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Sociodemographic, Clinical Characteristics, and Outcomes of Influenza Pneumonia Patients Admitted in a Tertiary Care Hospital in Karachi, Pakistan: Findings from a Cross-sectional Study

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ABSTRACT

Objective: To determine the sociodemographic, clinical characteristics, and outcomes of influenza pneumonia patients in tertiary care hospital, Karachi Pakistan.

Study Design: A cross-sectional study.

Place and Duration of Study: The Aga Khan University Hospital Karachi Pakistan from January 2013 to December 2018.

Methodology: All adult patients who were older than 18 years and suspected to have viral pneumonia were included in the study. Data were abstracted on 105 patients and were entered on preformed proforma after reviewing the files of patients.

Results: Ninety-four (89.5%) patients were influenza positive and 15.2% (n=16) had been vaccinated. Around 92.4% (n=97), 81.9% (n=86) and 61.9% (n=65) patients had cough, fever and shortness of breath, respectively; and 63.8% (n=67), 16.2% (n=17), and 2.9% (n=3) patients had consolidation, nodules, and cavitation, respectively. Almost 91.4% (n=96) patients were given treatment and discharged home; however, 7.6% (n=8) died. Procalcitonin, creatinine, HCO_3, lactate, and bilirubin level were increased in 2nd group (mortality group) after 48 hours; however, the results were only significant for HCO_3 ($p = 0.035$).

Conclusion: Influenza pneumonia is very common in our population and older people are more likely to be affected by this disease. Patients can be prevented from adverse outcomes and complications, if diagnosed and treated in time.

Key Words: *Influenza, Clinical characteristics, Outcome, Patients.*

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INTRODUCTION

Community-acquired pneumonia (CAP) is a significant worldwide health problem.[1] Viral pathogens such as influenza and rhinovirus have been implicated as causes in an estimated one-third of CAP cases.[2,3] Globally, pneumonia is the most common infectious cause of death, the fourth most common cause of death overall, and the second leading cause of life years lost.[4] There are globally 3.5 million deaths from community-acquired pneumonia annually.[5] The influenza pandemic in 2009 had a strong effect on clinical practice, and was the leading complication of influenza virus infection.[6]

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Among viral pneumonia, influenza pneumonia is the most common, both in adults and paediatric age groups.[7,8] Superadded bacterial pneumonia on the background of influenza pneumonia has been an established phenomenon and is associated with worse outcomes.[9]

There has been a substantial rise in the incidence of influenza pneumonia during the winter season in Pakistan.[10] The high population density, proximity to animal reservoirs, and lack of awareness and access to influenza immunisation, has put our population to a substantial risk of influenza pneumonia. There has been no study done in Pakistan to delineate the clinical course of influenza pneumonia in our population. Studies done in other low to middle-income countries have demonstrated a varied demographic pattern and mortality as compared to high-income countries.[4] Hence, this study will determine in detail the pattern of disease (influenza pneumonia), its hospital course and mortality.

The objective of this study was to determine the clinical characteristics including symptoms, laboratory findings, chest imaging,

and mortality in influenza pneumonia patients admitted at a tertiary care hospital in Karachi.

METHODOLOGY

A cross-sectional study was conducted in the inpatient setting of the Aga Khan University Hospital, Karachi, Pakistan by using inpatient data from January 2013 to December 2018.

All patients' medical records were identified through searching the medical records with diagnosis of suspected influenza pneumonia, using consecutive sampling technique. All adult patients', who were older than 18 years, suspected to have viral pneumonia on presentation, and underwent influenza PCR testing after admission to confirm the status of infection, were included. Patients who developed hospital-acquired pneumonia, defined as lung infiltrates and symptoms of pneumonia after 48 hours of admission, had lung infiltrates clinically consistent with cardiogenic pulmonary edema, and improved after diuretics therapy, were excluded from the study.

Pneumonia was defined as any patient having a new infiltrate on the chest X-Ray with any one of the following characteristics: body temperature ≥38° Celsius, cough, WBC count ≥11000/dL or <4000/dL, and need for supplemental oxygen; which must be of less than two weeks' duration. Patients with clinical features of pneumonia, whose nasopharyngeal or sputum samples for H1N1 PCR were sent within 24 hours of ER presentation, were classified as having presumed pneumonia. If PCR results were positive in nasopharyngeal or sputum samples, then those cases were classified as confirmed influenza pneumonia.

Data were extracted on 105 patients and were entered on preformed proforma after reviewing the files. No patient identifiers were recorded to protect patients' privacy. Data were collected on patients' demographics such as age and gender, patients' history of comorbid such as the presence of diabetes mellitus, asthma, malignancy, tuberculosis, HIV and any other comorbidity. Data were collected on patients' symptoms along with symptom's duration, X-ray findings, influenza vaccination status, clinical laboratory investigations at the time of admission and 48 hours after admission, to ascertain the progress of the patients. Complications were noted, such as cardiomyopathy, pneumothorax, acute kidney injury, and any other hospital-acquired infections; and outcome of the patient whether the patient was discharged or died.

Frequencies and proportions were calculate to describe the characteristics of the study population for the categorical variables such as gender, presence of diabetes or asthma, *etc*. Histograms superimposed with normal curves to check the normality of continuous variables were used. Mean and standard deviations were determined for normally distributed continuous variables (age); otherwise, median and interquartile (IQR) were determined, if data was skewed. Level of significance or alpha was kept as 5% for this study. A new parameter was calculated and labelled as difference in labortary parameter by subtratcting value of labortary parameters at the time of admission and after 48 hours of admission. This was followed by assessing the association between difference in the laboratory parameter and clinical outcome, *i.e.* discharge and death. Mann-Whitney U-test was used to compare differences in the laboratory parameter and clinical outcome and p-value of less than 0.05 was used a cut-off for significant results. SPSS version 23.0 was used to analyse the data. This study was reviewed and approved by the Ethics Review Committees of the Aga Khan University.

RESULTS

A total of 105 patients met inclusion criteria, who were initially admitted as suspected influenza patients. Around 89.5% (n=94) of all suspected cases were later confirmed to have influenza pneumonia. The mean age of the patients admitted to the hospital was 54.20±18.54 years. The most common comorbidity was diabetes, which was found in 40.0% (n=42) patients, while 16.2% (n=17) had asthma, 12.4% (n=13) had COPD, and 8.6% had chronic kidney disease (n=9, Table I).

Table I: Sociodemographic and clinical characteristics of patients presenting in a tertiary care hospital in Karachi (n=105).

Age (years) Mean (SD)	54.20 (18.54)
Age of patient (years): ≤50 years >50 years	 36 (34.3) 69 (65.7)
Gender: Males Females	 39 (37.1) 66(62.9)
Diabetes mellitus: Yes No	 42 (40.0) 63(60.0)
HIV: Yes No	 1 (1.0) 104 (99.0)
Malignancy: Yes No	 1 (1.0) 104 (99.0)
Asthma: Yes No	 17 (16.2) 88 (83.8)
COPD: Yes No	 13 (12.4) 92 (87.6)
Interstitial lung disease: Yes No	 3 (2.9) 102 (97.1)
Transplant history: Yes No	 1 (1.0) 104 (99.0)
Chronic kidney disease: Yes No	 9 (8.6) 96 (91.4)
Tuberculosis: Yes No	 1 (1.0) 104 (99.0)
Influenza vaccination: Yes No	 16 (15.2) 89 (84.8)

Table II: Clinical profile of patients presenting in a tertiary care hospital in Karachi (n=105).

Clinical parameters	Median (IQR)
Leucocyte counts	11.0 (7.3 – 18.0)
Neutrophils	80.0 (70.0 – 88.0)
Lymphocytes	11.0 (8.0 – 16.2)
Hemoglobin	12.3 (11.0 – 13.5)
C-Reactive protein	3.1 (2.0 – 12.4)
Sodium	134.0 (129.0 – 137.0)
Potassium	3.7 (3.2 - 4.1)
Chloride	99.0 (94.0 -105.0)
Bicarbonate	22.0 (16.2 – 25.8)
Bilirubin levels	2.0 (1.1 – 2.0)
Partial pressure of O_2	62.0 (2.0– 79.0)
Partial pressure of CO_2	25.0 (2.0 – 36.0)

Table III: Laboratory parameters of patients on admission and after 48 hours of admission between two groups (n=105).

Laboratory parameter	Discharge	Death	p-value
Leukocyte difference	2 (-0.6 – 7.1)	3.2 (0.2 – 11.4)	0.539
Neutrophil difference	10 (-1 – 66.2)	-0.9 (-9.6 – 77.9)	0.700
Lymphocyte difference	5 (-3.3 – 10)	6.7 (2.7 – 11.4)	0.208
CRP difference	0 (0 – 5.3)	0 (0 - 9.9)	0.947
Procalcitonin difference	0 (-1.2 – 0)	-0.05 (-1.9 – 0.12)	0.249
Creatinine	0 (-0.7 – 0.3)	-0.1 (-1.6 – 0.9)	0.631
Sodium	-1 (-7 – 130)	-5 (-14 – 0)	0.131
HCO3 difference	0.2 (-3 – 16)	-2.8 (-11.8 – 0.2)	0.035
Bilirubin	0 (0 – 0)	-0.5 (-1.6 – 0.9)	0.258
Lactate	0 (0 - 0.5)	0.2 (-2.7 – 1.7)	0.994
FiO_2	0 (0 – 27)	0 (0 – 37.5)	0.762
ALT	0 (0 – 20)	25 (-14 – 143.5)	0.186
pH	0 (0 – 5.4)	0.03 (-0.1 – 0.2)	0.768

Ninety-seven (92.4%) patients had cough with a mean duration of around 4.23 ± 2.48 days. Similarly, 81.9 % (n=86) patients had fever with a median duration of around 3.89 ± 2.4 days. Around two-thirds of the patients (61.9%, n=65) had shortness of breath with a median duration of 3.0 days. With respect to the chest X-ray findings, it was found that 63.8% (n=67) patients had consolidation, 16.2% (n=17) had nodules, 7.6% (n=8) had ground-glass opacity, and 14.3% (n=15) had pleural effusion. None of the influenza positive patients had any cavitation on chest X-ray.

Table II shows the clinical profile of patients presenting to a tertiary care hospital in Karachi. The data found that median hemoglobin was 12.3 g/l (11.0 – 13.5), median C-reactive protein was 3.1 mg/dl (2.0 – 12.4), median sodium 134.0 mol/l (129.0 – 137.0), median potassium 3.7 (3.2 - 4.1) mmol/l, median bicarbonate 22.0 mmol/l (16.2 – 25.8), mean WBC 12.8 ± 7.4, and median bilirubin levels 2.0 mg/dl (1.1 – 2.0).

Out of influenza-positive patients, 45.7% (n=43) needed non-invasive ventilation BiPAP and 19 (22% of all positive cases) of them needed ICU admission for invasive ventilation. Among 16% (n=15) resuscitation code was changed from full to DNR due to comorbid and worsening conditions. However, around 13.3% (n=14) of the patients developed hemoptysis, 25.7% (n=27) had non ST-segment elevation myocardial infarction, 11.4% (n=12) developed cardiomyopathy, 39.4% (n=37) developed acute kidney injury. A very small proportion of patients captured nosocomial infections by methicillin-resistant staphylococcus or carbapenem-resistant enterobacteriaceae and median length of stay was 3 days. Only 14 out of 94 influenza--positive patients had received influenza vaccination. Only 1 out of 14 (7%), while 80 patients did not receive the vaccine, 8 out of this group expired (10%).

Laboratory parameters were compared of the patient on admission and after 48 hours of admission were between two groups *i.e.* one group who was discharged (survival group) and one group of patients who unfortunately could not survive in hospital (mortality group). Overall, procalcitonin, creatinine, HCO_3, lactate and bilirubin level increased in 2nd group (mortality group) after 48 hours, however, the results were only significant for HCO_3 with p value 0.035 (Table III).

DISCUSSION

This study found that around 89.5% patients admitted in the hospital were diagnosed positive for influenza pneumonia and most of those patients were older males and diabetic. Patients older than 50 years were more likely to have influenza when compared to their counterparts. In addition, it was also found that less than a quarter of patients had been vaccinated for influenza vaccine. This study also revealed that most of the patients presented with cough, fever, and shortness of breath; however, very few had chest pain of shorter duration. The majority of the patients were found to have consolidation on the chest X-ray and very few had nodules or capitations. Almost all patients were discharged home after being treated in the hospital with 8% of mortality in influenza-positive patients.

This study findings are comparable with many studies conducted in São Paulo, which found that most of the patients had nodules, ground-glass opacities and pleural effusion on the chest X-ray.[11] The same study also found that the most common symptoms among patients were cough, fever, and shortness of breath, which are consistent with our study findings.[11]

Our study findings differ with few studies that found a longer length of stay and more adverse outcomes, such as mortality among those who had pneumonia.[12,13] These differences could be due to the severity of the condition. Patients in our study were admitted in the ward with less severe symptoms when compared to other studies where patients were admitted in the ICU with more severe symptoms, thus contradicting this study findings.[14,15]

This study has some potential caveats that need to be addressed in the future. One of the main potential limitations of the study is the design, which was a cross-sectional study and the authors could not determine the temporal precedence between various factors and outcomes. The sample size was only 105, which was not sufficient to adequately power our study for exploring the clinical and sociodemographic determinants. Lastly, this study was not a follow-up study; therefore, we do not know about the outcomes of the patients after being discharged from the hospital.

CONCLUSION

Influenza pneumonia is very common in our population and older people are more likely to be affected by this disease. This study demonstrated that patients can be saved from adverse

outcomes and complications, if diagnosed and treated promptly. However, the authors recommend undertaking longitudinal primary epidemiological studies to determine the long term outcomes among these patients, and to explore their sociodemographic and clinical characteristics with the adequately powered study.

ETHICAL APPROVAL:
This study was reviewed and approved by the Ethics Review Committees of the Aga Khan University.

PATIENTS' CONSENT:
Not applicable.

CONFLICT OF INTEREST:
The authors declared no conflict of interest.

AUHTORS' CONTRIBUTION:
SAA: Analysed the data and provided feedback for all parts of the manuscript, edited the manuscript and provided approval for publication.
FR: Involved in the intial protocol development, data analysis, manuscript writing and approval of the final draft.
MAA: Developed intail protocol, helped in data collection and analysis, contributed in manuscript writing, and reviwed and approved the final draft.
KA: Helped in intail protocol development, data analysis, reviwed and edited the final manuscript and approved it for submission.
MJA: Did data collection and analysis, reviwed the final manuscript and approved the final draft.
TA: Involved in the data collection and analysis, reviwed the final manuscript and approved the final draft for submission.

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