	Non viral	Viral	Total	P value
Viral	12 (34.29%)	10 (90.91%)	22 (47.83%)	0.001
Non viral	23 (65.71%)	1 (9.09%)	24 (52.17%)	
Total	35 (100.00%)	11 (100.00%)	46 (100.00%)	

Clinical diagnosis showed a sensitivity of 81.8% and specificity of 71%.Though this showed PPV of only 47.3% but NPV was quite high 92.5%.

Similarly for Radiology sensitivity was 90.9% and specificity of 65.71% . Again though radiology had a poor PPV 45.45% it showed high NPV 95.8% the diagnostic accuracy of clinical diagnosis was 73.91% and radiological diagnosis was 71.74%.

DISCUSSION

In the present study 95% of population was below 3 years of age but there was no difference in the mean age of the patients and sex distribution in both the groups. Similar results were seen in below mentioned studies.

Reem Hasan.et all found that ALRI incidence rate was higher in boys versus girls and in children 6- 23 months of age versus other age group.[10]

CLINICAL PROFILE

There was significant difference (p value of 0.006) in the incidence of fever between the two groups. 88% of patients in the non viral group had fever greater than 102 degree F, while 45% of patients in viral group had fever greater than 102 degree F.

Similarly other clinical findings like cough, coryza, feeding difficulty and respiratory difficulty was found equally in both the groups , but feeding difficulty and respiratory difficulty were 100% resolved after 72 hrs of admission in viral group. However the p value was not significant.

The mean heart rate and respiratory rate at the time of admission in our study showed no significant difference in both the groups.

LAB PARAMETERS

All patients were given the following test : complete blood count , CRP , PCT ,blood culture , and nasopharyngeal aspirates and throat swab.

The mean TLC count in non viral group was 19.59 and viral group it was 13.27 with a p value of 0.132.

The mean neutrophilic count had no significant difference between the two groups.

The mean CRP levels were 78 and 13.8 in non viral and viral respectively with a significant p value of 0.02.

virkki et all. (2001) stated that all combinations which had significant difference between bacterial and viral pneumonias like CRP >80 (p value 0.001) , TLC >15000 or ESR >30mm/hr had no additional power in differentiating viral and non viral LRTI. An additional 40 combinations were investigated but showed no significant results. But they also mentioned that serum CRP >80mg/dl was found to be most practical laboratory test for bacterial pneumonias with a good specificity (0.72) and a low sensitivity (0.52).[11]

Elemraid et al,[12] did a study on utility of inflammatory markers in predicting the aetiology of pneumonia in children and found that bacterial infections were associated with higher CRP >80 mg/L than viral infections (P=0.001), but levels <20 mg/L were not discriminatory (P=0.254) whereas WBC and neutrophil count showed no such significant difference.

We found that procalcitonin was one of the important biomarker in differentiating viral and non viral LRTIs. Supporting our evidence the following studies are found.

Nicola et al,[13] reviewed the role of biomarkers in diagnosis and treatment of pediatric CAP in 2017. Among traditional biomarkers, PCT appeared to be the most effective for both selecting bacterial cases and evaluating the severity. However, a precise cut-off separating bacterial from viral and mild from severe cases was not defined

Shin Ahn et all. (2009) found that PCT and CRP alone and their combination had a moderate ability to detect pneumonia of mixed bacterial infection during the 2009 H1N1 pandemic. Considering high specificity, combination of low CRP and PCT result may suggest that pneumonia is unlikely to be caused by mixed bacterial infection.[14]

CHEST X RAYS

Chest X ray was done in all the patients at the time of admission. A significant pathology was seen in 97% of patients among non viral group and 63% of patients in viral group and

Rest 36% patients in viral group had a normal chest X ray findings. This difference is statistically significant.

In our study, hyperinflation was found in both the groups reason could be any inflammation in lung parenchyma hampers the oxygen exchange, leading to recruitment of more alveoli to reduce ventilation perfusion mismatch causing hyperinflation of lung fields.

It was also found that interstitial infiltrates are more common in viral group with P value of 0.027 and alveolar consolidation is more commonly seen in non viral group with a significant P value of 0.036. Pleural effusion and hilar and para tracheal lymphadenopathy is associated with bacterial infections but not very commonly, hence the P value was not significant.

Although we achieved a significant P value for interstitial infiltrates and consolidation, this cannot be taken as a conclusive evidence in differentiating viral and non viral LRTIs because of small sample size , and analysis was done by only single radiologist and there were no clear cut standard definition about chest X ray findings in differentiating viral and non viral LRTIs.

It was reported that using standardized definitions and training, it is possible to achieve agreement in identifying radiological pneumonia, thus facilitating the comparison of results of epidemiological studies that use radiological pneumonia as an outcome.[15]

Gharib AM et al in 2001 Focal diffuse interstitial pattern is usually associated with viral, Mycoplasma, or Pneumocystis carinii pulmonary infection.[16]

Drummond P.et al,[17] in 2000 found that lobar consolidation is not very specific to bacterial pneumonia and interstitial infiltrates are seen in both viral and mixed infections. concluded that Inflammatory markers and chest x ray features did not differentiate viral from bacterial pneumonia; serology and viral immunofluorescence were the most useful diagnostic tests.

NASOPHARYGEAL ASPIRATES

Nasopharyngeal aspirates were collected at the time of admission from all the patients and samples were subjected to PCR analysis. We were able to isolate an organism in around 84% of patients. Similar results were seen in Virkki et al,[11] Bhuyan GS et al,[18] and richter et al.[9]

Out of 46 samples 23(50%) samples showed both viral and bacterial pathogens as a coinfection and among 5 (10%) patients bacteria was isolated and 11(23%) patients had viral isolation of organisms. Rest 7(15%) patients were tested negative for all the organisms.

Our study found that mixed infections (bacteria super imposed on viral) were most common .

Mathew et al,[5] also obtained similar results. And concluded that the presence of multiple pathogens, especially organisms associated with nasopharyngeal carriage, precludes confirmation of a causal relationship in most cases. Hence it is difficult to attribute etiology to a single pathogen in the majority of cases as co–infection is common and independent of disease severity. Multiplex PCR proved to be highly sensitive in identifying potential pathogens from respiratory samples; but lacked specificity for establishing a causal relationship.

Turner R.B et al. also had similar results and concluded that the high proportion of patients with bacterial pneumonia who have concurrent viral and bacterial infection is consistent with the speculation that viral infections may be important in the pathogenesis of bacterial pneumonia.[19]

The most common bacterial and viral organism isolated in our study Heamophilus influenza , streptococcus pneumonia and Human rhino virus respectively.

Also we want to highlight that bacterial pneumonia was more than viral pneumonia unlike many studies which predominantly have viral etiology. The reason for this differential epidemiology could be as ours is a tertiary care hospital often very sick patients seek the medical attention and we usually get referred patients. Another reason could be since we have used multiplex PCR which is very sensitive in picking up etiology. Often most of the studies relay on blood cultures for bacterial growth and the yield of isolation of an organism is very low.

BLOOD CULTURES

We were able to isolate an organism on blood culture in only 6 % of cases, rest all cultures were sterile. The yield of blood cultures in isolation of organism is low probably because pneumonias are predominantly lung parenchymal infections and most of the studies blood cultures are collected on the initial day of illness. By the time the organisms becomes more virulent and spreads into blood stream causing disseminated sepsis, antibiotics will be initiated and a chances of getting sterile cultures are again more. Similar results were found in study conducted by T.B.Ronald.[19] And Mathew et al.[5]

COMPARISION BETWEEN CLINICAL, RADIOLOGICAL AND MICROBIOLOGICAL DIAGNOSED VIRAL AND NON VIRAL LRTI.

Table 8: Data on microbiologically, clinically and radiologically diagnosed LRTI

GROUP	Clinical diagnosis	Radiological diagnosis	Microbiological diagnosis
Viral	19	22	11
Bacterial	27	24	35

Table 8: Comparing microbiological diagnosis with clinical and radiological diagnosis

Prediction	Clinical diagnosis	Radiological diagnosis	Combined diagnosis
Viral correct	9	10	9
Viral incorrect	2	1	1
Bacterial correct	25	23	23
Bacterial incorrect	10	12	10
Discordant information			3

Our primary outcome was to find out proportion of children confirmed to have viral LRTI based on microbiology and radiology.

Till now we were able to correctly diagnose bacteria in 25 (71%) of total microbiologically diagnosed non viral LRTI,[35] and correct viral in 9(81%) of total microbiologically diagnosed viral LRTI,[11] by using clinical and laboratory data with a significant p value of 0.004.

And by using radiology 10 (90%) out of 11 patients in viral group and 23(65%) of 35 patients in non viral group were diagnosed correctly with a significant p value of 0.001.

However when individual parameters of clinical and radiology were compared the p value was not significant in all of them.

The most significant finding of our study was that clinical diagnosis showed a sensitivity of 81.8% and specificity of 71%. Though this showed PPV of only 47.3% but NPV was quite high 92.5%.

Similarly for radiology sensitivity was 90.9% and specificity of 65.71%. Again though radiology had a poor PPV 45.45% it showed high NPV 95.8% the diagnostic accuracy of clinical diagnosis was 73.91% and radiological diagnosis was 71.74%.

Our secondary outcome was proportion of children who received antibiotics in viral group.

The positive result of our study was that we could correctly avoid antibiotics in atleast 72% of patients who were diagnosed as viral (p value 0.003). based on combination of our clinical judgement, radiological findings and lab parameters. hence our secondary outcome has been achieved.

CONCLUSION

Lower respiratory tract infections are one of the leading causes of morbidity and mortality in children under 5years of age in developing countries. And due to lack of clear cut consensus guidelines defining the lower respiratory tract infections and there management, leading to irrational use of antiobiotics. By using a predefined criteria 72% of viral pneumonias were correctly diagnosed and were discharged without antibiotics. Thus it is concluded that it is possible to differentiate viral and non viral LRTI by using clinical and simple investigative methods.

Even if the criteria are met patients need to be monitored on day to day basis and for some duration after discharge for any change in the category and need of antibiotics.

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