

Vol 57 / Issue 3 / Jul-Sep 2013

# Indian Journal of Public Health

Official Publication of The Indian Public Health Association



Online full text at [www.ijph.in](http://www.ijph.in)

**Conference Issue**

**57<sup>th</sup> All India Annual Conference, 2013**

## Descriptive Epidemiology of Novel Influenza A (H1N1), Andhra Pradesh 2009-2010

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### Abstract

**Background:** The first case of pandemic Influenza A (H1N1) in India was reported from Hyderabad, Andhra Pradesh on 16<sup>th</sup> May 2009. Subsequently, all suspected cases seeking treatment from A (H1N1) treatment centers and their contacts were tested. Laboratory confirmed cases were hospitalized and treated with antivirals according to national guidelines. We reviewed the surveillance data to assess the morbidity and mortality due to A (H1N1) in the state of Andhra Pradesh (population-76,210,007) during the period from May 2009 to December 2010. **Materials and Methods:** We obtained the line-list of suspected (influenza like illness as per World Health Organization case definition) and laboratory confirmed cases of A (H1N1) from the state unit of integrated disease surveillance project. We analyzed the data to describe the distribution of case-patients by time, place and person. **Results:** During May 2009 to December 2010, a total of 6527 suspected (attack rate: 8.6/100,000) and 1480 (attack rate: 1.9/100,000) laboratory confirmed cases were reported from the State. Nearly 90% of the suspected and 93% of the confirmed cases was from nine districts of Telangana region, which includes Hyderabad. Nearly 65% of total confirmed cases were reported from Hyderabad. The attack rate was maximum (2.6/100,000) in the age group of 25-49 years. The cases peaked during August-October. 109 case-patients died (Case fatality ratio: 7%) and most (80%) of these patients had comorbid conditions such as diabetes (24%), chronic obstructive pulmonary disease (20%), hypertension (11%) and pregnancy (11%). Case fatality was higher (16%) among patients who were older than 60 years of age compared with other age groups. **Conclusions:** In Andhra Pradesh, H1N1 transmission peaked during August-October months and predominately affected adults. Case fatality was higher in patients older than 60 years with comorbid conditions.

**Keywords:** Andhra Pradesh, H1N1, Mortality

### Introduction

Influenza is caused by a highly infectious respiratory virus with a potential to rapidly spread in susceptible host.<sup>1</sup> In April 2009, a novel strain of Influenza A (H1N1) virus, which is antigenically and genetically unrelated

to human seasonal influenza virus was identified in Mexico.<sup>2-4</sup> Compared with previous pandemics of this century, Influenza A (H1N1) has high transmission ability but low virulence.<sup>5</sup> However, it can cause severe complications such as pneumonia resulting in respiratory failure, acute respiratory distress syndrome, multi-organ failure and death.<sup>1</sup> In late April 2009, the World Health Organization (WHO) declared the emergence of this virus as a “public health emergency of international concern” and on June 2009, raised the phase of pandemic alert to six, indicating the beginning of the new pandemic.<sup>6</sup> As of 27<sup>th</sup> December 2009, world-wide more than 208 countries and overseas territories or communities had reported laboratory confirmed cases of influenza A (H1N1), including 12,220 deaths.<sup>7</sup> In WHO Southeast Asia region 41,513 cases of A (H1N1) virus and 573 deaths were reported as of October 2009. The case fatality rates in the USA and United Kingdom (UK) was in the range of 0.1-0.2%.<sup>8</sup>

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Website: <a href="http://www.ijph.in">www.ijph.in</a>	Quick Response Code: 
DOI: 10.4103/0019-557X.119836	

The first confirmed case of A (H1N1) in India was reported on 16<sup>th</sup> May, 2009. The patient was a passenger who travelled from USA to Hyderabad.<sup>9</sup> Thereafter, community transmission was reported from many parts of the country.<sup>10</sup> As per the national guidelines, pharyngeal or nasopharyngeal swabs were collected from the suspected case-patients and their close contacts for detection of the virus using real-time-polymerase chain reaction (RT-PCR) assay.<sup>11</sup> Only laboratory confirmed cases were provided with the antiviral treatment.<sup>12,13</sup> The Andhra Pradesh State health department identified treatment centers (nodal sites) across the State for isolation and management of suspected/confirmed pandemic influenza patients. A screening facility with thermal scanners was installed at the Hyderabad international airport to screen the inbound passengers flying into the country. In this paper, we describe the descriptive epidemiology of A (H1N1) cases reported in Andhra Pradesh during May 2009 to December 2010.

## Materials and Methods

### *Study setting and design*

Andhra Pradesh ( $n = 76,210,007$ ) is one of the south Indian states.<sup>14</sup> We reviewed the surveillance data on influenza A (H1N1) cases, which occurred during May 2009 and December 2010. The State integrated disease surveillance project (IDSP) unit, Hyderabad, received information regarding all diseases including A (H1N1) from all the 23 districts in Andhra Pradesh.

### *Case definitions*

A suspected case of influenza like illness (ILI) was defined as the occurrence of acute febrile respiratory illness (fever  $\geq 38^{\circ}\text{C}$ ) with the onset within seven days of close contact with a person who is a confirmed case of pandemic influenza A (H1N1) virus infection or within seven days of travel to areas where there are one or more confirmed pandemic influenza A (H1N1) cases, or resides in a community where there are one or more confirmed pandemic influenza cases. A suspected case of ILI with laboratory confirmed influenza A (H1N1) virus infection in an accredited laboratory through RT-PCR<sup>11</sup> was considered to be laboratory confirmed case. Death due to A (H1N1) was considered when the infection was confirmed by laboratory testing, either before or after death. All the case-patients who were residents of Andhra Pradesh reported to IDSP from all districts of Andhra Pradesh, between May 2009 and December 2010 were included in the analysis.

### *Data source, collection and analysis*

Active and stimulated passive surveillance was set up through IDSP across all the districts in the state. Cases and deaths of A (H1N1) were notified to state surveillance unit using structured data collection tool developed by Ministry of Health and Family Welfare. Pharyngeal or nasopharyngeal swab samples of suspected case-patients were sent to Institute of Preventive Medicine (IPM) from all treatment sites across the state. The samples were processed and analyzed using RT-PCR assay in accordance with the National protocol.<sup>15</sup>

The surveillance data available at the state IDSP cell (abstract line list of all cases and individual death reports) and IPM (line list of all samples received) was collected, collated and reviewed. Death reports had information on demographics, results of laboratory tests for A (H1N1), cause of death, time course of illness (date of symptom onset, hospital admission, start of antiviral drugs), and underlying medical conditions. Only the death reports from July 2010 had complete details of underlying risk factors, on set and severity symptoms and treatment history, hence records pertaining to January-December 2010 were considered for analysis. We analyzed the data using EPI-Info (Version 3.5.3) software to calculate attack rates, case fatality ratio, distribution of cases and deaths by month of occurrence and frequency of presenting symptoms and known risk factors among A (H1N1) deaths.

## Results

### *Descriptive epidemiology of A (H1N1) cases*

During May 2009 to December 2010, a total of 6,527 (Attack rate: 8.6/100,000) suspected cases of A (H1N1) were reported. Of these, 1,480 (23%) samples were positive for A (H1N1) with an attack rate of 1.9/100,000 [Table 1].

The attack rate was higher among males (3/100,000) and those aged 25-49 years (2.6/100,000) [Table 1]. The number of reported cases peaked during August-October in both the years [Figure 1]. 90% of the suspected and 93% of the confirmed cases were reported from nine districts of Telangana region and 65% of the total confirmed cases were reported from Hyderabad district of Telangana region [Figure 2].

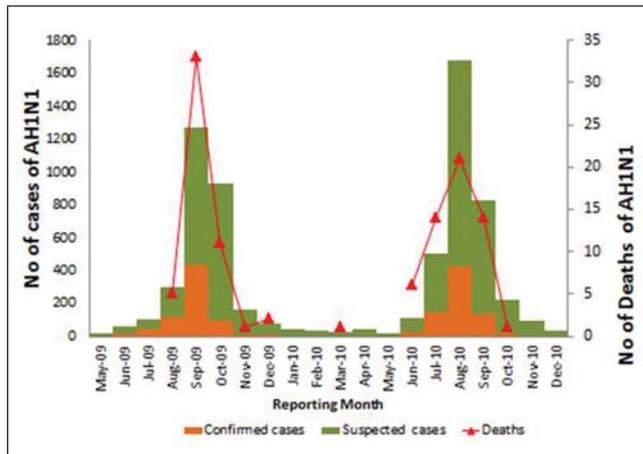


Figure 1: Cases and deaths of H1N1 reported in Andhra Pradesh, India-May 2009 to December 2010

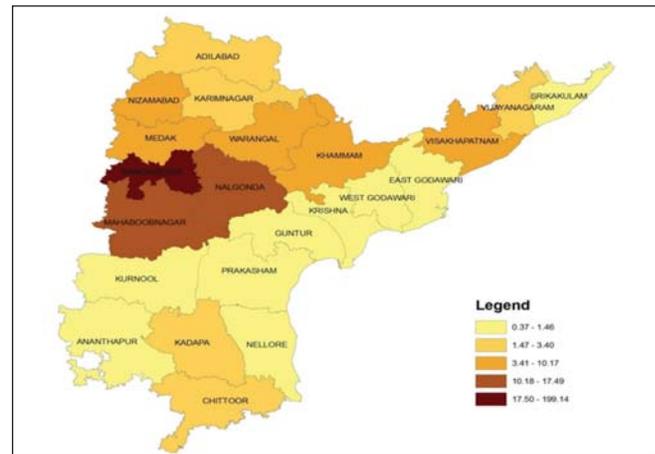


Figure 2: Attack rate of suspected cases of A (H1N1), Andhra Pradesh, May 2009 to December 2010

Table 1: Attack rate and case fatality rate of A (H1N1) by age and sex in Andhra Pradesh, India-May 2009-December 2010

Population groups	Cases	Deaths	2001 population	Proportion of cases (%)	Attack rate per 100,000	Case fatality ratio (%)
<b>Age</b>						
0-4	138	3	6684361	9	2.1	2.17
5-24	469	22	32230625	32	1.5	4.69
25-49	677	71	26199380	46	2.6	10.49
50-64	136	9	7511619	9	1.8	6.62
≥65	19	3	3450572	1	0.6	15.79
Not specified	41	1		3		2.44
<b>Sex</b>						
Male	775	55	26046326	52	3	7.10
Female	705	54	25765556	48	2.7	7.66
Total	1480	109	76210007	100	1.9	7.36

### Descriptive epidemiology of deaths due to A (H1N1)

A total of 109 laboratories confirmed influenza case patients died with a case fatality ratio of 1.7% among all the influenza case-patients reported and 7.4% among laboratory confirmed case-patients. About 3% of the patients who died were older than 60 years of age (Case fatality ratio: 16%). Of the total reported deaths, 73% were reported from nine districts of Telangana.

Of the total deaths that occurred during 2009 and 2010, data about clinical details was available only for 45 deaths that were reported during January 2010 and December 2010. Common symptoms among these case-patients included breathlessness (80%), high fever (58%), headache (38%), chest pain (22%), rhinorrhea (20%), sore throat (18%), vomiting (18%), sputum with blood (16%), diarrhea (7%) at the time of admission [Table 2]. Nearly 80% of the cases who died had a history of comorbid

Table 2: History of clinical symptoms and underlying medical conditions among those dying from Pandemic A (H1N1) in Andhra Pradesh during 2010 (N=45)

Clinical symptom	n	Percentage
Breathlessness	36	80
High fever	26	18
Headache	17	58
Chest pain	10	22
Rhinorrhea	9	18
Sore throat	8	16
Vomiting	8	20
Sputum with blood	7	7
Diarrhea	3	38
<b>Pre-disposing factors</b>		
Diabetes	11	31
COPD	9	25
Hypertension	5	14
Pregnancy	5	14
CHD	3	8
On cortisone therapy	2	6
HIV	1	3

COPD-Chronic obstructive pulmonary disease, CHD-Coronary heart disease, HIV-Human immunodeficiency virus

conditions such as chronic obstructive pulmonary disease (COPD) (21%), diabetes (24%), hypertension (12%) and pregnancy (12%), coronary heart disease (8%), Human immunodeficiency virus (2%), steroid therapy (4%). The median time taken for transportation of the sample to the lab was one day and the mean duration of admission was 5 days. Treatment with Ostealmavir was initiated in 36 cases (80%) and 41 (91%) were put on ventilators. About 20% of patients died on the same day of admission (within 12 h); hence, the treatment was not given. Nearly 80% of the 45 case-patients who died had a history of comorbid conditions.

## Discussion

The number of reported cases showed peaks during August-October. The attack rate was higher in the age group of 25-49 years. Case fatality rate was higher among patients who were older than 60 years of age compared with other age groups. Most of the patients who died had comorbid conditions.

The number of cases of pandemic influenza A (H1N1) infection in Andhra peaked during August to October in 2009 and 2010. Transmission of infection in various parts of India started around mid-June as in Andhra Pradesh.<sup>16</sup> In Eastern India, the transmission was highest in months of June-July in 2010<sup>10</sup> whereas, the transmission had just started in June 2010 in Andhra Pradesh.

The nine districts of Telangana region of the state accounted for the majority of the suspected (90%) and confirmed (93%) cases in the State. Hyderabad accounted for 65% of the total cases in the Telangana region. Large number of reported cases in Hyderabad is possibly due to the presence of International Airport where active surveillance was instituted, presence of designated laboratory and the highest number of tertiary hospitals in the state.

Attack rate of A (H1N1) was estimated at 1.9/100,000 population with male preponderance. Similar to the initial case reports of A (H1N1) observed in 2009 across other parts of India, infection was observed in all the age groups suggesting that the population does not have immunity to this virus.<sup>1</sup> Attack rate was highest in the age group of 25-49 years (2.6%) and lowest among >65 years (0.6%) age group as observed in USA, Canada and UK.<sup>15,17-20</sup> Higher attack rates in adults observed in Andhra Pradesh was consistent with other studies reported from India. Study by Shlomain *et al.* from Israel showed that age <65 years was an independent predictor for pandemic (H1N1) 2009 infection.<sup>21</sup>

Case fatality was estimated at 7/100 in Andhra Pradesh, which was equal in both the sex. Case fatality reported from India was estimated as 6%.<sup>17</sup> CFR was highest among the age group >65 years, which is similar to other studies documented across the globe.<sup>1,5,16,22</sup>

A total of 45 deaths (41%) occurred in 2010 of the total deaths during the pandemic. Death reporting in

2009 was incomplete. This phenomenon of incomplete reporting of mortality associated with H1N1 pandemic was observed world-wide.<sup>23</sup> Breathlessness and fever were the most common presenting symptoms among the reported deaths during initial hospitalization. Consistent with studies from India and other countries, fever was the most common symptom that patients with H1N1 have presented.<sup>19,20,24-26</sup> History of chronic illness was reported in 80% of the deaths at the time of admission. Diabetes was the most common comorbid condition with which the patient presented, which was similar to other studies.<sup>1,5</sup> India being diabetes capital, H1N1 patients presenting with Diabetes remain at higher risk and hence need to be monitored carefully.<sup>27</sup> In a cohort study, among 1479 laboratory-confirmed and hospitalized cases of pandemic A (H1N1) influenza in Canada, risk of severe outcome was found to be highest among patients with diabetes.<sup>27</sup> Similar findings were also reported by other investigators.<sup>28,29</sup>

### Limitations

Our study had certain limitations. First, we included laboratory-confirmed patients reporting to the state IDSP unit in the descriptive study. The designated laboratory is present in Hyderabad district of the Telangana region there may be under-reporting from other districts due to non-availability of laboratory facilities. Second, the line-list maintained at the district IDSP units did not have information about case categorization, as well as details of co-morbid conditions, including their BMI. Third the attack rates reported in this study could be an underestimate of the true population rate. The cases reported were mainly from the case-patients attending public sector hospitals. About 84% of the case patients in our study are from the public sector. Deaths that were reported during the second peak (2010) of the pandemic were only analyzed; hence, the estimates derived may either be an over or an underestimate compared with deaths in 2009.

## Conclusions

In Andhra Pradesh, the transmission of influenza A (H1N1) peaked during August-October months and affected individuals of all age groups with higher attack rates in those aged 25-49 and 0-4 years. Most of the cases were from Telangana (Ranga Reddy) region. The case fatality was higher in the elderly (>65 years) individuals. A history of chronic comorbid condition and presentation with pneumonia lead to poor outcomes and death.

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**Cite this article as:** Allam RR, Murhekar MV, Tadi GP, Udaragudi PR. Descriptive epidemiology of novel influenza A (H1N1), Andhra Pradesh 2009-2010. *Indian J Public Health* 2013;57:161-5.

**Source of Support:** Nil, **Conflict of Interest:** None declared.