Case Series

Heart failure among patients admitted with Influenza. The influenza subtypes, seasonality and mortality: A case series

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Abstract

Respiratory infections like influenza infections have been found to increase the risk of coronary artery disease and precipitate cardiac failure. However, Indian data is lacking. A retrospective observational study was done to describe patients with influenza infection who had concomitant heart failure (HF) requiring admission over 5 years (January 2013-December 2017). A total of 93 influenza cases were hospitalised during this time, of which 14 (15%) also had features of HF. Among them, the types of influenza infection were AH1N1 (6,43%), BH1N1 (4,29%), AH3N2 (3,21%) with one patient having both strains. Two-thirds of the HF were new onset (10, 71%), whereas rest were due to acute worsening of pre-existing HF (4, 29%). Ten (64.3%) of the patients had HF with reduced ejection fraction (HFrEF). The average hospital stay was 10 days with 2 (14%) deaths. The peak of influenza in August and September preceded the peak admission for HF. A total of 15% of influenza admissions have concomitant HF. They are predominantly due to influenza A H1N1 (43%), influenza A H3N2 (21%) and influenza B (29%). Only 7% had preceding influenza vaccination. Influenza during August and September appears to precede the peak of HF admissions which happen in October and November. Overall mortality was 14%

Keywords: Heart failure, influenza,vaccination

Introduction

An estimated 26 million patients worldwide have heart failure (HF).[1] Precipitants of HF are cardiac as well as non-cardiac; among the latter 10% could be due to pulmonary infections.[2] Among influenza hospitalizations in the United States, a study found that 20% had concomitant HF.[3]

Our objective was to evaluate in-patients with influenza who had concomitant HF. We also evaluated the type of influenza, seasonal trends as well as overall mortality.

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Material and Methods

This is a case series of adult influenza patients admitted in a tertiary care medical college in South India between 2013 and 2017. Among these subjects we describe those who had HF that had newly developed or had worsened when they were admitted for an influenza infection.

Influenza was diagnosed if a patient had presented with fever and upper respiratory complaints with a nose or throat swab being positive for influenza by PCR. HF was diagnosed based on the clinical and laboratory features by a senior treating physician.

The study was cleared by the Institutional Review Board (IRB no: 11457)

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The data were taken from the electronic medical records onto a study specific CRF. Statistical analysis was done using SPSS software, version 17. Continuous variables were presented as means and standard deviation, whereas categorical variables as frequency or percentage.

The sample size was based on all patients (N = 93) diagnosed with influenza during the study duration. As the study data collection was retrospective we had some missing information. We did not impute any data for these. We also graphically represented a time line of cases of HF, influenza as well as those with both together.

Results

Between 2013 and 2017 there were 7839 patients admitted in our medical unit. Among these, 93 (1.25%) had influenza infection. A total of 14 (15%) of these 93 had a concomitant diagnosis of HF. [Figure 1-STROBE figure]

10 (71%) patients had presented new onset HF, whereas 4 (29%) decompensation of pre-existing HF [Table 1]. A total of 9 of the 14 (62.3%) had HF with low ejection fraction, whereas 4 with preserved ejection fraction. Two patients (14.3%) died in hospital.

Most subjects had fever, cough and breathlessness which preceded HF symptoms. Most also had co-morbid diabetes and hypertension. Only 1 (7%) patient had had a previous influenza vaccination.

A total of 43% were due to influenzaA H1N1, whereas the rest H3N2 and influenza B. The peak seasons of influenza were from February to March and from August to September, which preceded the peaks of HF in influenza patients [Figure 2].

Table 1: Baseline characteristics of patients with influenza and heart failure

Variable	All patients, *n*=14 (%)
Age -Mean (SD)	64.4 (13)
≤60 years	6 (43)
Male	10 (71)
Co-morbid illnesses	
Diabetes	12 (86)
Hypertension	9 (64)
Dyslipidemia	6 (43)
Chronic kidney disease	3 (21)
Presenting complaint	
Fever	11 (79)
Cough	13 (93)
Breathlessness	14 (100)
Chest pain	4 (29)
Type of influenza	
A H1N1	6 (43)
A H3N2	3 (21)
Influenza B	4 (29)
Both influenza A and B	1 (7)
Previously immunised	1 (7)
Patients needing ICU stay	6 (43)
Hospital stay (mean days)	10

Discussion

A total of 15% of our Influenza patients had concomitant HF which compares well with US data of 20%.[3] Our mortality of 14% is higher than the 6% in the previous study. Although studies of HF generally have 50% with preserved heart ejection fraction, we had 38%, suggesting that patient with HF with low ejection fraction may be at a higher risk. Influenza A H1NI,[4] H3N2[5] and B[6] have been documented to affect the heart. However, close to 30% each were influenza AH3N2 and influenza B in our study, which is not described earlier. This along with the low vaccine coverage (7%) and the waning antibody titres following vaccination in those with HF suggests a more aggressive vaccination coverage as well as dosage may be required.[7] The seasonality we describe may suggest a possible window to vaccinate subjects before they acquire Influenza.

Patients with influenza who developed HF were similar in their demographics and pre-existing risk factors for HF as compared to other cohorts of HF patients. The mean age (64 yrs) and co-morbid conditions are similar to the Trivandrum HF study.[8] These patients were a decade younger than those with influenza and HF in the west.[6,9] Most patients had diabetes or hypertension, which was similar to the Trivandrum HF registry patients.

The exact mechanism by which influenza causes HF or acute coronary syndrome is not known. Influenza infection may induce acute activation of immune system and inflammation which could accelerate atherogenic processes or even rupture of existing plaques.[10]

The overall societal cost of HF needs to be considered along with the possible benefits and costs of an appropriate influenza vaccination strategy.

This adds to a rising body of evidence which show that infections can precipitate acute coronary events and worsen HF. The exact mechanism is not clear; however, it presents a huge economic and medical challenge to society. It is beyond the scope of this study to determine if vaccinations could prevent this additional burden of HF but it is surely worth exploring this through systematic studies on the same.

Conclusions

A total of 15% of influenza admissions have concomitant HF. They are predominantly due to influenza A H1N1 (43%), influenza A H3N2 (21%) and influenza B(29%). Only 7% had preceding Influenza vaccination. Influenza during August and September appears to precede the peak of HF admissions which happen in October and November. Overall mortality was 14%.

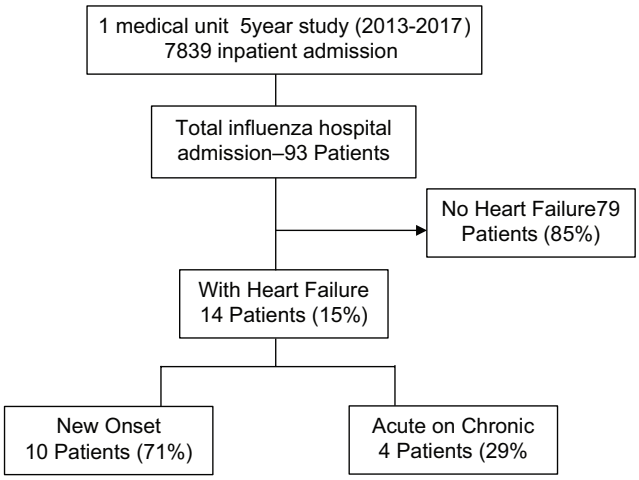

Figure 1: STROBE figure showing patients recruited from medical records data

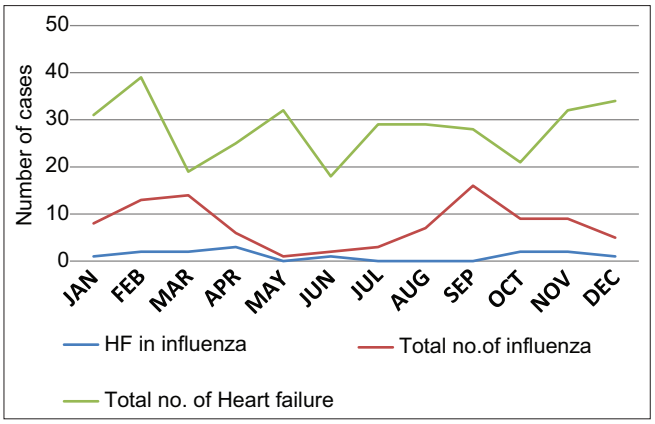

Figure 2: Seasonal distribution of cases of influenza, heart failure and of heart failure in influenza

Key message

1. Patients admitted with influenza virus may have concomitant HF and mortality in this group was 14%.
2. In 7% of these patients vaccination for influenza had been given previously, suggesting a probable role for more aggressive strategy for vaccination.
3. Influenza virus peaks were seen before peaks for admissions for HF.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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