Profile of Acute Respiratory Infection among adult patients during H1N1 outbreak in a tertiary care centre in Pune

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Profile of Acute Respiratory Infection among adult patients during H1N1 outbreak in a tertiary care centre in Pune

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Abstract

Background: During the spring of 2009, a pandemic influenza A (H1N1) virus emerged and spread globally. We describe the profile of Acute Respiratory Infection (ARI) during H1N1 outbreak in a tertiary care centre in Pune.

Methods: This was retrospective observational study. Information was collected from records on 100 consecutive cases of ARI admitted in the hospital. It was compiled from day of admission till final outcome which was either survival or mortality. Clinical history & physical examination were carried out, including serial SOFA (Sequential Organ Failure Assessment) score. Laboratory data included examination of throat sample & Endotracheal tube secretion by a real-time reverse-transcriptase– polymerase-chain-reaction (rRT-PCR)

Results: Out of total 100 cases, 68% were viral & 12% were bacterial, & for the rest 20% cases etiological agent could not be determined (undetermined). All viral cases were positive for H1N1 Influenza virus. In Bacterial group 10 cases were positive for Klebsiella pneumonia & 2 cases positive for S.pneumoniae. Mean age in this study was 39.82 yrs (SD12.611). Fever & cough were most common symptoms. Duration of symptom prior to admission was in range of 1 day -12 days. Tachypnea, Tachycardia, low mean arterial pressure (MAP) & High SOFA scores were associated with poor survival.

Conclusion: Mortality was higher in ARI cases where, microbial etiology could not be found. Delay in presentation & Hypoxia were associated with high mortality in ARI cases during H1N1 outbreak.

Keywords

Acute Respiratory Infection, H1N1 outbreak, tertiary care center, SOFA (Sequential Organ Failure Assessment), ARDS (Acute respiratory Distress Syndrome), CXR (Chest X-Ray)

Introduction

The epidemiology of ARI might be conceived as a constantly changing scene in which viral and bacterial causal agents play various roles according to age, immunological status of the population, and the degree of exposure of individuals. The pandemic of H1N1 influenza had its beginning in Mexico in March 2009 and soon spread to other parts of the globe in a rampant fashion. On June 11, 2009, the World Health Organisation (WHO) signaled that a global pandemic of novel Influenza A (H1N1) was underway. The pandemic started in India in the month of August 2009 and the index cases were reported from Pune. Soon the epidemic spread itself to other parts of the country[1]. This epidemic was notoriously seen to affect the younger population in the age group of 15-40 years.[2]

Severe pandemic (H1N1) 2009 manifesting predominantly as cases of pneumonia requiring admission to intensive care occurred more frequently in young[3,4], obese[5,6], and pregnant persons[7]. The pandemic strain of H1N1 virus caused severe illness, including pneumonia and ARDS, and resulted in ICU admissions and mortality.[3] Present study was conducted to analyse DATA of ARI during pandemic of Influenza A H1N1

Materials & Methods

Information was compiled retrospectively from day of admission till final outcome which was either survival or mortality. The study had ethical clearance from the institutional ethical committee. Inclusion criteria were, A person presenting with history of high fever (>38°C) and cough or breathing difficulty, A person with an unexplained acute respiratory illness, A suspect case with radiographic evidence of infiltrates consistent with pneumonia or respiratory distress syndrome (RDS) on chest X-ray (CXR). Exclusion criteria were an alternative diagnosis which can fully explain their illness, A case is known case of chronic respiratory illness with no acute respiratory infection, A case of aspiration pneumonia or health care associated pneumonia A case with age<13 yr. During this period
the clinical profile of ARI cases was analyzed with reference to etiological agents, age, sex & time distribution. Clinical manifestations, detailed physical examination including Serial SOFA score were carried out on day 1, 7 & 14. Investigations like complete blood count, renal function test, liver function test, ECG & chest X ray was done for all patients. Throat Swab/Endotracheal tube secretion for Influenza & Other viral study were done for all patients. Throat swab collected & transported in Viral Transport Media. All samples were tested by rRT-PCR following the Centers for Disease Control and Prevention (CDC) protocol for confirmation of pandemic H1N1 virus. Sputum was studied for gram/Z-N staining, culture sensitivity & Sputum for AFB was also done. Outcome of Cases, either survival or mortality were noted. Similarly cases were also divided as per etiology wise into three group as, bacterial, viral & Acute Respiratory infection for which cause could not be found–undetermined etiology. Finally all data were statistically analyzed with Paired test, Unpaired t test, Chi square test, ANOVA test, Fisher Exact test.

Result

In Our study we followed 100 patients & we were able to diagnose microbial etiology of 80 % of acute respiratory infection, out of total 100 cases, 68 % were viral & 12 % were bacterial for the rest 20 % we could not determine etiology of primary infection. We found that all viral cases were positive for H1N1 influenza virus & in Bacterial infection we found 10 cases positive for Klebsiella pneumonia & 2 cases positive for S.pneumoniae. We found 4 patients died in bacterial group, 8 in viral & 12 in undetermined group. Overall mortality was 22%. It was 33.34 % in bacterial, 14.71 % viral & 40 % in undetermined group (Illustration 1.)

Mean age in this study was 39.82 (SD 12.611) yrs, in survived group it was 38.8 (SD 12.6) yrs & in non survived group it was 43.2(SD 12.1) yrs. Out of total 100 patients 63 were males & 37 were female. Out of 63 male 14 died & out of 37 females 8 died. Fever & cough was present in all patients, followed by breathlessness in 84 patients. In H1N1 group 64 out of 68 had breathlessness, & 44 out of 68 patients had constitutional symptoms of bodyache, diarrhea etc. Duration of symptom prior to admission ranged from min.1 day to max 12 days. Median duration of symptoms prior to hospital admission was 4 days. In non-survived group as per etiology wise it was observed that duration of symptom was more in bacterial & undetermined group, i.e. 6 days & 6.38 days respectively, which was statistically significant as compared to survived patients. (p<0.001 & p 0.016 respectively). While in H1N1 pneumonia there was no significant difference in mean duration among survived & non survived group. (p 0.48). (Illustration 2 & Illustration 3)

Out of total 100 patients 53% had normal BMI while 38% cases were overweight & 9% cases were obese. Out of total cases observed in different groups higher mortality was observed in obese group. (Mortality 55%). Respiratory rate in our study ranged from 20 – 36/min. Tachypnea was observed in all cases. Heart Rate in our study was in range of 78 – 122/min. There was significant tachycardia among non survived as compared to survived in patients of all 3 bacterial, viral, & undetermined group. Tachycardia on admission was associated with poor outcome.

MAP was ranging from 54 -90 mmHg. MAP was 66.32 mm Hg in non survived patients but it was 75.59 in survived patients & difference was statistically highly significant.(p<0.001). Hypotension on admission was associated with poor outcome.

In our study SOFA score was calculated on admission & on follow up on Day 7 & 14. On Day 1 Mean SOFA score among survived group was 1.9359 (SD 2.37049) while among Non survived group it was 11.1818 (SD 2.80538) & difference was highly significant. (Illustration 4)

Discussion

The Present study of “Profile of ARI cases among adults during H1N1 outbreak in a tertiary care centre in Pune.” was carried out to study profile of ARI cases admitted in hospital during H1N1 outbreak. Data from total 100 patients were compiled & analyzed. Viral infection was predominant in this study (68%), & all were H1N1 influenza infection (as during our study it was pandemic of Swine Flu H1N1 virus infection). Bacterial etiology detection rate was 80%. Out of total diagnosed cases (n=80) 85 % were viral & 15 % bacterial. We could not determine etiology in 20 % cases, this can be explained by the fact that serology for both atypical & viral, (other than influenza), was not done at the time of study. Possibility of partial treatment from outside or delay presentation could be one of the factor. As study by Ling et al *showed that when oseltamivir was prescribed during first 3 days of illness, it shortened duration of viral shedding.

Mean age group in our study was 39.82 (SD12.611) yrs, while as per etiology wise 46.75 (SD 8.529) in bacterial, 37.85 (SD 13.005) in viral, & 42.35 (SD 13.005) in non survived group as per etiology wise it was observed that duration of symptom was more in bacterial & undetermined group.
As studied Impact of obesity in [12] also did not find significant difference in BMI of in their study stated that median age of younger population was more commonly affected possibly because of some degree of pre existing immunity in older individuals against antigenically similar influenza virus. Study by ANZIC [9] influenza investigators on H1N1 showed median age was 40 yrs. Comparing with outcome it was found that mean age in survived patients was 38.8(SD12.6) while those in non survived group was 43.2(SD 12.1) yrs , which was statistically not significant. Overall as per etiology wise infection was more common in male which was statistically not significant (p 0.610). As compared to information from American Lung association [19] & Kung HC et al [16] incidence of pneumonia in greater in Males than Females. Kadam et al [13] in their study found female sex preponderance which was carried out strictly in H1N1 patients. Overall mortality was 22 %. It was 21.62 % in male & 22.22 % in female, which was statistically not significant (p 0.857)

Viral infection was associated with other symptom like diarrhea, bodyache, Sore throat etc more commonly as compared to other pneumonia, which was statistically significant (p 0.008) . Breathlessness was found significantly present in viral pneumonia. (p<0.001). Other study by Bashir shah et al [12] showed that max number of patients presented with fever (95%) , Cough (99%),Tachycardia(92%) & Pleuritic chest pain(75%). Similarly Study by A Puvanalingam et al [18] in H1N1 infection showed that fever (95.4%) was most common symptom followed by breathlessness & sore throat. We observed breathlessness was more common with viral infection almost 95% & 50 % in bacterial infection. Prasad et al [13] in their study on Necropsy finding in H1N1 infection showed that there is more diffuse alveolar damage , so this can explain our finding of common symptom of breathlessness in viral infection.

In non-survived group as per etiology wise it was observed that median duration of symptom was more in bacterial & undetermined group, i.e. 6 days & 6.38 days respectively, which was statistically significant as compared to survived patients. (p<0.001 & p 0.016 respectively). While in viral pneumonia there was no significant difference in mean duration among survived & non survived group.(p 0.48 ) . Padilla et al [14] also found median duration of symptom prior to admission as 6 days. As breathlessness was most common symptom for which patients seek medical advice & this symptom is more common in viral infection, so mean duration of symptom was less in viral as compared to other. Diego viasus et al [15] showed that timely administration of oseltamivir has beneficial effect on outcomes. So overall it has been concluded that more the duration of symptom prior to hospital admission poor is outcome. It is because of delay in treatment.

As total no of obese cases were 9%, impact of obesity on outcome of pneumonia could not be concluded in our study. Diaz et al [16] studied Impact of obesity in patients infected with H1N1, & concluded that patients who were obese & infected with h1n1 did not have increased mortality. Study by Bochicchio et al [17] concluded that obesity is associated with increase in morbidity & mortality in critically ill patients. Kumar et al [18] also did not find significant difference in BMI of survivors & non survivors. It was observed that there was significant difference in respiratory rate among survived & non survived group in viral & undetermined group, (p, 0.001) but no significant difference among bacterial pneumonia of survived & non survived group. (P 0.057). We observed tachypnea in all cases.

There was significant difference in Heart rate among survived & non survived patients of bacterial, viral, & undetermined group. Mean MAP was max among viral infection & lowest in undetermined infection, which was statistically significant. There was significant difference in MAP among survived & non-survived group of viral pneumonia.(p<0.001)

Mean sofa score among non survived group was significantly high compared to survived group on admission & day 7 & 14 . As increased SOFA score is indicative of multi organ involvement, which is associated with poor outcome. Study by kumar et al [19] in critically ill patients also found SOFA score on day 1 was 6.8.Similarly on Day 7 & on Day 14 there were statistically significant difference in sofa score among survived & non survived group.

**Conclusion**

It can be concluded that in hospitalized cases of ARI during H1N1 outbreak, Mortality was high in undetermined group. Statistically significant correlation were found between Mortality & Tachypnea , Tachycardia , Low mean arterial pressure on admission, & High SOFA score on admission. Mean duration of symptom prior to admission was significantly associated with mortality in bacterial & undetermined group.
Abbreviations

ARI: Acute Respiratory Infection
SOFA: Sequential Organ Failure Assessment
CDC: Centre for Disease Control
WHO: World Health Organisation

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**Illustrations**

**Illustration 1**

**Microbial etiology Outcome**

<table>
<thead>
<tr>
<th>Group</th>
<th>Outcome</th>
<th>Chi square</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Survived</td>
<td>Non Survived(%)</td>
<td>Df=2</td>
</tr>
<tr>
<td>Bacteria</td>
<td>8</td>
<td>4(33.34)</td>
<td>6.78</td>
</tr>
<tr>
<td>Viral</td>
<td>58</td>
<td>10(14.71)</td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>12</td>
<td>8(40)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>22(22)</td>
<td></td>
</tr>
</tbody>
</table>
Illustration 2

Duration of Symptom prior to admission

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>ANOVA F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>12</td>
<td>1-7</td>
<td>3.58</td>
<td>2.021</td>
<td>1.661</td>
<td>0.195 NS</td>
</tr>
<tr>
<td>Viral</td>
<td>68</td>
<td>1-12</td>
<td>4.57</td>
<td>2.275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>20</td>
<td>3-10</td>
<td>5.05</td>
<td>2.089</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>1-12</td>
<td>4.55</td>
<td>2.226</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Illustration 3**

Comparison of Duration of symptom between Survival and Death

<table>
<thead>
<tr>
<th></th>
<th>Bacteria</th>
<th>Viral</th>
<th>Undetermined</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival</td>
<td>2.38</td>
<td>4.66</td>
<td>4.17</td>
<td>4.35</td>
</tr>
<tr>
<td>Death</td>
<td>6.00</td>
<td>4.10</td>
<td>6.38</td>
<td>5.27</td>
</tr>
<tr>
<td>Unpaired t</td>
<td>5.957</td>
<td>0.710</td>
<td>2.66</td>
<td>1.742</td>
</tr>
<tr>
<td>Unpaired P</td>
<td>&lt;0.001 HS</td>
<td>0.48</td>
<td>0.016 Sig</td>
<td>0.085</td>
</tr>
</tbody>
</table>
Illustration 4

SOFA Score (Sequential Organ Failure Assessment score)

<table>
<thead>
<tr>
<th>Sofa score</th>
<th>Outcome</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Unpaired t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day_1</td>
<td>Survived</td>
<td>78</td>
<td>1.9359</td>
<td>2.37049</td>
<td>15.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Non Survived</td>
<td>22</td>
<td>11.1818</td>
<td>2.80538</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day_7</td>
<td>Survived</td>
<td>54</td>
<td>1.6667</td>
<td>4.19793</td>
<td>13.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Non Survived</td>
<td>17</td>
<td>15.7647</td>
<td>1.82104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day_14</td>
<td>Survived</td>
<td>10</td>
<td>5.3000</td>
<td>5.61842</td>
<td>6.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Non Survived</td>
<td>8</td>
<td>19.2500</td>
<td>1.83225</td>
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</tbody>
</table>