General Medicine

A STUDY OF RESPIRATORY PATHOGENS IN SEASONAL OUTBREAKS AT TERTIARY CARE CENTRE IN WESTERN RAJASTHAN

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ABSTRACT **INTRODUCTION-** Different respiratory pathogens in every seasonal outbreak are reported in different part of world therefore it is imperative to see the pathogen responsible for such outbreak in Western Rajasthan (desert part of India).
METHODOLOGY- Prospective surveillance for outbreaks of respiratory tract infection and records were conducted in Mahatma Gandhi Hospital, Jodhpur over 6 months. The clinical manifestation of infected patients were identified and microbiological investigations for causal agents were conducted.
RESULTS- Out of 73 patients enrolled in which 46 male and 27 were female. Male experienced acute respiratory infection 1.73 times more than female. Mostly patients were from rural background 47 (64.38%). Multiple pathogen were detected in 60 (82.19%) patients, included Influenza virus H1N1 ,Streptococcus pneumoniae, Staphylococcus aureus, and Legionella species were mainly found in young and middle age group. Klebsiella pneumoniae, Pseudomonas aeruginosa and Acinetobacter species are the most common sputum pathogen in chronic obstructive lung disease in elderly age group and Haemophilus influenzae and Moraxella species found in young age group with bronchial asthma. In the prospective surveillance patients mainly presented had a cough, shortness of breath, fever and coryza.
CONCLUSION- Adequate surveillance and early identification of organism in seasonal outbreaks is important, so that appropriate implementation of strategies to prevent and minimize the transmission. Pulse oximetry has important technique for close monitoring and management of critical ill patients.

KEYWORDS : H1N1, Seasonal Outbreaks, Respiratory Pathogens, Pneumonia, Coryza, Pulse Oximetry.

INTRODUCTION

Acute respiratory tract infections are the leading cause among all diseases in different age groups regardless gender and races. Starting of 20th century there were epidemiologic surveys and community based studies which determined the rate of respiratory illness and the multiple pathogen involved in such infection.[1] The leading pathogen or triggers of these disease are said to be viruses. Mostly patients infected from our community acquired pathogens in rural background. It is well known that seasonal outbreaks of respiratory viral infections, in particular, Influenza virus, occur in winter season .These community outbreaks are associated with an increased risk of nosocomial transmission, thus putting at risk immuncompromised patients and older with lung and cardiac disease, who are susceptible to severe complications with comorbid conditions.

Respiratory illness mostly caused by respiratory viruses (influenza H1N1), and they may also be caused by bacterial agents such as Streptococcus pneumoniae, staphylococcus aureus, H. influenzae, chlamydia pneumoniae and legionella species[2,3].

Mortality is directly associated with seasonal outbreaks specially elderly patients in winter. Extreme heat in summer and influenza infection in winter have direct effect on circulatory system. Rate of pneumonia as high as 42% have been reported in outbreaks due to influenza virus.[4,5]

Thus understanding the nature of clinical and epidemiological features of seasonal outbreaks in tertiary care centre is essential. Although many outbreaks have been described, and reports from several cohort studies of respiratory tract infections in long term care facilities exist.[6]

As part of a study to define risk factors for lower respiratory tract infection[7], we conducted active prospective surveillance for seasonal outbreak of respiratory infections in Mahatma Gandhi over 6 months for detection of various risk factors and pathogens.

In seasonal outbreaks various presentation of chest radiography with multiple pathogen in which influenza (H1N1) demonstrated more extensive involvement presentation than other respiratory pathogen. Influenza was more likely bilateral involvement and peripheral in distribution of lung involvement.

We measure arterial oxygen saturation (SaO2) of patients with the help of pulse oximetry which has a continous monitoring and management technique in severly infected hospitalized patients. We can predict the result of SaO2 monitoring on emergency hospitalized patients.

As soon as detection of respiratory pathogen and seasonal outbreaks allows the implementaion of measures to interrupt transmission and initiate control measures.

MATERIAL AND METHODS

This prospective observational study was carried out on patients of Department of General Medicine at Mahatma Gandhi Hospital combined with Dr. S. N. Medical College Jodhpur Rajasthan from September 2019 to February 2020. Patients in the age group of 20 to 80 years were included.

Prospective identification of outbreaks we used definitions of infection that had been reached by consensus.[14]

Upper respiratory tract infection was defined by the presence of at least

Inclusion Criteria:

These results were obtained mainly from admitted patients under general medical ward and special ICU care setting in Mahatma Gandhi Hospital Jodhpur. There were 73 patients analysed with an overall positivity (sputum culture, nasopharyngeal swabs, isolation). upper respiratory tract infection was defined by the presence of at least 2 of the following signs or symptoms: runny nose or sneezing; sore throat; difficulty swallowing; dry cough; and Lower respiratory tract infection was defined by the presence of at least 3 of the following; new or increased cough; new or increased sputum production; fever (temperature>38%) pleuritic chest pain ;and one of the following ;new or increased shortness of breath, a respiratory rate of more than 25 breaths/min, or worsening mental or functional status.

Exclusion Criteria:

Those patient who were admitted with chronic illness.

Tools:

The collection, transportation, culture and identification of the viral specimens were carried out with standard protocol[15].Nasopharyngeal swabs were obtained from a sample of symptomatic residents for the direct detection of respiratory viral antigens means of immunofluorescence microscopy and for isolation of respiratory viruses (influenza

virus). An attempt was made to obtain sputum sample for culture from symptomatic residents.

Statistical evaluation:
Data collected was entered into MS Excel spread sheet and summarized according to type of variables. Nominal / Categorical variables were summarized as frequency and percentage and were analyzed using Chi-square test / Fischer Exact test as applicable. All statistical analysis was done using Epi info version 7.2.1.0 statistical software and Open Epi version 3 software. p value < 0.05 was taken as statistically significant.

OBSERVATIONS AND RESULTS
In our study, Out of 73 patients, 46 (63.01%) were males and 27
Table no 1- showed the clinical findings.

(36.98%) were females. Males experienced acute respiratory tract infections 1.73 times more often than females. Maximum no of patients 38 (52.05%) were in the age group of 20-40 years followed by the 41-60 years middle age group ranked 2nd (p= 0.748). According to geographic distribution, 47 (64.38%) were from rural and 26 (36.51%) were from urban background (p=0.197).

Clinical presentation in our study shortness of breathing (SOB), cough, fever, coryza, sore throat, sneezing, difficulty in swallowing and altered sensorium were most common symptoms: 60 infected patients had cough, 55 had fever, 42 had shortness of breath, 32 patients had coryza and 13 had sore throat, sneezing and difficulty in swallowing & 3 patients had altered sensorium.

Age Group	SOB	Cough	Fever	Coryza	Sore throat	Sneezing	Diff. in Swallowing	Altered Sensorium	Wheeze	Crepitation	Rhonchi	Normal	Total
20–40	20	29	27	17	9	9	9	2	11	15	4	8	38
41–60	12	18	16	10	2	2	2	1	7	8	1	3	20
61–80	10	13	12	5	2	2	2	0	7	6	1	1	15
Total	42	60	55	32	13	13	13	3	25	29	6	12	73

In table 1 main finding in lungs were crepitation and wheezing. 29 patients had crepitation and 25 had wheezing. Clinical finding were nonspecific and could not be used to distinguish between causal agents.

Table no 2 – showed lobe involvement

Age Group	Single lobe involvement	>1 lobe but single side	>1 lobe but both side	Normal
20–40	9	7	11	11
41–60	2	3	12	3
61–80	5	0	8	2
Total	16 (21.91%)	10 (13.69%)	31 (42.46%)	16 (21.91%)

Table no 2 showed chest radiographical presentation that maximum no of patients 31 (42.46%) presented more than 1 lobe both sides,16 patients had single lobe ,10 patients had more than 1 lobe but single side and 16 patients had normal chest x ray finding. In seasonal outbreaks most common chest x ray presentation was bilateral involvement of lung and peripheral lung involvement was also seen (p= 0.115).

Table no 3- showed O2 saturation among the patients

Age Group	O_2sat.<90	O_2sat.=91-95	O_2sat.>95	Total
20–40	25 (53.19%)	6 (54.54%)	7 (46.66%)	38
41–60	12 (25.53%)	3 (27.27%)	5 (33.33%)	20
61–80	10 (21.27%)	2 (18.18%)	3 (20.00%)	15
Total	47 (64.38%)	11 (15.06%)	15 (20.54%)	73

Table no 3 showed that maximum no patients 47 (64.38%) presented with O2 saturation below 90 and 15 (20.54%) patients had saturation above 95 percent (p =0.982).

Table no 4- showed the source of infection & comorbid conditions among the patients

Age Group	C/A	N/M	IHD	DM	HTN	K–Chest	COPD	B. Asthma	Acute pharyngitis
20–40	16	9	0	0	0	3	0	5	4
41–60	14	0	3	4	3	0	2	0	0
61–80	5	1	1	2	2	0	7	1	0
Total	35	10	4	6	5	3	9	6	4

Table no 4 showed that 35 patients had community acquired source of infection included maximum no of patients 35 had community acquired (C/A),10 patients had Nosocomial (N/M), 9 patients had chronic obstructive lung disease and other patients had Ischemic heart disease, diabetic mellitus, hypertension, pulmonary tuberculosis, bronchial asthma.

Of the 73 patients with acute respiratory tract infection, 60 (82%) had laboratory confirmed evidence of infection. H1N1 constituted 17 (23.28%) largest proportion of the viral pathogen detected chiefly by immunofluorescence on nasopharyngeal aspirates obtained mainly from (41-60) middle age group and young age (20-40) group with diagnosis of lower respiratory tract infection. In contrast, Streptococcus pneumonia 10 (13.69%), Staphylococcus aureus 4

(05.47%), Legionella pneumonia 6 (08.21%) cases were detected by sputum culture. These pathogen were distributed among different age groups. Pseudomonas aeruginosa 5 (06.84%), klebsiella pneumoniae 6 (08.21%) and Acinetobacter species 2 (02.73%) cases were found mainly in elderly age group (61-80) those associated with chronic obstructive lung disease as comorbid condition. H. influenzae 3 (04.01%) and Moraxella catarrhalis 1 (01.36%) were found in young age group (20-40) with bronchial asthma as comorbid condition. Mycobacterium tuberculosis 3 (04.10%) found in old case of tuberculosis in community. Mycoplasma pneumoniae 2 (02.73%) and Chlamydia pneumoniae 1 (01.36%) were detected sporadically, in small numbers and in different age groups. This table show statistical significant (p =0.03).

Table no 5- showed Respiratory pathogens among the patients

Age Group	Streptococcus Pneumoniae	Staphylococcus Aureus	Pseudomonas Aeruginosa	Klebseilla Pneumoniae	Acinetobactor Baumanni	Mycoplasma Pneumoniae	Legionella Pneumophila	Haemophilus Influenzae	Mycobactriium tuberculosis	Chlamydia Pneumoniae	Moraxella catarrhalis	H1N1	Normal C/M Saline Grow
20–40	6	1	0	4	1	2	4	3	2	1	1	7	6
41–60	4	2	0	0	0	0	1	0	1	0	0	8	3
61–80	0	1	5	2	1	0	1	0	0	0	0	2	4
Total	10 (13.69%)	4 (5.47%)	5 (6.84%)	6 (8.21%)	2 (2.73%)	2 (2.73%)	6 (8.21%)	3(4.10%)	3(4.10%)	1 (1.36%)	1(1.36%)	17(23.28%)	13 (17.8%)

DISCUSSION AND INTERPRETATION

Acute respiratory tract infection are continuously increased throughout the world and most common reason of mortality and morbidity of all age groups. Influenza virus (H1N1) are leading mortality pathogen in seasonal outbreaks, other non viral agents are also involved but in least number. Now a days various diagnostic technique available to easy to detect direct specific therapeutic agents at the causative pathogen.[8]

In the presenting study male were infected with ARTI 1.73 times more than female (46 male and 27 female). A survey was carried out by handerson FW et.al[10] in university of North Carolina School of medicine chapel hill, N.C. observed male experienced ARTI 1.25 times more often than did female. The result of the above study are similar to that of present study. A Cohort study was conducted by Nukiwa-Souma N, Burmaa A et al[11] in Baganuur district, Ulaanbaatar city, which observed respiratory tract infection were equal in male and female so this study dissimilar with our present study.

In our study maximum number of patients were in young age group (20-40 years) belong from rural background. A cohort study was carried out by Nukiwa-Souma N, Burmaa A et al[11] is either study observed respiratory tract infection transmission is more common in rural background. This finding is similar to our study and clearly show about area of respiratory tract infection transmission.

Clinical presentation in our study were nonspecific and could not be used to identify agents. A survey were carried out by Loeb M, McGeer Allison et al.[12] clinical finding were nonspecific and could not be used to distinguish between casual agents. Another study was conducted by Chew FT, Doraisingham S et al[9] in two large general hospitals in Singapore observed finding are in related with previous reports compared to disease due to different pathogen in tertiary care centre. The result of above different study are similar to that present study. The causative agent of respiratory illness could not found according to sign and symptom. The early use of appropriate laboratory investigation is essential for identification of respiratory pathogen. This is useful for early detection of respiratory pathogen for prompt starting of antibiotic and antiviral agents. Empirical treatment are also be given for seasonal outbreaks depending upon nature of pathogenesis

In our study maximum patients of chest X ray finding were bilateral lung involvement. These patients are mainly from young age group (20-40), Influenza (H1N1) being the virus infected. A similar study finding were reported by Nicolini A, Ferrera L et at.[13] Bilateral involvement and peripheral region of lungs were the predominant radiological findings of influenza A (H1N1) virus infected patients. A Study conducted by Henzler T, Meyar M et al [14] found similar results in ICU care patients. A Retrospective survey done by Aviram G, Bar-shai A et al [15] also should similar result. The observation that bilateral lung opacities in chest radiography may help in predict clinical outcome in patients in seasonal outbreaks.

In present study maximum patients 46 (68.38%) were presented with below 90% arterial oxygen saturation by pulse oximetry. A prospective uncontrolled clinical trial was conducted by Jones J, Heiselman D, et al[16] in Akron General Medical Center, North-eastern Ohio Universities College of Medicine, Akron, Ohio, USA, has similar results with our study. On the basis of different studies become pulse oximetry has important technique for close monitoring and management of critically ill hospitalized patients.

In our study out of 73 patients with acute respiratory tract infection 60 (82%) had laboratory confirmed evidence of infection. Most common pathogen in our study were influenza (H1N1) virus that constitute 23.28% in seasonal outbreaks. Influenza viral pathogen detected chiefly by immunofluorescence on nasopharyngeal swab in young and middle age group. In seasonal outbreaks most susceptible population from young and middle age group. In contrast,Streptococcus pneumoniae 13.69%,Stapyhlococcus aureus 5.47%, Legionella pneumoniae 8.21% ,Mycoplasma pneumoniae 2.73% and Chlamydia pneumoniae 1.36% were detected by sputum culture. These pathogen were distributed among different age groups. Pseudomonas pneumoniae 6.84%, Klebseilla pneumoniae 8.21% and Acinetobacter species 2.73% cases were found mainly in elderly age group ,those associate with chronic obstructive lung

disease comorbid condition. Haemophilus influenzae 4.01% and Moraxella catarrhalis 1.36% were found in young age group with bronchial asthma as comorbid condition. Mycobacterium tuberculosis 4.10% were found in case of pulmonary tuberculosis.

A survey done by Loeb M, McGeer A et[12] al in 5 nursing homes in metropolitan Toronto, multiple pathogen detected were 38% cases of influenza virus, parainfluenzae virus, respiratory syncytial virus, legionella sainthelensi and chlamydia species which were dissimilar with present study. Groenewegen KH, Wouters EF et al[17] study done of respiratory bacterial infection in hospitalized patients, admitted with an acute exacerbation of COPD were found Haemophilus influenzae (45%), Streptococcus pneumoniae (27%), and Pseudomonas aeruginosa (15%) results are dissimilar with present study.

A Study done by Linsh, Kuoph, Hsueh PRet al[18]at National Taiwan University Hospital from January 2000 to June 2004 observed Klebsiella pneumoniae (16.8%) and P. aeruginosa (19.6%) were the most common sputum pathogens in hospitalized patients with AECOPD in Taiwan similar with our study. A similar study was done by Li XJ, Li Q, Si LY, Yuan QY et al [19] they retrospective studied of 586 AECOPD patients and 345 community-acquired-pneumonia patients P.aeruginosa, Klebseilla pneumoniae, Acinetobacter baumannii and Staphylococcus aureus and H. influenzae in AECOPD patients and Streptococcus pneumoniae, H.influenzae, K. pneumoniae, Staphylococcus aureus in community-acquired-pneumonia were the culprit organisms in their study. The result of the above different study are similar to that of present study. Pseudomonas aeruginosa, Klebseilla pneumoniae and Acinetobacter baumanni are most common pathogen in AECOPD patients and Streptococcus pneumoniae, Staphylococcus aureus in our community, an alarming observation.

CONCLUSION

surveillance in tertiary care centre over 6 month ,identified multiple respiratory pathogen in one seasonal outbreak .The importance of adequate surveillance for outbreak of respiratory tract infection given emphasize early determination of the cause so that an intervention ,such as the use of antiviral and antibacterial is started and measure to curb such infection are taken rapidly. Pulse oximetry has important technique for close monitoring and management of critical ill patients. The clinical features were nonspecific and could not be used for identification of the causative agents.

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