INTRODUCTION

Influenza virus is a common pathogen in humans which has caused fatal respiratory illness and mortality.\(^1\) H1N1 is an infectious viral disease which is a subtype of influenza A virus and have developed by genetic reassortment. Upper and potentially lower respiratory tract infections, which results in symptoms like nasal secretions, fever, chills, decreased appetite, cough and breathlessness. H1N1 influenza virus is an orthomyxovirus. It commonly infects pigs around the world, and hence called as swine flu.\(^2\) Although its name swine flu but it does not acquired by eating pig meat. In 1918, H1N1 influenza virus caused deadly influenza pandemic, known as the Spanish flu, the most fatal pandemics in the human, infected approximately 500 million people worldwide and resulted in the 50 to 100 million deaths (3% to 5% of the world population). In the year 2009, a new strain of H1N1 swine flu spread fast in so many countries of the world and caused lot of mortality around the world and India was also badly affected. On June 11, 2009, highest level phase 6 pandemic alert was raised by World Health Organization (WHO) indicating worldwide spread of community transmissions in at least 2 continents of the world. This virus was having a unique gene segment combination which was previously not been detected in humans or animals.\(^3\) According to WHO, previously there was no any pandemic disease has been detected so early or watched so closely, in real-time, right at the very beginning.\(^4\) It spread easily from one person to another via droplets/aerosols.

In 1918, H1N1 influenza caused fatal respiratory illness and mortality over the past century. There are limited studies on epidemiology of swine flu in Indian context. A retrospective study was conducted to find out clinical, biochemical, radiological profile and outcome of admitted patients of Swine flu (category C) in northern India. This virus was having a unique gene segment combination which was previously not been detected in humans or animals.

**Background and Aims:** Influenza virus is a common pathogen in humans which has caused fatal respiratory illness and mortality over the past century. There are limited studies on epidemiology of swine flu in Indian context. A retrospective study was conducted to find out clinical, biochemical, radiological profile and outcome of admitted patients of Swine flu (category C) in northern India.

**Subjects and Methods:** A total 3,025 suspected cases of swine flu were seen in medicine outdoor, of which 1,253 cases were found influenza A H1N1 positive. Among these positive cases 80 cases were admitted in isolation ward of Medicine department. All the above cases were admitted from June 2017 to January 2018. Clinical, biochemical and radiological parameters were assessed for mortality in above patients.

**Results:** Fever (100%), dyspnoea (84%), cough (82%), and sore throat (60%) were chief complaints of admitted patients. Average duration of presentation was 5.7±2.4 days. Most of the patients, 76 (95%) had septicemia of which 26(32.5%) developed acute respiratory distress syndrome (ARDS) with multiple organ dysfunction syndrome (MODS) while 6 (7.5%) had only ARDS. 15 patients required ventilator support of which 14 expired and 1 survived. History of contact with swine flu cases (p = 0.013), multiple comorbid conditions (p<0.05) with severe degree of hypoxemia were significant determinants of mortality.

**Conclusion:** Swine flu outbreak of the year 2017 – 2018 occurred in northern India stretched from monsoon season to winter with peak in October. All age groups were equally affected. Females were more affected than males. Case fatality was associated with multiple comorbid conditions and patients requiring invasive ventilator support. People with comorbid condition should be vaccinated with influenza vaccine prior to outbreak of disease. Suspected cases should be promptly treated with oseltamivir within 48 hours of illness to prevent complication and fatality.
and thus H1N1 influenza has become an important public health burden having potential to cause recurrent pandemics. Recently, increased in influenza A H1N1 activity was found in some countries of Northern Africa, Middle East, and in India. It has been found that the recent 2014-2015 H1N1 widespread outbreak in India caused more than 8000 cases including 800 deaths. In all these cases it was observed that death was higher in younger adults. H1N1 Strain A/California/04/2009 was main cause behind this outbreak in India. This study was conducted to evaluate clinical, biochemical, epidemiological and radiological profile of all confirmed and admitted swine flu cases in department of medicine.

MATERIAL AND METHODS

Study place and design
A hospital based retrospective, analytical and descriptive study was conducted at King George’s Medical University (KGGMU), Lucknow India. The study protocol was approved by the local ethical committee of KGGMU. We collected one year data of influenza A H1N1 patients from July 2017 to June 2018. In India, revised guidelines on categorization of Influenza-A H1N1 cases during screening for home, isolation, testing, treatment and hospitalization was given by ministry of Health and Family welfare. According to which all cases were categorized into 3 category:

Category A
It includes patients with mild fever, sore throat or cough.

Category B
1. Patients with high grade fever, severe sore throat, bodyache, headache, diarrhoea, and vomiting.
2. Patient has 1 or more of the following high risk conditions:
   - Pregnant women.
   - Persons aged more than 65 years or older.
   - Patients with lung disease, heart disease, liver disease, kidney disease, blood disorder, diabetes, neurological disorders, cancer and Human Immunodeficiency Virus (HIV): Acquired Immunodeficiency Syndrome (AIDS).
   - Patients on long term steroid therapy.

Category C
In addition to above signs and symptoms patient has:
   - Breathlessness, chest pain, drowsiness, fall in blood pressure, sputum mixed with blood, bluish discoloration of nails.
   - Worsening of underlying chronic conditions.

Study population
Total 3,025 suspected cases of swine flu were seen in outdoor department of Medicine, KGGMU, of which 1,253 cases were confirmed positive from July 2017 to January 2018. There were no cases from February 2018 to June 2018. Among these positive cases, 80 cases were admitted in medicine isolation ward because of their severe illness (Category C). The study population included 80 patients of ≥ 12 years of age. Routine laboratory blood investigations and radiographic imaging was done. Throat and nasal swab was subjected to reverse transcription polymerase chain reaction (RT-PCR) (TAQMAN real time PCR CDC protocol) assay for confirmation of H1N1. All the admitted patients were administered Oseltamivir and managed according to severity of their illness. Demographic characteristics, clinical manifestations, radiological imaging and laboratory test results of the expired group and survival group were compared.

Statistical analysis
Statistical analysis was performed using SPSS Statistics software. Base line characteristics were assessed with standard descriptive statistics. Quantitative variables were compared using independent t-test and Mann-Whitney test between two groups. Qualitative variables were compared using Chi-square test. *p*<0.05 was considered statistically significant.

RESULTS
A total of 80 (6.3%) patients of swine flu category C of total 1253 cases with confirmed H1N1 by RT-PCR were admitted. 18 (22.5%) of admitted patients came within 3 days of fever while maximum, 62 (77.5%) patients came after 3 days of fever. There were near about equal distribution of cases in specified age group (Table 1). 46(57.5%) patients admitted were female and 34(42.5%) were male. September to january months were with most of the admissions and maximum number of admissions were during october month (Table-2).

Table 1 Age-sex wise distribution of admitted cases of Swine flu

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Age (years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>12-30</td>
<td>11</td>
<td>(13.75%)</td>
<td>16</td>
</tr>
<tr>
<td>2.</td>
<td>30-50</td>
<td>12</td>
<td>(15%)</td>
<td>15</td>
</tr>
<tr>
<td>3.</td>
<td>&gt;50</td>
<td>11</td>
<td>(13.75%)</td>
<td>15</td>
</tr>
<tr>
<td>4.</td>
<td>Total</td>
<td>34</td>
<td>(42.5%)</td>
<td>46</td>
</tr>
</tbody>
</table>

Table 2 Month wise distribution of admitted cases of Swine flu

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases</td>
<td>2</td>
<td>8</td>
<td>13</td>
<td>20</td>
<td>10</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>(%)</td>
<td>(2.5%)</td>
<td>(10%)</td>
<td>(16.25%)</td>
<td>(25%)</td>
<td>(12.5%)</td>
<td>(15%)</td>
<td>(18.8%)</td>
</tr>
</tbody>
</table>

Among of all the patients admitted, underlying at least one co-morbid condition were found in 67(83.8%) of the patients. Obesity (Body Mass Index>25 kg/m2) was found in 42 (52.5%), hypertension in 16 (20%), type-2 diabetes mellitus in 15 (18.8%), asthma/chronic obstructive pulmonary disease in 12 (15%), chronic renal failure in 3 (3.8%), chronic liver disease in 6 (7.5%) and cardiac disorders in 7 (8.75 %) patients. Other high risk conditions were recent history of travelling in 39 (48.8%), pregnancy in 15 (18.8%), alcohol intake in 4 (5%), smoking in 11 (13.8%) and contacts with H1N1 positive were found in all cases.

Symptoms in H1N1 positive cases
In this study fever was present in all 80 (100%) patients, dyspnoea in 67(83.8%) and cough in 66 (82.5%). Other symptoms were myalgia (35%), headache (33%) and gastrointestinal symptoms (nausea, vomiting and abdominal pain) (23.8%) in patients. Most of the patients, 76 (95%) had
septicaemia of which 26 (32.5%) developed ARDS with MODS while 6 (7.5%) had only ARDS.

**Chest X-Ray findings**

85% (68) patients had abnormal chest-X ray which was suggestive of pneumonia while 15% (12) patients had normal chest X-ray. Bilateral pneumonia was found in most of the cases (Table 3).

Table 3 Chest X-ray findings of admitted cases of Swine flu

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Chest X-Ray</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bilateral pneumonia</td>
<td>32(40%)</td>
</tr>
<tr>
<td>2.</td>
<td>Left sided pneumonia</td>
<td>16(20%)</td>
</tr>
<tr>
<td>3.</td>
<td>Right sided pneumonia</td>
<td>16(20%)</td>
</tr>
<tr>
<td>4.</td>
<td>Pleural effusion</td>
<td>4(5%)</td>
</tr>
</tbody>
</table>

**Ventilator support required**

There were total 16 (20%) patients that needed ventilator support of which 2 patients were admitted within 3 days of fever and rest came after 3 days. 7 patients needed ventilator support of which 2 patients were admitted within 3 days of disease presentation while 3 (21%) of 62 patients expired who reported after 3 days but who reported within 3 days of disease presentation.'
admitted patients mostly present lately when they have landed in various complications.

**Symptoms**

Fever, cough and headache like in our study were also predominant clinical manifestations reported by other studies. Dyspnea (83.8%) was also predominant finding, as this was the reason for admission. In this study bilateral pneumonia was found in 40% while in other study it was 78.6%. All patients admitted in our hospital, had abnormal chest-X ray findings, while in study in Surat district 2009-2010, 78.7% have abnormal chest-X ray findings.

**Mortality analysis**

Mean age at death among all expired cases was 47 ± 14.92 years which was higher (p = 0.204) as compared to alive cases (40.79 ± 17.27 years) although not statistically significant. In other studies, mean age of death was about 45 years.

Though not significant, but mortality in positive cases was found to be higher among females as compared to males. In few studies female gender and pregnancy was important risk factor for mortality. In one of the study diabetes, chronic lung conditions, and pregnancy/postpartum state were the high risk conditions for death. In our study patients who expired had multiple co-morbid conditions. All patients (except one) who required invasive ventilator support expired. Similarly in study in Surat district 2009-2010 out of 32 patients on invasive ventilator support, 24 expired. All patients were cases of ARDS with MODS. 17 (53%) patients of ARDS who did not required ventilator support survived, while in other study all patients of ARDS required ventilator support and expired. Patients of ARDS with severe grade of \((PO_2/FiO_2)\) was important predictor of mortality.

Average hospital stay in expired patients was 4.93 (range 1-9) days with a mean duration of symptoms of 6.2 (range 3-10) days. Similar results were found in study in Baroda district, Gujrat 2015 were mean time lag between hospitalisation and death was of similar duration. An earlier Indian study of 2009 swine flu pandemic found that expired cases had a much shorter mean stay of only 3.98 days. Out of all 15 patients expired 5 patients (33.3%) expired within 3 days of illness and majority 66.4% reported to hospital after 3 days of fever and similarly it was observed in other study.

**CONCLUSION**

Swine flu equally affected all age groups. Female were more affected than male. Patients having comorbid conditions were severely affected and obesity was one of important predictor for mortality. Fever, cough and dyspnea were most common presenting symptoms of admitted patients. Bilateral pneumonia was more common than unilateral lung involvement. Requirement of mechanical ventilation and multiple comorbidities were poor prognostic factors. Swine flu patients with multiple comorbid condition having rapid downhill course may not be benefitted by administration of Oseltamivir. People with comorbid condition should be vaccinated with influenza vaccine prior to outbreak of disease. Suspected cases should be promptly treated with oseltamivir within 48 hours of illness to prevent complication and fatality.

**Funding Sources:** None

**Competing interest:** None declared

**Acknowledgement**

The authors are grateful to all the patients, clinicians and other medical staffs involved in this study.

**References**

15. Fajardo-Dolci G. Comparing Deaths from Influenza H1N1 and Seasonal Influenza A: Main Sociodemographic and Clinical Differences between the Most Prevalent 2009 Viruses. Influenza Research and Treatment. Volume (2012), Article ID 501784.

How to cite this article:

*******