“Study on Burden and Risk Factors of Death due to Influenza-A (H1N1) in Punjab, India"

The seminar will begin shortly.

Please take a moment to check your audio (sound and microphone) to ensure you will be able to hear the presentation.
Click Tools ➔ Click Audio ➔ Click Audio Setup Wizard

There will be no video so webcams are unnecessary.
“Study on Burden and Risk Factors of Death due to Influenza-A (H1N1) in Punjab, India"

Presenter: Dr. Tripurari Kumar
India EIS Officer, Integrated Disease Surveillance Program
Directorate of Health & Family Welfare, Sector-34/A, Chandigarh, Punjab, India
“Study on Burden and Risk Factors of Death due to Influenza-A (H1N1) in Punjab, India"

Discussant: Dr. Shashi Khare
Deputy Director NCDC and Head of the Division of Microbiology, National Center for Disease Control, Delhi

Title: Pandemic Influenza A H1N1 : How India contained?
“Study on Burden and Risk Factors of Death due to Influenza-A (H1N1) in Punjab, India"

Discussant: Dr. Renu Lal
Influenza Coordinator, CDC-India, Influenza Division, US Embassy, New Delhi
Title: How does this study fits into the context of influenza in India and any other teaching points
Burden and Risk Factors for Deaths in Patients Hospitalized for Influenza A (H1N1), Punjab, India

Dr. Tripurari Kumar, EIS Officer, Integrated Disease Surveillance Program Punjab

Placement Supervisor: Dr. Deepak Bhatia
Mentor: Dr. Rajesh Kumar
Co-Mentor: Dr. Tanzin Dikid

India EIS Programme
Influenza Disease Burden

- Influenza virus circulating since 16th century
- Ability to cause recurrent epidemics and global pandemics

World wide

- Estimate 250-500,000 deaths per year
- Estimated 3-5 million severe cases/year (WHO)
- Limited data from tropical settings like India

Economic burden

- Substantial economic impact (direct health care cost, societal cost, other trade related losses)
- ~$37.5 billion in USA per year
Global Emergence of Novel H1N1 Influenza

March – April 2009

- Emerged in Mexico, causing severe illness and death
- Human infections with a novel H1N1 also reported in North America
- Patients had no contact with pigs, indicating human-to-human transmission
- WHO Phase 6 Pandemic announced in June 2009

Image: Garten, et.al., Science

The reassortment of the S-OIV genome
Characteristics of Pandemic H1N1 2009

- Occurred late in the season
- Affected young people disproportionately
- Most cases of severe and fatal infections were reported in adults between the ages of 30-50 years
- Socially disruptive, especially for schools

www.cdc.gov/H1N1flu
H1N1 (2009) in India

- First case 13th May, Hyderabad
- First death, 4th August, Pune
- Country-wide SARI-surveillance for H1N1 (test ONLY for H1N1)
- SARI = severe high grade fever + cough/severe sore throat, worsening chronic conditions or high risk group
- Punjab - first cases 14th June 2009, with history of US travel
Resurgence of H1N1 Globally in 2013

Number of specimens positive for influenza by subtype

- B (Lineage not determined)
- A (Not subtyped)
- A(H1)
- A(H5)
- B (Victoria lineage)
- A(H3)
- B (Yamagata lineage)
- A(H1N1)pdm09

Global Influenza Surveillance and Response System (GISRS): generated on 05/12/2013 06:57:50 UTC
H1N1 Hospitalized Cases and Deaths, Punjab, 2013

23%
A. Describe the hospitalized influenza A (H1N1) cases and deaths by time, place and person in 2013 in Punjab, India

B. Identify risk factors and co-morbidities associated with mortality among hospitalized influenza A (H1N1) cases
Punjab State in India

- Punjab in NW India; 22 districts
- Occupies 1.6 percent of the total area and 2.3% of India population
- Population: 27.7 million (2011 Census)
- Religion- Sikh (60%), Hindu (37%), Muslim (1.6%)
Influenza A (H1N1) Surveillance, Punjab

- Managed by the Integrated Disease Surveillance Program
- Public and private hospitals send nasal/throat swabs from SARI cases for testing by real time RT PCR
- Laboratory reports test results to IDSP
- District surveillance units provide oseltamivir to cases and close contacts and collect data on any deaths
**Definitions**

- **Confirmed influenza A (H1N1) infection:** Hospitalized patient with febrile respiratory illness with laboratory-confirmed H1N1 influenza A virus detected by RT-PCR

- **Case:** Death among hospitalized patients of confirmed influenza A (H1N1) infection in Punjab reported from 1\(^{st}\) January to 15\(^{th}\) April 2013

- **Control:** Surviving hospitalized cases of confirmed influenza A (H1N1) infection admitted to one of the same hospitals where deaths reported 1\(^{st}\) January to 15\(^{th}\) April 2013
Study Design

Study design
- Descriptive study of influenza A (H1N1) cases in 2013 in Punjab state
- Unmatched case-control study to identify risk factors associated with mortality among patients hospitalized for influenza A (H1N1) in 2013

Study population
- Descriptive study: all confirmed H1N1 cases and deaths
- Case control study: all confirmed H1N1 deaths [cases]; controls from hospitals where deaths due to H1N1 occurred

Time frame
- 1st January and 15th April 2013
Sample Size and Data Collection

Sample size

- 41 cases and 82 controls to estimate an odds ratio (OR) of 3 with 95% confidence and 80% power, assuming 30% of the controls had risk factors.

Data collection and analysis

- Socio-demographic and clinical/comorbid data collected from hospital records using existing WHO questionnaire and if missing, via tele-interviews with controls and next-of-kin of cases.
- Data entered in Epi info-7; SPSS-version-16 for analysis.
- Bi-variable/ multi-variable logistic regression analysis to identify risk factors associated with H1N1 mortality.
Results

Descriptive Study
Descriptive Results of H1N1 Cases, 1 Jan 2013-15 April 2013

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARI cases</td>
<td>559</td>
</tr>
<tr>
<td>Confirmed H1N1 cases</td>
<td>182 (33%)</td>
</tr>
<tr>
<td>Age</td>
<td>Median 46 years (IQR 40-54)</td>
</tr>
<tr>
<td>Male</td>
<td>54%</td>
</tr>
<tr>
<td>History of travel</td>
<td>0%</td>
</tr>
<tr>
<td>History of H1N1 vaccination</td>
<td>0%</td>
</tr>
<tr>
<td>Deaths</td>
<td>42 (CFR=23%)</td>
</tr>
</tbody>
</table>
Epi-curve for H1N1, 2013 (N=182)
Distribution of H1N1 Cases, 2013 (N=182)

H1N1 Prevalence/Million

- No Case
- 0.01-2
- 2.01-5
- 5.01-10
- 10.01-25

Rajasthan
## H1N1 Cases and Deaths by Age and Sex, 2013 (N=182)

<table>
<thead>
<tr>
<th>Age/Gender</th>
<th>Cases (n=183)</th>
<th>%</th>
<th>Deaths (n=42)</th>
<th>%</th>
<th>Case Fatality Ratio (CFR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>99</td>
<td>54.1</td>
<td>21</td>
<td>50</td>
<td>21</td>
</tr>
<tr>
<td>&lt; 5</td>
<td>12</td>
<td>6.6</td>
<td>1</td>
<td>2.4</td>
<td>8.3</td>
</tr>
<tr>
<td>5 - 14</td>
<td>4</td>
<td>2.2</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>15 – 49</td>
<td>96</td>
<td>52.7</td>
<td>30</td>
<td>71.4</td>
<td>31.3</td>
</tr>
<tr>
<td>50 - 64</td>
<td>61</td>
<td>33.5</td>
<td>8</td>
<td>19.0</td>
<td>13.1</td>
</tr>
<tr>
<td>65+</td>
<td>9</td>
<td>4.9</td>
<td>3</td>
<td>7.1</td>
<td>33.3</td>
</tr>
<tr>
<td>Total</td>
<td>182</td>
<td>100.0</td>
<td>42</td>
<td>100.0</td>
<td>23.1</td>
</tr>
</tbody>
</table>
Results
Case Control Study
Selection of H1N1 Cases and Controls

H1N1 positives from 30 hospitals; n=182

- H1N1 positives from 21 hospitals where deaths reported; n=163
  - Deaths n=42
  - Survived n=107
    - Cases n=42
    - Controls n=80

- Excluded 9 hospitals where no deaths reported; n=19 H1N1 infections
- Left against medical advice; n=14 H1N1 infections
- Record unavailable n=27 (Controls w/o records were significantly younger than those with records)
## Socio-demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case (n=42)</th>
<th>Control (n=80)</th>
<th>OR</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Age&lt;50 years</td>
<td>31</td>
<td>74</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>50</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>Rural</td>
<td>20</td>
<td>48</td>
<td>29</td>
<td>36</td>
</tr>
<tr>
<td>Up to High School</td>
<td>29</td>
<td>69</td>
<td>49</td>
<td>62</td>
</tr>
<tr>
<td>Non Sikh</td>
<td>24</td>
<td>57</td>
<td>30</td>
<td>38</td>
</tr>
<tr>
<td>Private hospital</td>
<td>34</td>
<td>81</td>
<td>59</td>
<td>74</td>
</tr>
</tbody>
</table>
## Pre-existing Conditions of Study Subjects

<table>
<thead>
<tr>
<th>Co-morbidity</th>
<th>Case  (n=42)</th>
<th>Control  (n=80)</th>
<th>OR</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Respiratory disease (COPD/TB)</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>13</td>
<td>31</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Hypertension</td>
<td>16</td>
<td>38</td>
<td>37</td>
<td>46</td>
</tr>
<tr>
<td>Obesity (BMI&gt;30)</td>
<td>12</td>
<td>29</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Heart disease</td>
<td>4</td>
<td>9</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
# Delays in Care: Disease Process

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case (n=42)</th>
<th>Control (n=80)</th>
<th>OR</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom to treatment; ≤48 hrs</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>0%</td>
<td>29%</td>
<td>1%</td>
</tr>
<tr>
<td>≤7 days</td>
<td>12</td>
<td>19</td>
<td>24</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>29%</td>
<td>29%</td>
<td>24%</td>
<td>0.55-3.0</td>
</tr>
<tr>
<td>Visit to &gt;2 centers before H1N1</td>
<td>19</td>
<td>19</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>confirmation</td>
<td>45%</td>
<td>9%</td>
<td>9%</td>
<td>31.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9%</td>
<td>9.5-105.4</td>
</tr>
</tbody>
</table>
## Independent Factors Associated with Mortality, 2013

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>AOR</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;50 years</td>
<td>10.1</td>
<td>1.1-21.1</td>
<td>0.04</td>
</tr>
<tr>
<td>Obesity (BMI&gt;30)</td>
<td>16.7</td>
<td>1.6-170.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Visit to &gt;2 centers before H1N1 confirmation</td>
<td>25.8</td>
<td>5.4-121.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Patient on ventilator</td>
<td>51.5</td>
<td>7.3-363.1</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Conclusions

- In Punjab, 2013, increased number of hospitalized cases of H1N1, with high case fatality
- All districts affected; no clusters were observed
- Most affected ages were 15-49 years
- Delays in access to appropriate diagnosis significantly associated with an adverse outcome
- Obesity was an additional risk factor for death
Limitations

- Study was conducted among hospitalized laboratory-confirmed cases only
  - Not all SARI cases may have accessed the hospital
  - Not all SARI cases laboratory tested due to logistics or transport issues
  - Medical records missing on 27 surviving H1N1 cases

- Recall bias from controls and next of kin for cases may have over- or under-estimated risk factors
Recommendations

- Community should be sensitized about influenza symptoms and comorbid conditions, and encouraged to seek medical advice early

- Healthcare providers should be prepared before the influenza season for early identification of signs and symptoms and for early referral for laboratory confirmation and treatment

- Surveillance activities should be strengthened
  - Need more laboratory testing in the state
  - Need for collecting additional information like disease severity and co-morbidity, for all cases
Acknowledgements

- Dr. Deepak Bhatia – Placement Supervisor
- Dr. Rajesh Kumar – Mentor
- Dr. P.V.M. Lakshmi – PGI, Chandigarh
- Dr. Tanzin Dikid – Co Mentor
- Dr. Archana Choudhry – Epidemiologist, NCDC
- Dr. J.P. Narain – Senior Advisor to EIS
- Dr. Kayla Laserson – EIS Resident Advisor
- Dr. Shashi Khare – Head of Microbiology Division, NCDC
- Dr. Renu Lal – Influenza Coordinator, CDC-India
- Medical Superintendents of Hospitals & Civil Surgeons of the Districts, where visited to collect the data.
- Staff of IDSP – Punjab
Thank You.....
Pandemic Influenza A H1N1: How India Contained?

DR. SHASHI KHARE
ADDITIONAL DIRECTOR & HOD (MICROBIOLOGY & CARD)

NATIONAL CENTRE FOR DISEASE CONTROL
DGHS, MOHFW GOI
22, SHAM NATH MARG, DELHI-110054
Presentation Outlines

- Update of Pandemic H1N1: Global
- Update of Pandemic H1N1: India
- Actions taken by GOI and outcomes
- Conclusion
Influenza an omnipresent threat

- Influenza is an acute viral infection that spreads easily from person to person.
- Influenza circulates worldwide and can affect anybody in any age group and is unpredictable.
- Influenza causes annual epidemics that peak during winter in temperate regions.
- Influenza is a serious public health problem that causes severe illnesses and deaths for higher risk populations.
- An epidemic can take an economic toll through lost workforce productivity, and strain health services.

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
North America / WHO European Region / Southern Asia / Caribbean region of Central America and tropical South America / Southern hemisphere showed low levels of influenza activity.

Northern Asia influenza activity slightly increased in the north of China and Mongolia. (Source: www.who.int)

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
Pandemic H1N1: India

- March 2009: pandemic reported from Mexico
- April 2009: NCDC designated as the nodal agency for H1N1
- May 2009: 1st positive case reported from Hyderabad
- August 2009: 1st death reported from Pune

Pandemic Influenza A H1N1 : How India Controlled?
National Centre For Disease Control
Situation update Pandemic H1N1: India

- 268109 Persons tested for H1N1 - 58678 positive cases, 3904 deaths

- Among ILI cases, only those admitted to indoor facility (category – C) are being tested.

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
Situation update Pandemic H1N1: India contd.....

- 2009 - Delhi, Maharashtra and Rajasthan

State Case Load: Year 2009

- Including only those states, which reported more than 100 cases
Situation update Pandemic H1N1: India contd.....

- 2009 - Delhi, Maharashtra and Rajasthan
- 2010 - Delhi, Maharashtra and Karnataka

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
Situation update Pandemic H1N1: India contd.....

- 2009 - Delhi, Maharashtra and Rajasthan
- 2010 - Delhi, Maharashtra and Karnataka
- 2011 - Kerala, Karnataka and Uttar Pradesh
Situation update Pandemic H1N1: India contd.....

- 2009 - Delhi, Maharashtra and Rajasthan
- 2010 - Delhi, Maharashtra and Karnataka
- 2011 - Kerala, Karnataka and Uttar Pradesh
- 2012 - Maharashtra, Karnataka and Tamil Nadu

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
Situation update Pandemic H$_1$N$_1$: India contd.....

- 2009 - Delhi, Maharashtra and Rajasthan
- 2010 - Delhi, Maharashtra and Karnataka
- 2011 - Kerala, Karnataka and Uttar Pradesh
- 2012 - Maharashtra, Karnataka and Tamil Nadu
- 2013 - Delhi, Gujarat and Rajasthan.

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
Situation update Pandemic H1N1: India contd.....

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control

Post Pandemic Phase

- Cases
- Death

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>27236</td>
<td>981</td>
</tr>
<tr>
<td>2010</td>
<td>20604</td>
<td>1763</td>
</tr>
<tr>
<td>2011</td>
<td>603</td>
<td>75</td>
</tr>
<tr>
<td>2012</td>
<td>5044</td>
<td>405</td>
</tr>
<tr>
<td>2013</td>
<td>5233</td>
<td>689</td>
</tr>
</tbody>
</table>
The data includes samples mainly from Delhi and also from places around Delhi.

*p. Samples positives for Inf. A. were not subjected to subtyping till 2011.
Age and Genderwise Positive H1N1 cases for Jan 2013 to November 2013

Pandemic Influenza A H1N1 : How India Controlled?
National Centre For Disease Control
Symptoms wise & year wise Analysis of H1N1 Positive cases

- **2009-2010**: Fever was the most common symptom.
- **2010-2011**: Fever & Cough was the most common symptoms.
- **2011-2012**: Fever & Sore Throat was the most common symptoms.
- **2012-2013 (till date)**: Fever, cough & Sore throat is common symptoms.
Risk Factors associated with death cases

2009–2013

- Delay in treatment
- Pregnancy
- Comorbid conditions like:
  - Diabetes
  - Hypertension
  - Respiratory disease
  etc..

- Study conducted in Madras Medical College suggested that most common cause of mortality were:
  - Pneumonia
  - Pregnancy (25%) and fetal loss rate (16.67%)

- Another study in Tamil Nadu suggested that most common cause of mortality were:
  - Past history of diabetes
  - Treatment with corticosteroids delay of >48 hours in starting antivirals

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
ACTIONS TAKEN SINCE THE PANDEMIC IN 2009 BY GOI

- Screening at Airports, Ports and Border Crossings
- Enhanced Surveillance and Laboratory Support
- Hospital Preparedness
- Medical Supplies—Drugs, Personal Protective Equipment
- Pandemic Vaccines
- Training
- Communication
- Application of non-pharmaceutical interventions was given due importance

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
Specimen collection and transport policy developed

Strengthened communication systems

Laboratory surveillance data base and quality assurance & National influenza strain repository established

Influenza Vaccine & Drugs:

Influenza vaccine and drugs (Oseltamivir) are being produced indigenously and vaccination policy for high risk groups has been developed.
Strategies for the Future-assumptions

- The pandemic Influenza virus would circulate in the years to come as one of the strains causing seasonal influenza.

- Invest in Influenza Research (operational, drugs, vaccines, diagnostics etc).

- This would also help address other emerging and re-emerging diseases.

- Use pandemic strategic interventions to further strengthen and achieve the IHR core capacities.
Public health needs: priority for country

- To reduce the risk of emergence of pandemic influenza.
- To limit the spread of epidemic/pandemic influenza.
- To minimize the impact of seasonal and pandemic influenza.
- To optimize the treatment of patients with influenza; and
- To promote the application of modern public health tools.

In November 2011, a review of the progress was undertaken to:

i. Collate the knowledge and progress attained since the launch of the agenda.
ii. Interpret or apply the knowledge for improved influenza.
Conclusion

“Eternal vigilance is the price of freedom (even) from preventable diseases and pandemics.”
Threat Continues

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
H7N9 & MERS CoV

Total 137 cases and 45 deaths have been reported due to Avian Influenza H7N9 since February 2013 – October 2013. (Source: www.who.int)

NO case has been reported in India till Date

Since April 2012, 130 laboratory-confirmed and 58 deaths have been reported. (Source: www.who.int)

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
I would like to acknowledge: –

Dr. Archana Aravindan
Microbiology Division
Biotechnology Division
IDSP
Outbreak Monitoring Cell (24 X 7)
12 AI lab under the IDSP lab network
at

National Centre for Disease Control

Pandemic Influenza A H1N1: How India Controlled?
National Centre For Disease Control
FETP Global Seminar
Improving Health Outcomes through Field Epidemiology Training, Surveillance, and Outbreak Response

Questions & Answers

To ask a question using your microphone:

Step 1: Raise your hand
In the participant panel, click on the hand button.

Step 2: Use your talk button
In the audio/video panel, click the talk button.

or

To ask a question using the chat box:

In the chat panel, type your question.
Thank you for attending!

Use the TEPHINET Learning Center to:

• Post a review
• Review the recording
• Download the PowerPoint
• Attend the next seminar: **Wednesday, January 15, 2014**
The Influenza Transmission Zones are geographical groups of countries © WHO 2011
Last updated: 2011-03-15
Global Influenza activities by Influenza Transmission Zone

Percentage of respiratory specimens that tested positive for influenza
By influenza transmission zone

Status as of week 45
03 - 09 November 2013

Note: The available country data were joined in larger geographical areas with similar influenza transmission patterns to be able to give an overview (www.who.int/influenza/surveillance_monitoring/updates/EN_GIP_Influenza_transmission_zones.pdf). The displayed data reflect reports of the stated week, or up to two weeks before if no data were available for the current week of that area.

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: WHO/GIP, data as of 20 November 2013.
Data used are from FluNet (www.who.int/flu), 11:30 UTC snapshot, from WHO regional offices and/or ministry of health websites.
Government of India revised the Guidelines on categorization of Influenza A H1N1 cases on 5th October 2009,

<table>
<thead>
<tr>
<th>Category</th>
<th>Presentations</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Patients with mild fever plus cough / sore throat (ILI)</td>
<td>Home isolation only</td>
</tr>
<tr>
<td>B</td>
<td>Category-A+ high grade fever and severe sore throat or High risk group</td>
<td>No testing but start treatment</td>
</tr>
<tr>
<td>C</td>
<td>Cat.B+ severe sign/symptoms or worsening of chronic conditions (SARI)</td>
<td>Hospitalization, investigation and treatment</td>
</tr>
</tbody>
</table>

- **“SARI case definition” was used** as all the cases who underwent investigation were in Category C
## State-wise H1N1 Cases, 2009-13

<table>
<thead>
<tr>
<th>States</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Northern Region</strong></td>
<td></td>
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### Demographic Characteristics of Cases and Controls

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<th>Control (n=80)</th>
<th>OR</th>
<th>95%CI</th>
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### Table 6: Delay in Care of Cases and Controls

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DOA= Date of Admission
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