Comparison of Demographic, Clinical, Radiological Characteristics and Comorbidities in Mechanically Ventilated and Nonventilated, Adult Patients Admitted in ICU with Confirmed Diagnosis of Influenza A (H1N1)


Abstract

Introduction: Influenza A(H1N1) infection affected Indian population in 2009. Patients needed ICU admission and monitoring. Simple demographic, clinical and radiological variables are described in this article in mechanically ventilated and nonventilated patients.

Objectives: To describe and correlate demographic, clinical, radiographic characteristics and comorbidities in mechanically ventilated and nonventilated, adult patients admitted in ICU with confirmed diagnosis of Influenza A(H1N1) infection.

Material and methods: Retrospective study of records of 100 RT-PCR confirmed patients with Influenza A (H1N1) infection from August 2009 to March 2010 was done. Each patient underwent an evaluation to determine demographic, clinical and radiographic features, comorbidities, mechanical ventilator required or not.

Results: 35 Patients required mechanical ventilation. 27 required IMV, 4 required NIMV while 4 patients initially were put on NIMV required IMV subsequently. 19 (40.42%) female patients required mechanical ventilator. Mean age of mechanically ventilated patients was 33 years, mean duration of illness was 7.9 days, mean duration of hospital stay was 6.8 days. 07(20.00%) patients with pregnancy, 05 (14.29%) with DM, 05 (14.29%) with HT, 04/11.43%) with obesity required mechanical ventilator. 97.14% patients with fever, 88.54% with breathlessness, 11.43% with haemoptysis, 31.42% patients with throat pain required mechanical ventilator. However except Tachypnoea (p < 0.01) no other symptom was statistically significant for mechanical ventilation.

33(36.26%) patients with abnormal X ray, 16(80.00%) patients with right sided, 09(60.00%) patients with left sided and 40(71.43%) patients with bilateral disease required mechanical ventilator, right sided (p < 0.01) and bilateral (p < 0.01) disease is statistically significant for requirement of mechanical ventilator. 33(47.14%) patients with lower zone involvement, 44 (67.70%) patients with middle zone and 23 (47.92%) patients with upper zone involvement required mechanical ventilator. Upper zone disease (p < 0.01) and middle zone disease (p < 0.01) is statistically significant for requirement of ventilator. 23(47.92%) patients with right upper zone, 29 (42.64%) patients with right middle zone, 29 (46.77%) with left middle zone, 32 (42.67%) with right lower zone involvement required mechanical ventilator. RUZ (p < 0.01), RMZ (p < 0.01), LMZ (p < 0.001) and RLZ (p < 0.01) involvement had statistical significance for requirement of mechanical ventilator. 20 (33.89%) patients with patchy consolidation, 08
Introduction

In June 11, 2009, the World Health Organisation declared the H1N1 Influenza infection as a global pandemic after at least 3 months of the confirmed diagnosis of the first case in California. India reported its first case of Novel 2009 influenza A (H1N1) virus in May 2009 and subsequently, it was diagnosed all over the country within a short period of time. First case in Pune (Maharashtra) was reported in August 2009 and since then Novel 2009 influenza A (H1N1) infection had significantly affected the population. Many patients during 2009 pandemic required mechanical ventilation for management. It was the first pandemic with such a demand for critical care services. Various investigators have reported the requirement of mechanical ventilation to the tune of 63% to 100% in critically ill patients of Influenza A (H1N1) infection. Kumar et al. reported requirement of mechanical ventilator in 73% (n=156/215), Domenech-Cherit et al. reported in 93% (n=54/58), Estenssoro et al. reported in 84% (n=16/19), Jain et al. reported it in 63% (n=42/67).

In Pune, during the pandemic, a significant number of patients became critically ill primarily because of respiratory failure. Many patients needed ICU management, intubation and mechanical ventilation (unpublished data). Various demographic characters, comorbidities, clinical and radiological characteristics of influenza A (H1N1) infection have been described by various investigators in the past. However the description and correlation of demographic characters, comorbidities, clinical and radiological characteristics in mechanically ventilated and nonventilated patients in India’s population has not been published yet. We therefore conducted a retrospective review of medical records of mechanically ventilated and nonventilated adult patients admitted with confirmed diagnosis of Novel 2009 influenza A (H1N1) virus infection in critical condition in ICU to evaluate and correlate these characteristics with mechanical ventilator.

Material and Methods

Study Period and Population: Available hospital records were retrospectively reviewed for adults with PCR-confirmed 2009 H1N1 infection, and admitted to intensive care unit of Sassoon General Hospital (SGH)-Byramjee Jeejeebhoy Medical College (BJMC), Pune between August 2009 and April 2010. This is single centre retrospective study. Patients were admitted in intensive care unit because either they had ARDS requiring mechanical ventilator or tachypnoea > 24 breaths per minute or haemoptysis or hypotension requiring vasopressor support. All these patients were treated with antiviral drugs i.e. cap Oseltamivir 150 mg twice a day orally or through Ryles tube and Zanamavir inhalation 10 mg twice a day. Vasopressor support whenever required, antibiotics and supportive treatment. Our patients received conventional invasive and noninvasive mechanical ventilation.

Out of 103 patients admitted in the ICU during August 2009 to April 2010, we could not get proper records of three patients so clinical, comorbid and radiological findings were evaluated in one hundred patients.

Data Collection: Clinical data were extracted from available hospital records. The following information was collected: demographic characteristics on admission including age, gender; clinical characteristics on admission including duration of symptoms, co-morbid illnesses (like pregnancy, obesity, diabetes mellitus, hypertension, immunocompromised state like HIV, RVHD, COPD); clinical findings at presentation and radiologic abnormalities. Intubation and whether on mechanical ventilator or not was also recorded.

Diagnosis of 2009 H1N1 Influenza: Influenza-like illness was defined by the documentation of fever (temperature > 100°F), and/or cough, and/or headache or sore throat, with any of the following...
All adults admitted with influenza-like illness, underwent nasopharyngeal (NP) aspirate or swab specimen collection for Influenza A (H1N1) detection on the day of hospitalisation. Patient specimens were sent to the National Institute of Virology (NIV) in Pune, a world health organization (WHO) designated influenza centre, where Real time reverse-transcriptase PCR assay was performed according to the protocol recommended by the U.S. Centres for Disease Control and Prevention (CDC) and results communicated within 24 hours. For the purposes of this analysis, an adult was defined as infected with 2009 H1N1 influenza based on laboratory confirmation of the presence of H1N1 specific viral nucleic acid in nasopharyngeal specimen collected on hospitalisation.

**Radiology** : All 100 patients underwent chest radiography within 24 hours of admission. All radiography was performed in portal machine of Adonis of 100MA capacity. The chest radiographs were reviewed by two experienced radiologists who were blinded to each other’s reports who showed excellent (95%) agreement. Zonal involvement was assessed by drawing an horizontal lines traversing the lung fields from the apex to the domes of the diaphragm at 1/3rd and 2/3rd distances.

**Data Analysis** : All analyses were carried out utilizing SPSS version 16. Odds ratio, likelihood ratios, Anova predictive values and F tests were carried out with confidence intervals.

**Ethical Review and Approval** : Due to retrospective nature of the study, with no interventions deviating from standard clinical practice and without the possibility of identification of individual patients from the anonymised collected data, the Ethics Committee of SGH gave ethical approval for the study and waived the need for informed consent of the patients.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Total</th>
<th>Mechanical ventilation+ n=35(%)</th>
<th>No mechanical ventilation n=65 (%)</th>
<th>Significant odds ratio 95% CI</th>
<th>Likelihood ratio</th>
<th>Fisher exact test</th>
</tr>
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<tbody>
<tr>
<td>Gender</td>
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<td></td>
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<tr>
<td>Males</td>
<td>053</td>
<td>16 (30.18)</td>
<td>37 (69.81)</td>
<td>1.56 (0.68- 3.58)</td>
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<tr>
<td>Females</td>
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<td>19 (40.42)</td>
<td>28 (59.57)</td>
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<td></td>
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<tr>
<td>Mean age (yrs)</td>
<td>33.43</td>
<td>33.00</td>
<td>33.66</td>
<td>0.67 NS</td>
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<td>Mean duration of illness</td>
<td>07 days</td>
<td>7.9 days</td>
<td>6.1 days</td>
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<td>Mean duration of hospital stay</td>
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<td>6.8 days</td>
<td>11.3 days</td>
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<td></td>
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<td>Pregnancy</td>
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<td>07(20.00)</td>
<td>06(09.23)</td>
<td>0.28-2.08 (NS)</td>
<td>2.22 NS</td>
<td>0.22 NS</td>
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<tr>
<td>Diabetes</td>
<td>12</td>
<td>05(14.29)</td>
<td>07(10.77)</td>
<td>0.39-4.64 (NS)</td>
<td>0.233 NS</td>
<td>0.74 NS</td>
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<td>Hypertension</td>
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<td>05(14.29)</td>
<td>06(09.23)</td>
<td>0.78-1.76 (NS)</td>
<td>0.57 NS</td>
<td>0.50 NS</td>
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<td>Obesity</td>
<td>10</td>
<td>04(11.43)</td>
<td>06(09.23)</td>
<td>1.10-1.58 (NS)</td>
<td>0.120 NS</td>
<td>0.737 NS</td>
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<td>RVHD</td>
<td>06</td>
<td>03(08.57)</td>
<td>03(04.62)</td>
<td>0.37-10.15 (NS)</td>
<td>0.604 NS</td>
<td>0.420 NS</td>
</tr>
<tr>
<td>COPD</td>
<td>03</td>
<td>03(08.57)</td>
<td>00(00.00)</td>
<td>(NS)</td>
<td>6.41 NS</td>
<td>0.042S</td>
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<tr>
<td>HIV</td>
<td>03</td>
<td>01(02.86)</td>
<td>02(03.07)</td>
<td>2.51-2.36 (NS)</td>
<td>0.004 NS</td>
<td>NS</td>
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<td>CVA</td>
<td>02</td>
<td>01(02.86)</td>
<td>00(00.00)</td>
<td>(NS)</td>
<td>2.11 NS</td>
<td>1.00 NS</td>
</tr>
<tr>
<td>Others (IHD, alcoholism)</td>
<td>04</td>
<td>02(05.71)</td>
<td>02(03.07)</td>
<td>1.36-2.65 (NS)</td>
<td>0.394 NS</td>
<td>0.35 NS</td>
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Clinical symptoms and signs

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Total</th>
<th>Mechanical ventilation+</th>
<th>No mechanical ventilation</th>
<th>Significant odds ratio 95% CI</th>
<th>Likelihood ratio</th>
<th>Fisher exact test</th>
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<tbody>
<tr>
<td>Fever</td>
<td>97.14</td>
<td>93.85</td>
<td>1.43-3.03 NS</td>
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<td></td>
<td></td>
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<tr>
<td>Cough</td>
<td>94.28</td>
<td>96.92</td>
<td>2.65-1.36 NS</td>
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<td></td>
<td></td>
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<td>Breathlessness</td>
<td>88.57</td>
<td>80.00</td>
<td>0.54-1.87 NS</td>
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<td></td>
<td></td>
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<tr>
<td>Throat pain</td>
<td>31.42</td>
<td>35.38</td>
<td>1.08-0.70 NS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bodyache</td>
<td>20.00</td>
<td>12.30</td>
<td>0.53-1.69 NS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Haemoptysis</td>
<td>11.42</td>
<td>07.69</td>
<td>0.95-1.82 NS</td>
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<td></td>
<td></td>
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<tr>
<td>Vomiting</td>
<td>11.42</td>
<td>10.76</td>
<td>1.24-1.37 NS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Diarrhoea</td>
<td>08.57</td>
<td>04.61</td>
<td>1.01-2.30 NS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rhinorrhoea</td>
<td>25.71</td>
<td>27.15</td>
<td>0.98-0.89 NS</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Chest pain</td>
<td>05.71</td>
<td>03.07</td>
<td>1.37-2.60 NS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tachypnoea</td>
<td>74.28</td>
<td>50.76</td>
<td>1.13-6.90 p&lt;0.01</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rhonchi</td>
<td>14.28</td>
<td>10.76</td>
<td>0.91-1.55 NS</td>
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<tr>
<td>Crepitations</td>
<td>82.15</td>
<td>61.53</td>
<td>0.94-2.117 NS</td>
<td></td>
<td></td>
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</tbody>
</table>

**symptoms**: myalgia or arthralgia, respiratory distress, or vomiting or diarrhoea, chest pain, abdominal pain.

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Table 2: Comparison of mechanically ventilated and nonventilated (radiological characteristics)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value: Number</th>
<th>Mechanical ventilation +</th>
<th>No mechanical ventilation</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiologically</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Normal XRC</td>
<td>09</td>
<td>02 (22.22)</td>
<td>07 (77.77)</td>
<td></td>
</tr>
<tr>
<td>Abnormal XRC</td>
<td>91</td>
<td>33 (36.26)</td>
<td>58 (63.73)</td>
<td>NS</td>
</tr>
<tr>
<td>Anatomical laterisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right side</td>
<td>20 (21.92)</td>
<td>16 (80.00)</td>
<td>04 (20.00)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Left side</td>
<td>15 (16.48)</td>
<td>09 (60.00)</td>
<td>06 (40.00)</td>
<td>NS</td>
</tr>
<tr>
<td>Bilateral</td>
<td>56 (61.53)</td>
<td>40 (71.43)</td>
<td>16 (28.57)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Anatomical zonal involvement</td>
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<tr>
<td>Lower zones</td>
<td>70 (77.46)</td>
<td>33 (47.14)</td>
<td>37 (52.86)</td>
<td>NS</td>
</tr>
<tr>
<td>Middle zones</td>
<td>65 (71.42)</td>
<td>44 (67.70)</td>
<td>21 (32.30)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Upper zones</td>
<td>39 (42.70)</td>
<td>23 (58.98)</td>
<td>16 (41.02)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>RUZ</td>
<td>48 (52.74)</td>
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<td>25 (52.08)</td>
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<td>LUZ</td>
<td>30 (32.96)</td>
<td>11 (36.67)</td>
<td>19 (63.33)</td>
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<td>RMZ</td>
<td>68 (74.72)</td>
<td>29 (42.64)</td>
<td>39 (57.36)</td>
<td>&lt;0.01</td>
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<td>LMZ</td>
<td>62 (68.13)</td>
<td>29 (46.77)</td>
<td>33 (53.23)</td>
<td>&lt;0.001</td>
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<tr>
<td>RLZ</td>
<td>75 (82.41)</td>
<td>32 (42.67)</td>
<td>43 (57.33)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>LLZ</td>
<td>66 (72.52)</td>
<td>25 (37.87)</td>
<td>4162.13</td>
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<td>Pattern</td>
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<tr>
<td>Consolidation</td>
<td>59 (64.83)</td>
<td>20 (33.89)</td>
<td>39 (66.11)</td>
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<tr>
<td>Reticulonodular</td>
<td>22 (24.17)</td>
<td>08 (36.36)</td>
<td>14 (63.64)</td>
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<td>Nodular</td>
<td>10 (10.98)</td>
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<td>05 (50.00)</td>
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<td>09</td>
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<td>01</td>
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<td>02</td>
<td>25 (27.47)</td>
<td>08 (32.00)</td>
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<tr>
<td>03</td>
<td>18 (19.78)</td>
<td>06 (33.33)</td>
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<tr>
<td>04</td>
<td>20 (21.97)</td>
<td>08 (40.00)</td>
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<tr>
<td>05</td>
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<td>01 (14.28)</td>
<td>06 (85.71)</td>
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<tr>
<td>06</td>
<td>11 (12.08)</td>
<td>08 (72.72)</td>
<td>03 (27.27)</td>
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<td>Deaths</td>
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</table>

Results

Out of one hundred patients, 35 required conventional mechanical ventilation. 27 required invasive mechanical ventilation, 4 required noninvasive while 4 patients initially were put on noninvasive ventilator required invasive ventilation subsequently.

As shown in Table 1, 19 (40.42%) female patients required mechanical ventilator however gender distribution is not statistically significant (odds ratio 1.56 i.e. 0.68 to 3.58). Mean age of mechanically ventilated patients was 33 years vs 33.66 years in nonventilated however it was not statistically significant (likelihood ratio - 0.67). Mean duration of illness was 7.9 days for mechanically ventilated patients and 6.1 days for nonventilated patients however it is not statistically significant. Mean duration of hospital stay was 6.8 days for mechanically ventilated patients and 11.3 days for nonventilated patients and is not statistically significant. 07 (20.00%) patients with pregnancy, 05 (14.29%) with DM, 05 (14.29%) with HT, 04/11.43% with obesity required mechanical ventilator. However, none of the comorbidities were statistically significant for mechanical ventilation. 97.14% patients with fever, 88.54% with breathlessness, 11.43% with haemoptysis, 31.42% patients with throat pain required mechanical ventilator. However except Tachypnoea (p < 0.01 (CI 95% CI = 1.13 – 6.90) no other symptom was statistically significant for mechanical ventilation.

As shown in Table 2, 33 (36.26%) patients with abnormal X ray required mechanical ventilator. 16 (80.00%) patients with right sided, 09 (60.00%) patients with left sided and 40 (71.43%) patients with bilateral disease required mechanical ventilator. Right sided (p < 0.01) and bilateral (p < 0.01) disease is statistically significant for requirement of mechanical ventilator. 33 (47.14%) patients with lower zone involvement, 44 (67.70%) patients with middle zone and 23 (47.92%) patients with upper zone involvement required mechanical ventilator. Upper zone disease...
Discussion

Seasonal influenza is an acute respiratory illness that occurs particularly during the winter months. Type A virus is the most virulent and this virus can mutate easily. 12

The novel H1N1 virus has the features of North American and Eurasian swine, avian and human influenza virus.1 In Pune, during the pandemic, a significant number of patients became critically ill primarily because of respiratory failure. A dedicated and isolated swine flu intensive care unit was created on emergency basis at Sassoon General Hospital (SGH)-Byramjee Jeejeebhoy Medical College (BJMC), Pune. Many patients needed ICU management, intubation and mechanical ventilation. Out of one hundred patients admitted in intensive care unit during August 2009 to April 2010, thirty five patients required mechanical ventilator.

Various studies have been published in the past in relation to mechanical ventilation in critically ill patients with influenza A(H1N1) infection. Study carried out by Teke T et al13 have reported 92% of critically ill patients who were on mechanical ventilator due to profound hypoxaemic respiratory failure required high levels of inspired oxygen and PEEP. Study carried out by Evangelia Alkoumianaki and colleagues14 have observed better survival with nonconventional mechanical ventilation vs conventional mechanical ventilation in patients with critical influenza A(H1N1) infection. Study carried out by Estenssoro E4 showed that patients who required mechanical ventilator were 56% males; and 64% had underlying conditions, with obesity (24%), chronic obstructive respiratory disease (18%), and immunosuppression (15%) being the most common. Seven per cent were pregnant. They also noted that on admission, patients had severe hypoxaemia (PaO2/FiO2 140 [87-200]), extensive lung radiologic infiltrates (2.87 ± 1.03 quadrants) and bacterial coinfection, (25%; mostly with Streptococcus pneumoniae).

E. Evdokimov, N. Malishev15 in their study reported that Mechanical ventilation was received by 98 pts (69.2%), non-invasive respiratory support - 4 pts (2.8%). BiPAP was used in 73 pts (74.5%), PCV - in 11 pts (11.8%), SIMV+PSV - 14 pts (13.7%). Mean Vt at first day was 510 ± 130 ml (380-690 ml), Pplat, 26 ± 13 mmHg, PEEP 8.7 ± 4.2 mmHg, and FiO2 0.69 ± 0.11. Various ventilator variables of mortality like PEEP, ventilator pressures have also been described in Influenza A (H1N1) patients by many investigators in the past.2,3,13,14 However there are no Indian studies describing simple characteristics like clinical, comorbidities, radiological in mechanically ventilated and nonventilated patients. Though we could not study NIMV vs Invasive ventilation, conventional vs nonconventional ventilation, an attempt is made to describe and to identify simple characteristics between mechanically ventilated and nonventilated patients. To our knowledge this is the only Indian study describing the comparison of demographic characteristics, comorbidities, clinical and radiographic characteristics in mechanically ventilated and nonventilated, confirmed patients with H1N1 influenza admitted in ICU.

73 patients with severe illness with Influenza A (H1N1) infection requiring ICU admission in our study were adults younger (age between 18-40 yrs) than expected for seasonal influenza. Prior studies have reported seriously ill patients of seasonal influenza in people of extremes of age.1 Though mean age of mechanically ventilated patients was slightly lower in our study, there is no statistically significant age difference for requiring mechanical ventilator. More female patients with us required mechanical ventilator. This we attribute to pregnancy as additional factor responsible for ventilation compromise. However gender difference does not have statistical bearing on requirement of mechanical ventilator.

In our study pregnancy, DM, obesity, HT were the commonest comorbidities in patients requiring mechanical ventilator. However none of the comorbidity was statistically significant for requirement of mechanical ventilator. Most common clinical presentations in our patients on mechanical ventilator were fever, cough, breathlessness, throat pain, Tachypnoea, and crepitations however except...
tachypnoea (respiratory rate > 24/min p < 0.01),
there is no statistically significant relation of various
symptoms for requirement of ventilator. We report
abnormal X rays in 91% of cases. Only two patients
with normal X ray chest required mechanical
ventilator. These two patients presented to us with
breathlessness, tachypnoea and haemoptysis and
had low PaO2. We attribute normal X ray in these
two patients to inflammation of tracheobronchial
tree. 33 patients requiring mechanical ventilator
had abnormal X rays. Radiologically our patients
requiring mechanical ventilator had more common
bilateral disease and also right sided disease. This we
attribute to microaspiration from upper respiratory
tract in these seriously ill patients and also aspiration
of gastric contents in few of the comatose patients
and also inoculation of more number of viruses to
right side, giving possible pathological damage
of right lung. We observed that more number of
patients with right upper zone disease required
mechanical ventilation and is statistically significant
for requirement of ventilation. If there is radiological
finding of Right upper zone involvement, then,
there is more probability that these patients require
Mechanical ventilator for case management. In other
words, these patients downgrade in their condition
and require ventilator management. Similarly, RMZ,
LMZ and RLZ and cardiac involvement if shown in
X-ray, the necessity of ventilator management is more.

We suggest that the patients with influenza
A(H1N1) having middle zone disease or right upper
zone disease should be monitored vigilantly as these
patients are more likely to be critical and may require
mechanical ventilation for management. The most
common radiological patterns requiring mechanical
ventilator in our study was consolidation followed
by reticulonodular and then Nodular pattern.
However none of the specific pattern is statistically
significant for mechanical ventilator. In our patients
Multizonal disease was the most common. Though
requirement of mechanical ventilator was more
in patients with 6 zone involvement, we did not
observe statistically significant association between
number of zones affected and mechanical ventilator
requirement. Because patients got admitted late with
serious form of illness with us and since most of them
radiologically presented with advanced disease,
we can not comment on requirement of mechanical
ventilation in other radiological presentations
like ground glass opacities, hyperinflation etc. We
observed requirement of mechanical ventilator in all
patients with cardiomegaly. However cardiomegaly
here was diagnosed radiologically and not by
echocardiographically or laboratorywise. The mean
duration of illness in mechanically ventilated patients

though was more, we did not observe significant
association for requirement of mechanical ventilator.

Though 15 patients required mechanical ventilation
for less than 10 days, when analysed statistically,
the duration of hospital stay has no bearing with
requirement of ventilation. Number of deaths were
more (n=28, 80%) among pts who required MV.
As there were no deaths in patients not requiring
mechanical ventilator we can not apply statistics for
finding out significance of mechanical ventilator for
survival or death. Though in this case series observed
mortality in patients on mechanical ventilator is
considered high, more number of deaths in our
patients are likely to be due to extensive, bilateral,
multizonal disease, affecting right upper zone also
and could be additional systemic variables like AKI
which we haven’t studied. Galit aviram et al16 also
reported 4 deaths out of 5 on mechanical ventilator
because of bilateral, extensive, multizonal disease
during initial days of influenza A(H1N1) pandemic.
Study carried out in by K N Bhatt17 also reported high
mortality in patients on mechanical ventilation (41 on
ventilator, 24 deaths, 58%). We could not study the
outcome in terms of survival or death of different
types of mechanical ventilation like IMV vs SIMV.
However Teke T and colleagues13 have reported higher
survival rate in NIMV than invasive ventilation. Even
today we are witnessing the occurrence of new cases
of influenza A (H1N1) along the globe and in India
also and we may even see many critically ill patients
of this disease in near future, so we suggest primary care
physicians serving in resource limited areas (e.g. not
having ventilator facilities) to identify these simple
variables in their patients and refer these patients
immediately to nearby centre where these facilities
are available.

Our study has certain limitations. First, its single
centre retrospective study and the sample size is
relatively small. Second, we could not correlate
other variables like APACHE II score,PaO2/FiO2 ratio,
ventilator variables. Third, we could not compare
various types of mechanical ventilation like invasive
vs noninvasive in these patients. Fourth, we could not
study associated complications during ventilator stay
in these patients. In spite of these limitations, the study
is the largest study from India that correlated various
comorbidities, clinical, radiological characteristics
with mechanical ventilation for patients of influenza
A (H1N1).

Conclusions

Young to middle age patients were commonly
affected. Common comorbidities were pregnancy,
diabetes, hypertension, and obesity and fever,
cough, breathlessness, tachypnoea, crepitations
were common clinical features. Radiologically it was multizonal, bilateral disease with predominant lower zone involvement and common patterns were consolidation followed by reticulonodular and nodular. Mechanical ventilation requirement was more in females, in presence of comorbidities like pregnancy, DM, HT, in presence of tachypnoea, in presence of bilateral disease and in presence of middle zone and right upper zone disease and with multiple zone disease. All patients with cardiomegaly required mechanical ventilator. If there is radiological finding of right upper zone involvement, then, there is more probability that these patients require mechanical ventilator for case management. Similarly, RMZ, LMZ and RLZ and cardiac involvement if shown in X-ray, the necessity of ventilator management is more.

**Abbreviations**

XRC- X ray chest, RN- Reticulonodular, DM- Diabetes Mellitus, HT - Hypertension, NS - Not significant, RVHD - Rheumatic valvular heart disease, CVA - Cerebrovascular accident, HIV - Human immunodeficiency virus, COPD - Chronic obstructive pulmonary disease, IHD - Ischaemic heart disease, RT-PCR - Reverse transcriptase polymerase chain reaction, NIV - National Institute of Virology, ICU - intensive care unit, IMV - invasive mechanical ventilator, NIMV - noninvasive mechanical ventilation, AKI - Acute kidney injury, APACHE - Acute physiology and chronic health evaluation, rRT-PCR - real time reverse transcriptase polymerase chain reaction, PEEP- Positive end expiratory pressure FIO2-inspired fraction of oxygen, PSV- Pressure support ventilation, PCV - Pressure control ventilation SIMV - Synchronised intermittent mandatory ventilator Vt - Tidal volume

**References**

15. E Evdokimov, M Malishev, D Protsenko, A Belevskiy, A Yaroshetskiy, O Muravyev, P Boytsov, B Gelfand, Moscow Critical Care Trials Group H1N1 Collaborative Russian Medical Academy of Postgraduate Education, Moscow, Russian Federation, Clinical Hospital for Infection Disease, Moscow, Russian Federation, State Medical University of Russia, Anesthesiology & Critical Care, Moscow, Russian Federation, State Medical University of Russia, Moscow, Russian Federation, Botkin’s City Hospital, Moscow, Russian Federation. 0205 - Critically Ill Patients With Influenza A (H1N1) Infection In Moscow, Russian Federation. *Int J Med Sci* 2011;8:228-23