International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Chest Imaging Findings from a Tertiary Teaching Hospital in Andhra Pradesh, India in the Recent Epidemic of H1NI Viral Pneumonia

Dr P Hari Babu[1], Dr N Pramod Philip[2], Dr Anindita Mishra[3]

[1]MBBS, Junior Resident, Department of Radiology. GSL Medical College

[2]MD, Professor

[3]MD, Professor & HOD, Department Of Radio-Diagnosis, GSL Medical College, Rajahmundry, Andhra Pradesh, India

Abstract: ***HRCT findings associated with H1N1 infection are variable, ranges from mild patchy ground glass opacities (with or without crazy paving pattern) up to air space consolidations, alveolar haemorrhage& ARDS. Manifestation of bronchiolitis obliterans was also detected including mucous plugging, mosaic attenuation with air trapping and bronchiectasis.CT picture of H1N1 chest infection is highly variable with a spectrum of findings ranging from focal patchy ground glass attenuation to consolidations, or adult respiratory distress syndrome (ARDS). Still, constellation of clinical data and HRCT findings especially in endemic areas can raise the suspicion of H1N1.***

Keywords: H1N1, CT findings, Chest imaging, Diffuse GGO, subpleural consolidation

1. Introduction

One of the most important causes of acute respiratory infection includes viral infection.Among them influenza virus are common and important pathogens causing several epidemics andunpredictable pandemics, infecting both immunocompetent & immunocompromised.

Influenza virus belongs to family orthomyxoviridae. These are SS-RNA virus. Based on internal membrane nucleoprotein antigens they are subdivided into 3groups.They are influenza ‘A’,B’,C’. Out of which ‘A’,B’, mostly A causes pneumonic influenza.

Based on surface proteinshemagglutinin(H), neuraminidase (N), influenza A is sub divided into multiple subtypes: H1N1, H1N2,H3N1,H3N2,H2N3. H1N1 pandemics occurred in 2009 in about 70countries with 30000 infected cases. This H1N1 is usually referred as Swine flu, which is a highly contagious disease of pigs.These strains undergoes significant antigenic shifts and antigenic drifts causing new epidemics.

Patient presentation ranges from mild flu like symptoms to ARDS, respiratory failure and death. Important symptoms include fever, cough, chills, headache, diarrhoea, fatigue, and vomitings.

Most patients present with mild illness but small percent of patients have severe course that results in respiratory failure,ARDS and death.

Lab findings include lymphopenia, increased serum LDH levels, increased in serum Creatine kinase levels, thrombocytopenia in very less number of cases.

For the diagnosis of H1N1 virus, sample should be collected from nasal swab or bronchial washings/ aspirates and were analysed using RT-PCR. (Reverse Transcriptase – polymerase chain reaction)

Radiological manifestations in H1N1 viral pneumonia reported in various previous studies includes unilateral or bilateral,focalor multifocal or diffuse ground glass opacities, peribronchovascular and subpleural consolidations and interstitial thickenings with some patients showing basal predominance.Prime motto of this study is to review the chest radiographic and CT finding is 10 patients withconfirmed H1N1.

Radiologically, wide range of chest HRCT findings were described including subcentimeter air-space nodules, patchy ground-glass opacities and air-space consolidations. Diffuse alveolar damage (DAD) and ARDS were considered to be the end result

2. Material & Method

Subjects

Study approval obtained from institute ethics board. As the study was retrospective, informed consent was not required.We retrospectively reviewed all H1N1viral pneumonia cases admitted in our casualty and TBCD department. RT-PCR positive cases during the time period of December 2018 to March 2019 and reviewed their imaging findings.

Our review yielded about 40 cases of viral pneumonia, presented with influenza signs and symptoms. Out of which 12 cases are H1N1 positive.And out of 12 positive cases, 10 had undergone chest imaging.

Our study group consists of 3 males, 7 females with age ranging from 17-68yrs with medium age of 44yrs. Most of these patients presented to the emergency department with high grade fever, cough, haemoptysis,chest pain and

dyspnoea. 8 of them were put on intubation and mechanical ventilation with continued antiviral drugs. 7 out of 10 died inspite of good treatment and mechanical ventilation. 3 of them survived.

The inclusion criteria includes patients above 15 years of age with clinical presentation of H1N1 and Laboratory proven diagnosis of H1N1 by RT-PCR within 24 hours of admission.

Exclusion criteria includes presence of underlying conditions such as HIV, malignancies and prolonged antibiotic/steroid use.

3. Imaging Techniques

Chest radiographs, CT chest were performed on all the patients. Most of them have bedside AP view radiographs. All of them had several bedside follow up radiographs taken for every 1-2days after admission. The CT scans were performed on a 16 slice-MDCT scanner (Toshiba). The protocol used was as follows: end-inspiratory acquisition, 120 kV, 150–200 mAs, and 5mm &1-mm reformation. The images were viewed on both lung (window width, 1,500 HU; level, –700 HU) and mediastinal (window width, 350 HU; level, 40 HU) settings.

4. Results

The radiographs taken at the time of admission initially were normal in 5 out of 10 patients (Fig 1 & 2). In three of the patients, the follow-up bed side radiographs taken after admission showed the development of ground glass opacities and consolidations (Fig 3 & 4). These GGOs and consolidations were seen to be involving the lower lobes. The other two patients show extensive patchy consolidation changes involving bilateral upper and lower lobes.

Figure 1

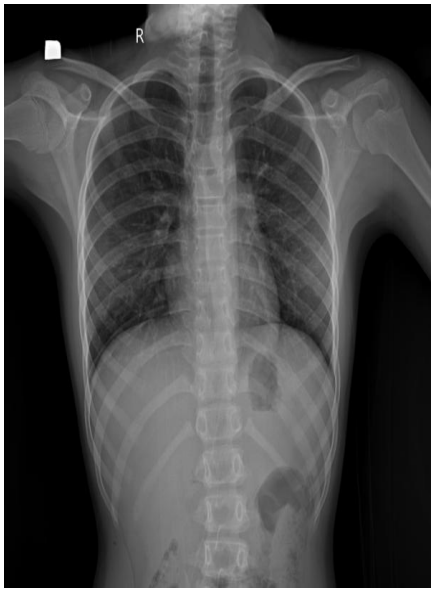

Figure 2

Figure 1 & 2: Radiographs of two patients showing normal radiographs on initial presentation.

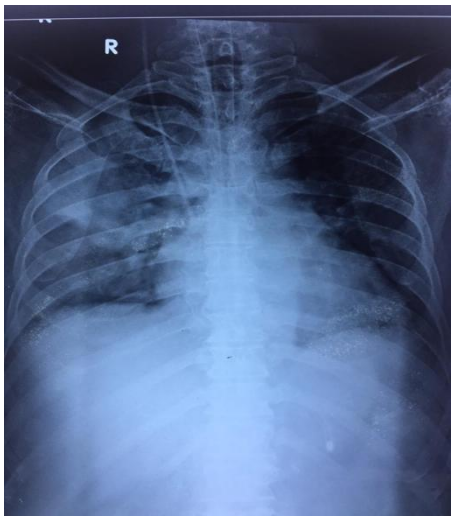

Figure 3

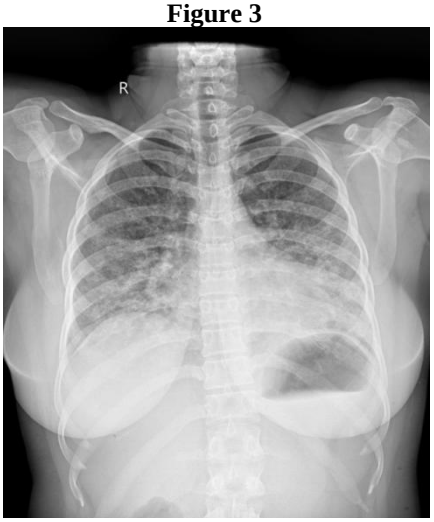

Figure 4

Figure 3&4 showing unilateral and bilateral consolidations and GGO

The other five patients had abnormal findings on their initial radiographs. Two patients had faint ground-glass opacities in

the lower zone of the lungs (Fig. 5). Later on these patients show progressive consolidatory changes involving the middle and upper zones (Fig 6).

Figure 5

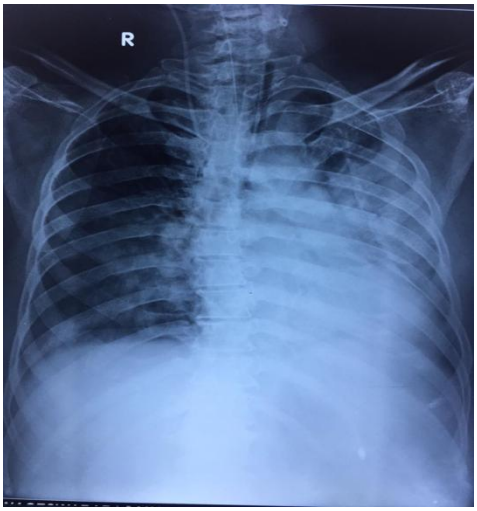

Figure 6

Figure 5 showing diffuse ground glass opacities and patchy opacities in bilateral lower zones (R>L). Fig 6 shows diffuse consolidatory changes in left mid and lower zones and mild fluffy opacities in right lower zone

The other three patients presented with extensive bilateral ground-glass opacities and diffuse areas of consolidation. The ground-glass opacities and consolidations were diffuse on the both sides involving the middle and lower zones giving bat wing appearance (Fig.7 & 8). These patients had significant increase in the consolidations in the follow up scans.

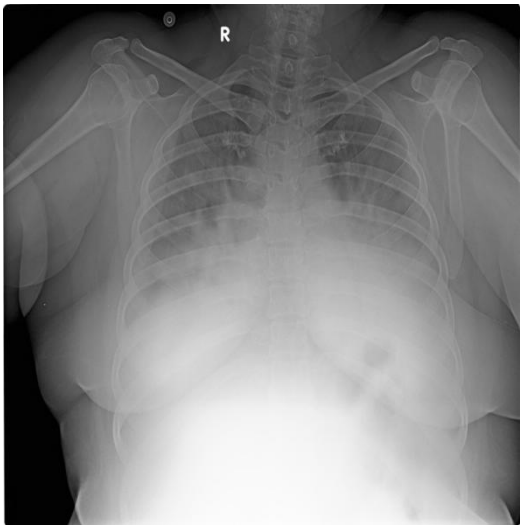

Figure 7

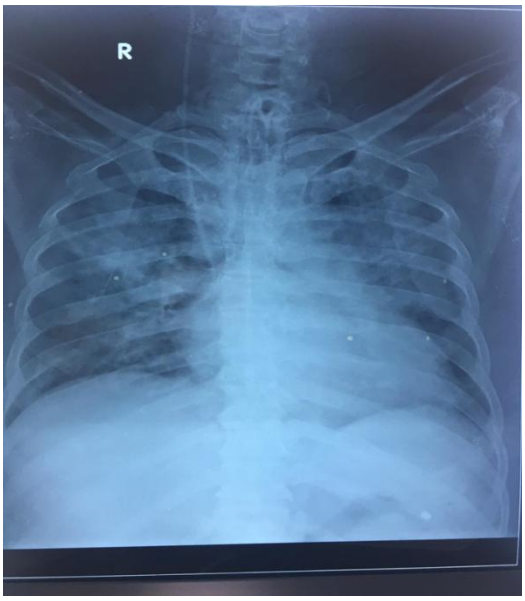

Figure 8

Figure 7&8 showing extensive ground glass opacities and consolidatory changes in bilateral lower and middle zones.

Table 1 Showing different presentations of H1N1 viral pneumonias on chest radiographs.

Imaging findings can range from:
Normal
Focal opacities
Unilateral ground glass opacities
Bilateral ground glass opacities
Unilateral consolidation changes
Bilateral consolidation changes

The patients are also had CT chest following the radiographs on the following days. The MDCT scan showed simple lobular patchy ground-glass opacities and mild multifocal areas of consolidation in three patients.(Fig 9 & 10).

Two to three patients showed diffuse peribronchovascular and subpleural consolidations with thickened interstitium, termed as 'crazy paving pattern' and also focal areas of air trapping under background of GGO, called as 'head cheese pattern'. Minimal basal predominance was noted as well. (Fig 11&12).Two patients died in the following 2-3 days by development ARDS. In rest of the patients bilateral symmetrical multifocal ground-glass opacities and extensive areas of consolidation, extensive bronchialdilatation were present, these changes were predominant in peribronchovascular and subpleural location. The CT picture thus giving appearance of ARDS (Figs. 13&14). Only one patient showed mild basal pleural effusion in bilateral lung fields. All these patients died inspite of best treatment and ventilator support.

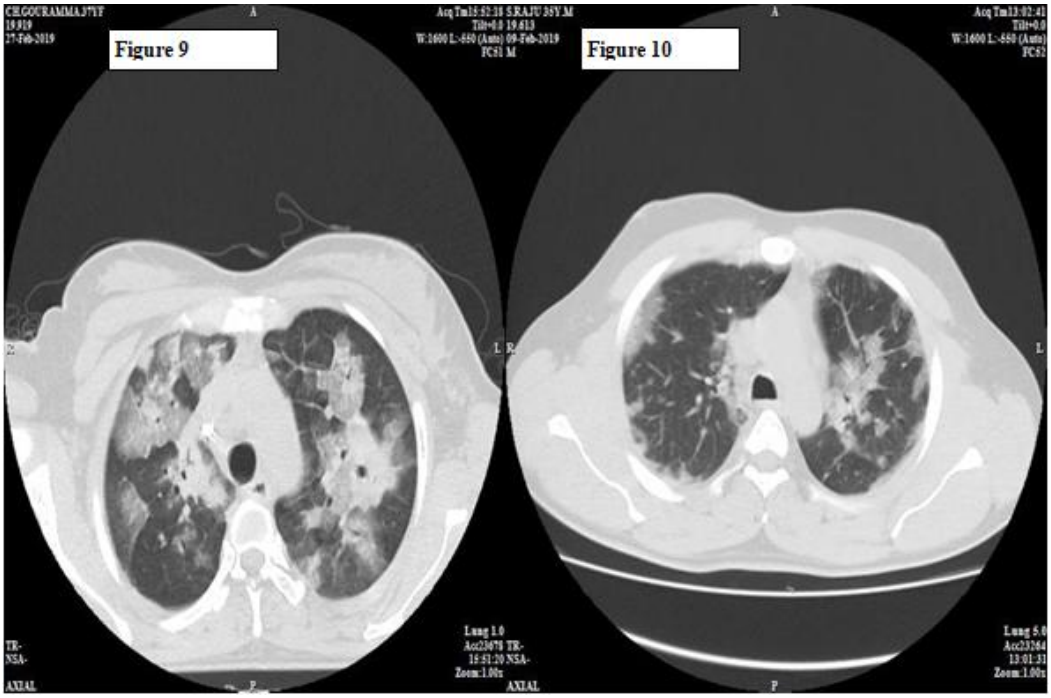

Figure 9&10: bilateral lung fields patchy areas of ground glass opacities with few subtle focal areas of consolidation changes

None of the patients showed mediastinal lymphadenopathy, centrilobular nodules with tree in bud opacities. Only one of them showed mild pleural effusion. The changes noted in the CT are most extensive in distribution and presentation when compared to corresponding radiographs.

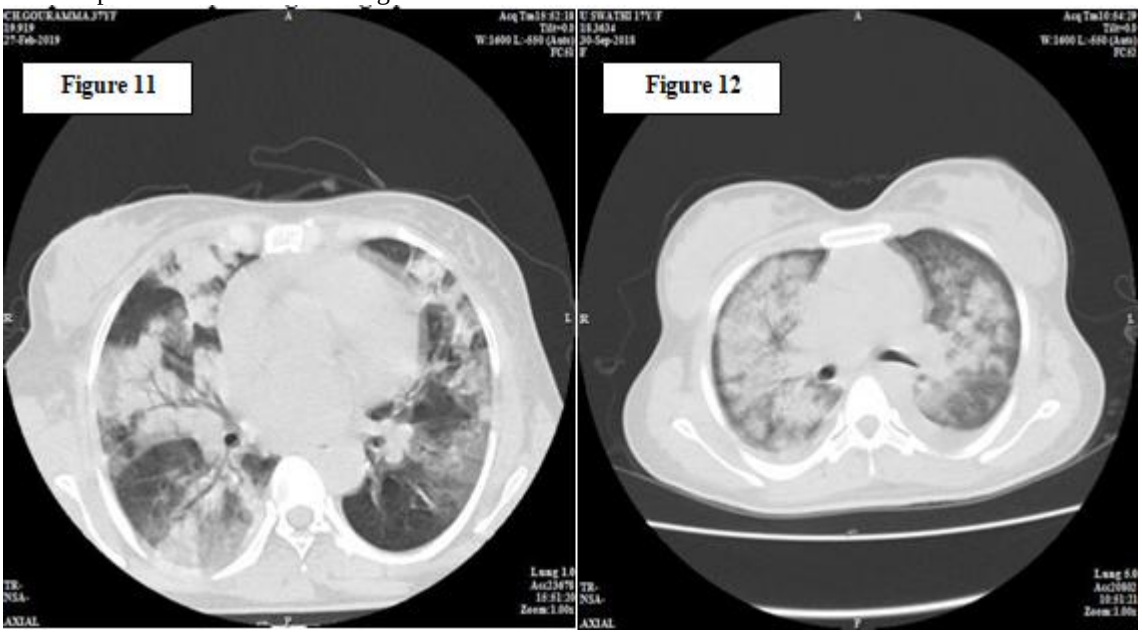

Figure 11&12: bilateral lung fields shows extensive peri-bronchovascular and subpleural consolidations under background of extensive ground glass opacities. Interstitial septal thickening also noted. Fig 12 shows basal pleural effusion bilaterally.

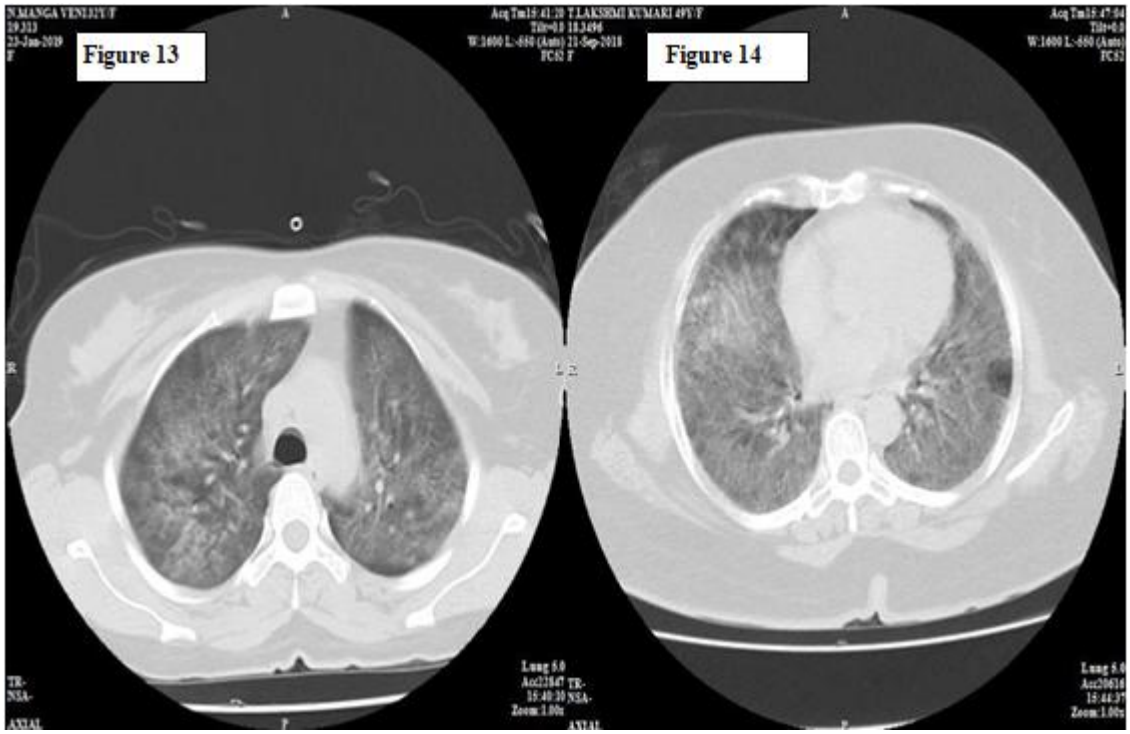

Figure 13&14: Bilateral lung fields showing extensive ground glass opacities with few areas of mosaic attenuation

Table 2 Showing various CT imaging patterns in H1N1 viral pneumonias.

CT Imaging findings can range from:
Simple patchy lobular ground glass opacities
Patchy ground glass opacities with septal thickening referred so as to ‘‘Crazy paving pattern”
Mixed patchy ground glass opacities and air space consolidations with air bronchogram
Manifestation of bronchiolitis obliterans including mosaic attenuation, mucous plugging and bronchiectasis
DAD/ARDS presenting by white lung

5. Discussion and Conclusion

The radiographic findings of our current study shows extensive ground-glass opacities and consolidations in peribronchovascular and subpleural locations corroborate to those in previous studies. However, ground-glass opacities and imaging picture of ARDS(n = 7) were by far the most common finding in our group of patients, which indicates the increased virulence of strain of this current epidemic H1N1influenza virus. All these patients with ARDS ultimately landed in death indicating the increased virulence of H1N1 influenza virus.

In our group, five patients also had a normal initial radiographic appearance, one of which remained normal on the 24 hours follow-up. Normal-appearing radiographs in the setting of mild or even severe illness have been previously reported. We also noted that none of our patients showed a reticular or nodular pattern on the initial or follow-up radiographs. Another observation in our patients was that the progression of radiographic abnormalities was mostly in the form of developing multifocal areas of consolidation on follow-up.

In all the patients with abnormal radiographic findings, CT showed more extensive involvement. In addition, CT was superior to radiography in showing the distribution of the disease. An interesting observation on the MDCT scans was the distinctive peribronchovascular (n = 6) and peripheral (n = 7) distribution of the disease. This appearance is similar to that seen in cases of organizing pneumonia. Few of them showing crazy paving pattern and head cheese patterns of distribution.

Our study has some limitations. Likely that includes only a small number of cases. None of the patients underwent lung biopsy or autopsy that would have allowed radiographic–histopathologic correlation. But all of them showed H1N1 positive in RT-PCR.

In conclusion, the most common radiographic and MDCT findings in patients with H1N1 influenza virus infection are unilateral or bilateral extensive ground-glass opacities with multifocal areas of consolidation peribronchovascularly and subpleurally. On CT, the ground-glass opacities and areas of consolidation gave an appearance of diffuse alveolar damage leading to ARDS.

This study can be useful to prepare ourselves (clinicians and radiologists) in early detection and early treatment of viral pneumonias in the next epidemic as the virus becoming more and more aggressive & drug resistant after every epidemic.

Table 3 Showing the constellation of entire presenting clinical features, radiographic and CT imaging findings along with their clinical outcome

Pt. No.	Clinical presentation	Radiographic patterns and distribution	CT patterns and distribution	Clinical Outcome
1	Fever, cough, sore throat	Unilateral GGO	Bilateral diffuse GGO	Recovered
2	Fever, cough	Normal	ARDS	Death
3	Fever, cough	Normal	Central patchy alveolar consolidation	Recovered
4	Fever,cough, chest pain	Focal GGO	Diffuse alveolar damage and ARDS	Death
5	Fever,cough, dyspnoea	Normal	Peribronchovascular consolidation and GGO	Recovered
6	Fever,cough, chest pain	Bilateral diffuse GGO	Diffuse alveolar damage & ARDS	Death
7	Fever,cough, hemoptysis	Bilateral diffuse GGO and consolidation	Diffuse GGO with intermixed mosaic attenuation	Death
8	Fever, cough, fatigue, dyspnoea	Bilateral hazy opacities	Diffuse GGO with intermixed mosaic attenuation	Death
9	Fever, cough, hemoptysis, chest pain	Unilateral diffuse GGO andmultifocal consolidation	Diffuse alveolar damage & ARDS	Death
10	Fever,cough, hemoptysis, dyspnoea	Unilateral diffuse consolidation	Diffuse GGO with intermixed mosaic attenuation & interstitial septal thickening	Death

References

[1] Radiological findings in patients with H1N1 influenza pneumonia, MagdyAbdelsalam a, HaythamSamyDiab a, Yasser Ragab b a Chest Department, Faculty of Medicine, Ain Shams University, Egypt b Radidiagnosis Department, Faculty of Medicine, Cairo University, Egypt.Received 23 May 2015; accepted 1 July 2015,Available online 19 August 2015.

[2] Swine-Origin Influenza A (H1N1)Viral Infection: Radiographic and CT Findings. Received September 13, 2009; accepted after revision October 3, 2009. All authors: Department of Radiology, Vancouver General Hospital, University of British Columbia. AJR 2009; 193:1494–1499.

[3] Swine-Origin Influenza A (H1N1)Viral Infection: Thoracic Findings on CT, Edson Marchiori,Gláuciazanetti,GiuseppeD'Ippolito,Carlos Gustavo Yuji Verrastro,Gustavo de Souza PortesMeirelle. Received June 4, 2010; accepted after revision October 21, 2010.

[4] H1N1 viral pneumonia: Spectrum of chest HRCT findings Ahmed Samir a, Abdel Aziz M. El-Nekiedya,Ayman Ibrahim Baess , Adel M. Rizka,Department of Radio-diagnosis, Faculty of Medicine, Alexandria University, Egypt. Article history:Received 15 April 2016,Accepted 21 June 2016,Available online 22 July 2016.

[5] Pulmonary imaging of pandemic influenza H1N1 infection: relationship between clinical presentation and disease burden on chest radiography and CT. 2010 The British Institute of Radiology. L Abbo, MD, A Quartin, PhD, MD, M IMorris, MD, G Saigal, MD.

[6] Radiographic and CT Features of Viral Pneumonia.May 14 2018,Hyun Jung Koo, Soyeoun Lim, JooaeChoe, Sang-Ho Choi, Heungsup Sung, Kyung-Hyun Do.

[7] Swine-Origin Influenza A (H1N1) Viral Infection in Children: Feb 8 2010 Initial Chest Radiographic Findings,Edward Y. Lee , Alexander J. McAdam, GulraizChaudry, Martha P. Fishman, David Zurakowski, Phillip M. Boiselle.

[8] Indian pneumonia guidelines, 2012 Oct-DecBharat Bhushan Sharma and Virendra Singh.Division of Allergy and Pulmonary Medicine, Department of Medicine, SMS Medical College, Jaipur, Rajasthan.