Clinical and radiological profile in patients with H1N1 infection

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Abstract:
Aim: *The purpose of this study is to describe in detail the clinical and radiological features in patients with H1N1 infection.*
Materials and methods: *This study was carried out in CMCH , Coimbatore and 105 patients were included in the study .The study population included patients admitted with symptoms and signs of flu , RT PCR positive for H1N1 , and undergone CT chest imaging. Clinical signs and symptoms at presentation were recorded . CT chest images were analyzed and the radiological findings was described in detail in terms of opacities and distribution .These findings were correlated with disease severity in terms of need for ventilatory support .*
Results: *The predominant symptoms were fever, cough and breathlessness. The disease is most commonly seen in males than females. The study population had comorbidities of which diabetes mellitus and systemic hypertension were the most common. Nearly all patients with comorbidities had abnormal CT chest findings. The most common abnormalities noted were patchy areas of consolidation, ground glass opacities, nodular opacities, pleural effusions. Patients with comorbidities and abnormal CT chest findings required ventilatory support and prolonged hospital stay whereas most of the patients without comorbidities and normal CT chest recovered quickly and did not require ventilatory support.*
Conclusion: *These clinical and radiological features can help patient triage and can predict the severity of illness and outcome earlier as early recognition and initiation of treatment can reduce the morbidity and mortality assosciated with H1N1 infection .*
Keywords: *clinical features , ct chest imaging ,consolidation , ventilatory support*

I. Introduction

To date, influenza A(H1N1)pdm09 viruses have predominated nationally. Since this H1N1 virus emerged in 2009, it has been associated with significant morbidity and mortality. Severe flu outcomes are a somber reminder of how serious flu can be, even for otherwise healthy people. The death toll in the country this year(2018) due to swine flu has soared to 1103 while the number of those affected crossed the 14,000 mark(14992) with Tamilnadu topping the list with 2812 cases. Most patients have only mild illness but H1N1 virus can cause severe illness, including sepsis, pneumonia, and acute respiratory distress syndrome. We postulated that the identification of characteristic CT chest findings obtained at admission, which are related to poor clinical outcome, may contribute to the patient's triage .

II. Objectives

1.To describe in detail the clinical and radiological features of patients with H1N1 infection.
2.To evaluate whether clinical findings and initial CT CHEST findings obtained from influenza A (H1N1) patients can help predict clinical outcome.

III. Materials and Methods

This study was carried out in Coimbatore Medical College and Hospital , Coimbatore during the epidemic period from 01/10/18 to 31/12/18. 105 patients were included in the study . This study was a retrospective descriptive study. The selected patients case sheets were reviewed for demographics, background diseases or conditions (including obesity, diabetes, smoking, asthma, COPD), symptoms, signs ,need for ventilatory support in the form of nasal O2, Positive pressure, mechanical ventilation, and death. The main adverse outcome measures were the need for ventilatory support and death. CT was done on a "Toshiba - Alexion Scanner" model TSX-033A in spiral mode and viewing was done in the mediastinal and lung windows and they were reviewed by two experienced radiologists. Each of them were analyzed and identified as normal or abnormal. The radiological appearances were characterized as ground glass pattern, consolidation, reticular

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opacities or nodular opacities. The distribution was documented as follows: Peripheral ,Central ,Focal, Multifocal, Diffuse .The involved segments were also noted. Presence of pleural effusion was also documented.

INCLUSION CRITERIA	EXCLUSION CRITERIA
More than 12 years of age	Less than 12 years of age
Both sexes	Pregnancy
Signs and symptoms of acute respiratory tract infection	those with a proved additional concurrent acute illness (eg. bacteremia seen at admission)
RT PCR positive for H1N1 infection	presence of a known major immunocompromising condition such as HIV, hematologic malignancy, post organ transplant, active chemotherapy utilization, and/or regular use of steroid of more than 15 mg Prednisolone (or equivalent) daily for more than one month.
Undergone CT chest imaging within 24 hrs of hospital arrival	Radiological studies and/or the sample collection for RT-PCR were delayed for more than 24 h of hospital arrival.

IV. Results and Statistical analysis

Description of quantitative variables such as mean and standard deviation (SD) was done. The Chi square test was used for comparison among various qualitative variables. A significance level of $P < 0.05$ were used in all tests. All statistical procedures were carried out using SPSS version 2.0 for Windows.

4.1 Clinical analysis

Age and sex distribution: Among 105 H1N1 positive patients 54.3% were males and 47.6% were females .Out Of these 20.12 %(31) were of age. 47.6% were in the 20-40 years age group ,31.4% were in the 40-60 years age group, 21% were more than 6o years. Underlying comorbid conditions: Hypertension(28.6%) and Diabetes mellitus(24.8%) were the major co-morbidities followed by asthma(6.7%) , heart disease (6.7%), COPD(3.8%) , thyroid disease(3%) ,psoriasis(3%) , renal disease(2%) ,CVA(2%). Symptomatology and signs in H1N1 positive patients : Our study shows fever and cough as the predominant symptom followed by breathlessness , chills and rigors , sore throat , headache , nausea/vomiting ,hemoptysis and diarrhoea. 28% of patients were anemic , 64% had crepts , 13% had wheeze, 9% had clubbing. Pedal edema is seen in 3% and cyanosis in 3% of patients .

4.2 CT analysis

65.7% had abnormal CT chest findings. The predominant CT findings at presentation of illness were unilateral or more often bilateral multi-focal areas of consolidation, followed by ground glass opacities . Patients who exhibit consolidation on chest CT , who had predominant lower lobe involvement, central and multifocal areas of distribution had a more severe clinical course.

4.3 Ventilatory support and outcome

38.1% required ventilatory support. Patients with older age group and with comorbidities especially hypertension and diabetes mellitus and who is a smoker/alcoholic, with signs of breathlessness , chills/rigors often required ventilatory support compared with others. Patients who exhibit consolidation on chest CT , who had predominant lower lobe involvement, central and multifocal areas of distribution had a more severe clinical course, requiring ventilatory support.

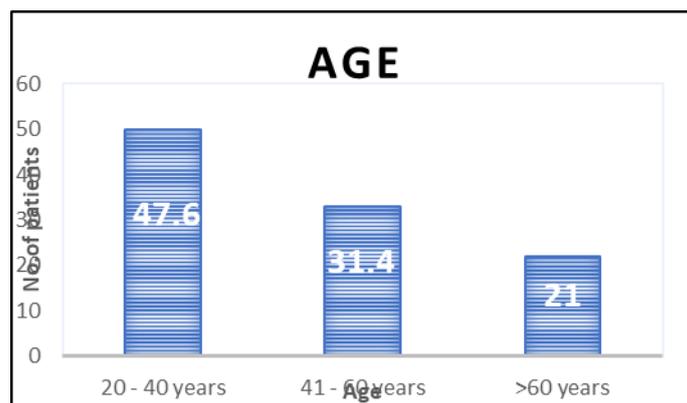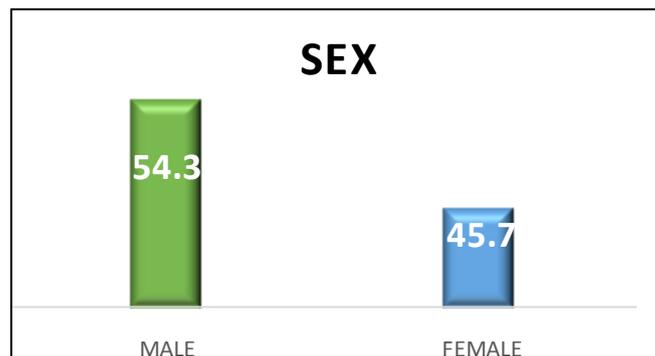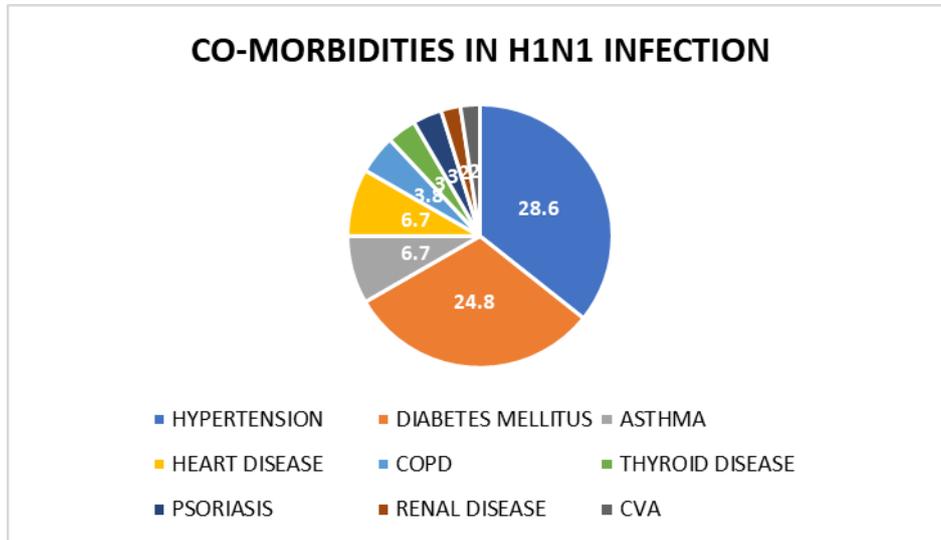## V. Profile of expired H1N1 patients

Twelve deaths among 105 patients. Males(n=8) > females(n=4).Patients who died had fever and breathlessness as major symptoms and hypertension , diabetes mellitus as their major comorbidities. In CT-lower lobe involvement was more common. Ground glass opacities , central and mutifocal areas of distribution were more common in expired patients.
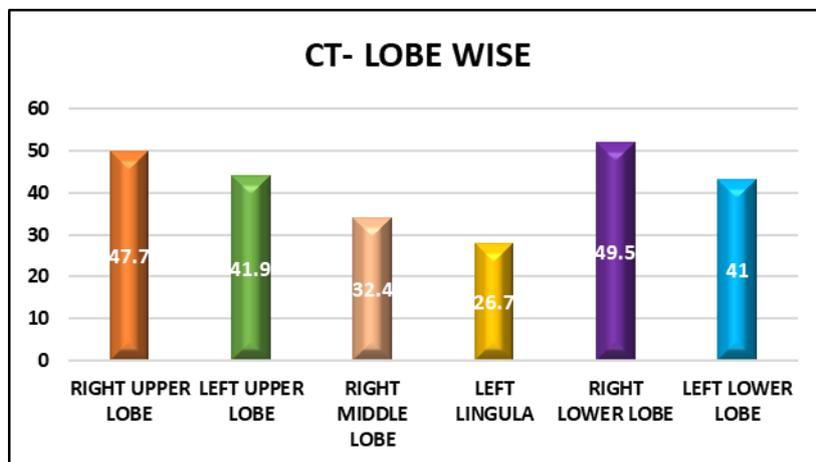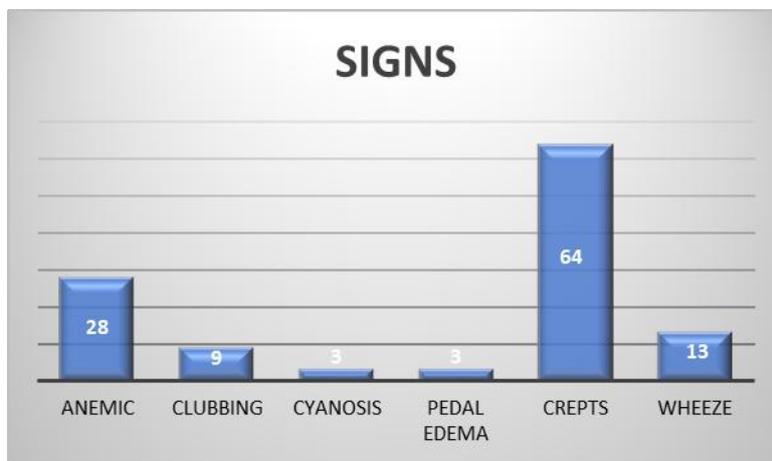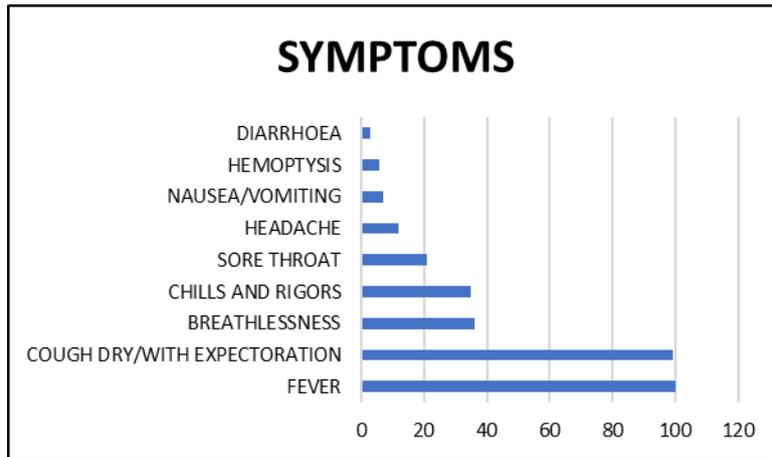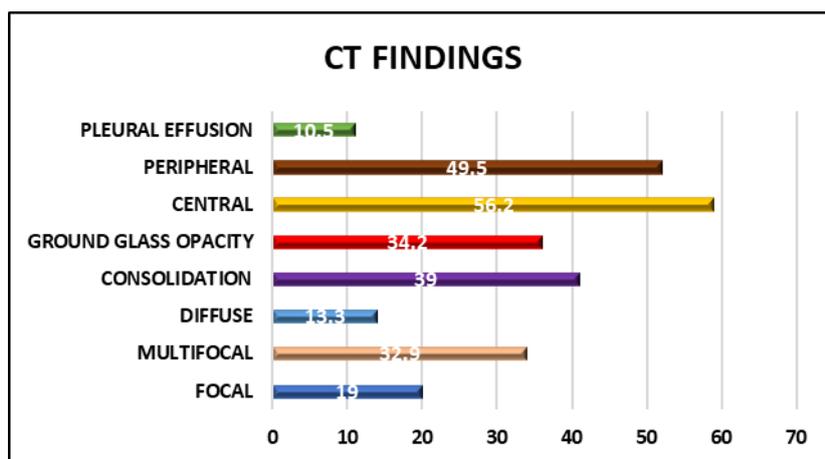
VI. Discussion

Males more commonly affected than females .Predominant age group – 20 to 40 years of age. Major comorbidities – Hypertension and Diabetes mellitus.65.7% had abnormal CT chest findings and they were statistically significant.38.1% required ventilatory support. Patients with older age group and with comorbidities especially hypertension and diabetes mellitus and who is a smoker/alcoholic, with signs of breathlessness ,

chills/rigors , who exhibit consolidation on chest CT , who had predominant lower lobe involvement, central and multifocal areas of distribution had a more severe clinical course often required ventilatory support compared with others .

VII. Figures And Tables

CO-MORBIDITIES IN H1N1 INFECTION

- HYPERTENSION
- DIABETES MELLITUS
- ASTHMA
- HEART DISEASE
- COPD
- THYROID DISEASE
- PSORIASIS
- RENAL DISEASE
- CVA

SEX

AGE

SYMPTOMS

Horizontal bar chart showing symptom frequency (scale 0 to 120):

- DIARRHOEA: ~3
- HEMOPTYSIS: ~5
- NAUSEA/VOMITING: ~7
- HEADACHE: ~12
- SORE THROAT: ~20
- CHILLS AND RIGORS: ~35
- BREATHLESSNESS: ~36
- COUGH DRY/WITH EXPECTORATION: ~100
- FEVER: ~100

SIGNS

Bar chart showing sign frequency:

- ANEMIC: 28
- CLUBBING: 9
- CYANOSIS: 3
- PEDAL EDEMA: 3
- CREPTS: 64
- WHEEZE: 13

CT- LOBE WISE

Bar chart showing CT lobe-wise values (scale 0 to 60):

- RIGHT UPPER LOBE: 47.7
- LEFT UPPER LOBE: 41.9
- RIGHT MIDDLE LOBE: 32.4
- LEFT LINGULA: 26.7
- RIGHT LOWER LOBE: 49.5
- LEFT LOWER LOBE: 41

CT FINDINGS

CHARACTERISTICS	NO VENTILATORY SUPPORT (n=65)	VENTILATORY SUPPORT (n=40)	P VALUE
Age (yrs)	41.4±14.33	52.43±14.14	<0.0001
Male sex	34	23	0.604
Female sex	31	17	0.604
Hypertension	11	19	0.001
Diabetes mellitus	4	22	<0.0001
Asthma	4	3	0.788
Heart disease	3	4	0.283
COPD	2	2	0.617
Thyroid disease	2	1	0.24
Psoriasis	2	1	0.863
Renal disease	0	2	
CVA	0	2	
Smoker	12	15	0.03
Alcoholic	6	16	<0.0001
SYMPTOMS			
Fever	62	38	0.928
Cough dry/with expectoration	61	38	0.43
Breathlessness	4	32	<0.0001
Chills and rigors	5	15	<0.0001
Headache/bodyache	3	9	0.009
Sore throat	11	10	0.315
Nausea/ vomiting	3	1	0.863
Hemoptysis	2	4	0.138
Diarrhoea	1	2	0.301

| CHARACTERISTIC	NO VENTILATORY SUPPORT	VENTILATORY SUPPORT	P VALUE
LUNG ZONES			
Right upper	9	19	<0.0001
Rightmiddle	13	21	<0.0001
Right lower	23	29	<0.0001
Left upper	5	20	<0.0001
Left lingula	9	19	<0.0001
Left lower	16	27	<0.0001
OPACITY			
Ground glass	18	18	0.07
Consolidation	18	23	0.002
DISTRIBUTION			
Central	25	34	<0.0001
Peripheral	21	31	<0.0001
Focal	13	7	<0.0001
Multifocal	15	19	<0.0001
Diffuse	4	10	<0.0001
PLEURAL EFFUSION			
Right	2	4	0.071
Left	1	2	0.071
Bilateral	0	2	
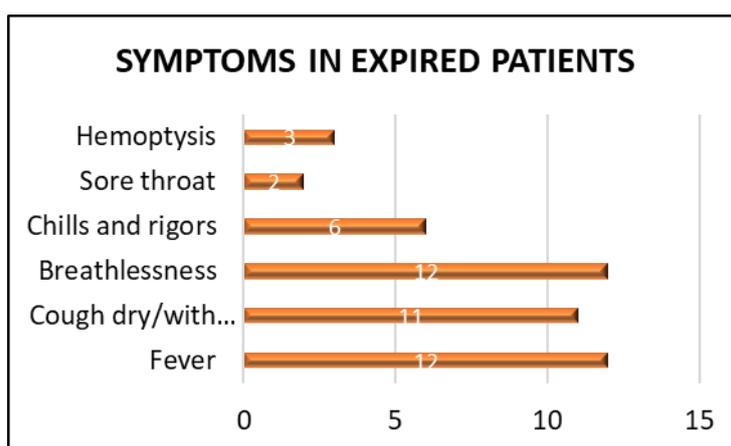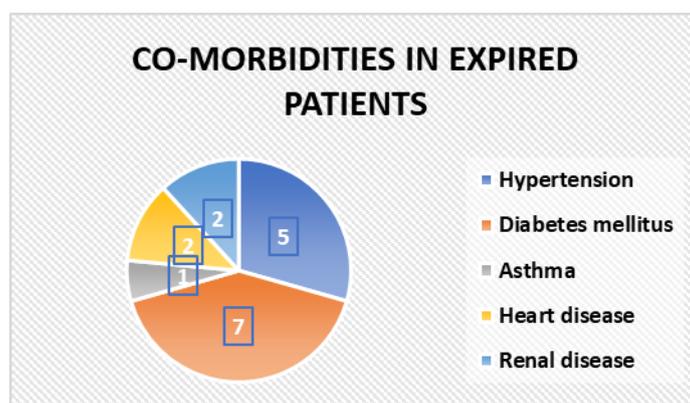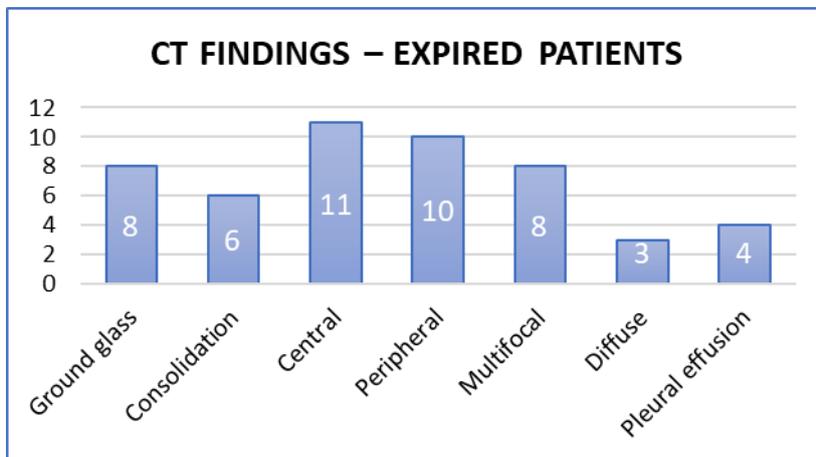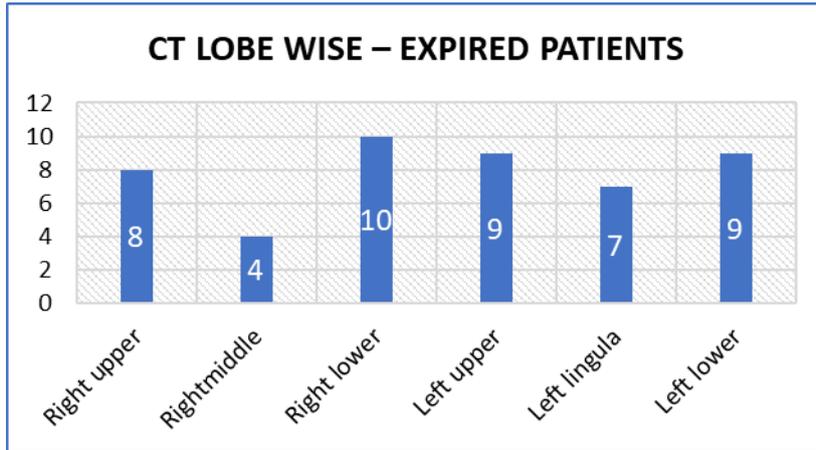
Figure 1 CT chest showing multifocal areas of consolidation

Figure 2 CT chest showing consolidation and ground glass opacities

VIII. Conclusion

A combination of clinical and chest CT indicators may aid in predicting the clinical course and outcome of influenza A H1N1 infection. These clinical and radiological features can help patient triage and can predict the severity of illness and outcome as early recognition and initiation of treatment can reduce the morbidity and mortality associated with H1N1 infection.

Acknowledgements

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