

## **Research Article**

# **Epidemiology of Pandemic Influenza A (H1N1) 2009 in Western Rajasthan, India: A Retrospective Study**

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**Abstract:** H1N1 pandemic posed a serious threat to world health community and was a cause of serious concerns of various governments worldwide. The aim of the study was to study the Epidemiology of H1N1 in western Rajasthan from August 2009 to March 2010. This study was conducted in hospitals attached to Dr. S. N. Medical College, Jodhpur. This retrospective descriptive study analyse the month, age, sex and area wise distribution of all 686 confirmed cases of H1N1 in western Rajasthan from the month of August 2009 to March 2010. All suspected cases were confirmed by RT-PCR performed at Microbiology laboratory of Dr. S. N. Medical College, Jodhpur. 686 cases were confirmed positive with positivity ratio of 32.34%. 80. Out of 686 had expired with an overall case fatality rate of 11.69%. Maximum cases (50.72%) and deaths (60%) were seen during the month of December. Maximum cases (42.10%) and deaths (46.25%) were seen amongst the age group of 16 to 30. More cases were seen in males (54%) but more deaths had occurred in females (64%). More cases were reported from urban area (60%), but mortality was higher in patients of rural area (62.5%). The mortality rate among pregnant women with H1N1 infection was significantly very high (24.03%). The incidence and mortality from H1N1 in western Rajasthan was significantly higher in young. H1N1 influenza can cause severe illness and death in pregnant and postpartum women.

**Keywords:** H1N1, Pandemic Influenza, Epidemiology, Pregnant, Postpartum women

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## **INTRODUCTION**

H1N1 is a novel strain of Influenza A virus that evolved by genetic reassortment. Following its emergence in March 2009 in Mexico, the H1N1 virus spread rapidly throughout the world<sup>1</sup>. The WHO declared H1N1 as a pandemic on 11th June, 2009 [1]. The disease started in India in May 2009 and the first laboratory-confirmed case was reported from Hyderabad on 16<sup>th</sup> May [2]. Soon the disease spread to other parts of the country.

The state of Rajasthan, which is the largest state in India, reported its first case of H1N1 infection on 23<sup>rd</sup> July 2009 [3]. Soon the disease spread to other parts of the state. The pandemic influenza A (H1N1) started in the western part of Rajasthan in August 2009 and lasted until April 2010. A large number of H1N1 cases (584 cases) and deaths (80 deaths) have been reported during this pandemic. The Western Rajasthan region of India was worst hit during this pandemic of H1N1 in year 2009-10.

This study is aimed to give an idea regarding the epidemiological trends of the H1N1 diseases in western

Rajasthan during H1N1 pandemic 2009. As there are very limited studies relating to Influenza A H1N1 and its epidemiology in the Indian situation, We carried out a retrospective descriptive study, in order to study the epidemiologic profile of patients found positive for Influenza A H1N1 in Western Rajasthan during H1N1 pandemic 2009.

Information from this study can be used to quantify severity and develop mathematical models to predict how flu outbreak affects and different interventions may be taken. Knowledge about patient will help public health decision-makers plan and respond to future pandemic.

## **MATERIALS AND METHODS**

In this study we retrospectively studied all suspected as well as confirmed cases of swine flu which occurred in the Western Rajasthan during H1N1 pandemic 2009. A complete data of all the patients visiting swine flu OPDs, swine Flu wards and screening centre were maintained from the month of August after diagnosis of first case of H1N1 pandemic in Western Rajasthan. Each patient visiting either the swine flu OPD or the swine

flu ward, who was suspected clinically to be H1N1 positive was placed in one of three categories according

to the guidelines provided by Ministry of Health and Family welfare in August, 2009 [2].

They were as follows:

Category A	Mild fever plus cough / sore throat with or without bodyache, headache, diarrhea and vomiting. No testing for H1N1 is required in such patients
Category B	<ol style="list-style-type: none"> <li>i. Above signs and symptoms plus high grade fever and severe sore throat</li> <li>ii. Addition of above symptoms and signs plus one or more of the following conditions: <ul style="list-style-type: none"> <li>• Children less than 5 years</li> <li>• Pregnant women</li> <li>• Age above 65 years</li> <li>• Having lung, heart, liver or kidney diseases, blood disorders, diabetes, neurological disorders, cancer and HIV</li> <li>• Long term cortisone</li> </ul> </li> </ol>
Category C	In addition to symptoms and signs of A and B if patients have one or more of the following: <ul style="list-style-type: none"> <li>• Breathlessness, chest pain, drowsiness, low BP, sputum mixed with blood, bluish discoloration</li> <li>• Irritability among small children, refusal to accept feeds</li> <li>• Worsening of underlying chronic conditions</li> </ul>

Only those patients who fell in category C were subjected to viral isolation tests, while category B and Category A individuals were empirically given Oseltamivir and Azithromycin respectively, and were not included in the study.

During H1N1 pandemic 2009, in Western Rajasthan, 2121 clinically suspected patients (category C) were tested for H1N1, of which 685 were found to be H1N1 positive. All these positive cases (685) are then classified according to their age, gender, location, duration of admission and their final clinical outcome. Data were analysed using statistical SPSS software version 20.

## RESULTS

Flu-like illness was reported by 10608 patients, but testing for H1N1 using real-time reverse-transcriptase-

polymerase-chain-reaction (RT-PCR) assay was done in only those patients who fell in category C (2121 out of 10608 patients, 20%). Out of all these suspected 2121 individuals, who turned out positive were 686 while 1435 turned out negative. Total percentage of positivity of samples was 32.34 % (686 out of 2121).

The number of individuals suspected as well as confirmed to be H1N1 peaked during the months of November to February with maximum number of suspected and confirmed cases during December where 812 (38% of all suspected) were suspected and of them 348 (50.72% of all positive) were tested positive. The maximum case positivity was seen during the month of November, where 44.18% of all suspected turned out positive (Table 1).

**Table 1: Month wise distribution of Pandemic (H1N1) 2009 cases and deaths in Western Rajasthan (2009-10)**

Month (yr)	H1N1 Suspected	H1N1 Cases	H1N1 Deaths
Aug 2009	10	02	00
Sept 2009	07	02	01
Oct 2009	24	04	04
Nov 2009	430	190	14
Dec 2009	812	348	48
Jan 2010	437	85	13
Feb 2010	359	55	00
Mar 2010	42	00	00
Total	2121	686	80

From table 2, it can be seen that, 422(61.51%) cases were seen amongst the young age group of 16 to 45 years. While 177 (25.87%) and 87 (12.71%) cases were seen in age group of less than or equal to 15 years and greater than 45 years respectively. More Cases were

seen in Male (372 cases, 54%) as compare to Female (314, 46%). Males were more affected than females in the age group of 0-15 years and 46-60 years. Distribution of cases remained almost equal for both sexes in other age groups (Table 2).

**Table 2: Age and Sex wise distribution of Pandemic (H1N1) 2009 cases and deaths in Western Rajasthan (2009-10)**

Age Groups (Years)	Male		Female		Total	
	H1 N1 Cases	H1N1 Deaths	H1 N1 Cases	H1 N1 Deaths	H1 N1 Cases	H1N1 Deaths
0-15	109	3	68	4	177	07
>15-30	141	9	149	29	290	37
>30-45	70	12	62	13	132	26
>45-60	40	4	25	3	65	07
>60	11	1	11	2	22	03
Total	372	29	314	51	686	80

More Cases occurred in urban area (414 cases, 60%) as compare to rural area (272, 40%). Out of 686 total positive cases 80 had expired with an overall Case Fatality Rate of 11.66%. Most of the patients who

eventually succumbed to the disease, succumbed within 1 to 3 days of admission (42%). Case fatality rate were significantly higher in rural area (18.38%) as compare to urban area (7.24 %) (P value <.0001) (Table 3).

**Table 3: Area Wise Distribution of Pandemic (H1N1) 2009 cases and deaths in Western Rajasthan (2009-10)**

Area	H1N1 Cases (%)	H1N1 Deaths (%)	CFR (%)
Urban	414 (60.35)	30 (37.50)	07.24
Rural	272 (39.65)	50 (62.50)	18.38
Total	686 (100.0)	80 (100.0)	11.66

Overall, the maximum deaths were seen in month of December.48 out of 348 cases had expired with a case fatality rate of 13.79% during that month (Table 1).

Maximum deaths (37 deaths) were seen in age group (16-30 years) with case fatality rate of 12.75%. The case fatality rate in children less than or equal to 15 years and elderly above 45 years is 3.95% and 11.49% respectively (Table 2).

The number of men and women succumbing to the disease are 29 (36%) and 51 (64%) respectively. Case fatality rate was significantly higher in females (19.10%) as compare to males (9.96 %, p value <0.001)

Mortality rate of H1N1 influenza was found to be very high (24.03%) in pregnant women than the overall mortality (11.66%) (Table 4).

**Table 4: Pandemic (H1N1) 2009 Infection and Pregnancy in Western Rajasthan (2009-10)**

	Cases	Deaths	CFR(%)
Pregnant	104	25	24.03
Non-Pregnant	210	26	12.38
Total	314	51	16.24

## DISCUSSION

Pandemic H1N1/09 virus is a novel strain of influenza A which derived originally from a strain that lived in pig. Virus first evolved around September 2008 and circulated in the human population for several months before the first cases were identified. Following its emergence, H1N1 virus spread rapidly throughout the world. The virus spread in such a manner that on June 11, 2009, WHO declared a Pandemic Alert level of six[1]. The disease started in India in the month of May 2009. Soon the disease spread to other parts of the country. The first case in the state of Rajasthan was seen much later on July 23, 2009. From that date onwards there is steep rise in the cases as well as mortality in the state. A large number of H1N1 cases and deaths had occurred in the western part of state. The present study based on the retrospective study of all

confirmed cases of H1N1in western Rajasthan from month of August 2009 to March 2010.

It was observed that more cases occurred in male (54%) as compare to female (46%). A Puvanalingam et al (2010) in their study in two government hospitals in Chennai also observed similar finding [4]. The males being the one who more exposed to the environmental virus and in contact with higher people are affected more than their female counterparts. The seasonal influenza A virus is believed to affect the individuals in extremes of ages, but this H1N1 strain is believed to affect the younger individuals more. In our study maximum number of cases (61.51%) occurred in age group of 16-45 years which clearly reflects its high prevalence, morbidity and mortality among the younger population. This is similar to that reported in other study [5-9]. The likely reason may be the higher

immunity of younger individuals. Higher immunity is associated with a robust immunological response and cytokine storm making the disease to be clinically apparent.

The suspected as well as confirmed cases rose during the winter months of December, January and February. As H1N1 is a viral disease that spreads via aerosols, the disease was expected to rise in winter months. With the fall in temperature during the winter months the spread of the disease via aerosols like any other influenza strain and like other respiratory viruses increased steeply so that 28% of all suspected and 37.9% of all positive were seen in the month of January itself.

It was observed that in our study case fatality rate of H1N1 was 11.69%, which is higher than that reported from other parts of world (0.3%-0.4%).<sup>7</sup> In contrast, A Puvanalingam et al (2010) in their study observed case fatality rate of H1N1 was only 1.8% and Tanvir Samra et al (2010) in their study in tertiary care hospital in Northern India reported case fatality rate of H1N1 was 5% [4,6].

It was observed that in our study, males were affected more than females but mortality was significantly higher (Case fatality rate =19.10%, p value <.001) in females as compare to males. This is similar to that reported in other study [4-6,10]. This indicating not only a late referral but also the severity of disease being more in women, especially, pregnant women.

Maximum deaths were reported in younger age group, 16-30 years. Case fatality rate was similar to overall case fatality rate (11.69%) in those above 45 years of age (11.48%). In contrast, Himanshu Rana et al (2010) in their study observed a very high H1N1 mortality in those above 45 years of age (case fatality of 26.8%) [10].

Case fatality rate was significantly higher in rural area (18.38%) as compare to urban area (7.24 % , p value <.0001).

In our study mortality of H1N1 influenza was found to be significantly high (24.03%) in pregnant women than the overall mortality. Similar to our analysis, A Puvanalingam et al (2010) in their study in two government hospitals in Chennai also observed the high mortality rate (25%, 3 out of the 12 case) among pregnant women [4]. Similar finding reported in other studies [11,12].

### Recommendation

Information from the present study can be used to quantify severity and develop mathematical models to predict how flu outbreak affects and different interventions may be taken. Knowing the different proportion of population infected in different age groups and proportion of those died will help public health decision-makers plan and respond to future

pandemic. Early interventions by means of screening of the vulnerable population for influenza like illness and providing prophylactic antiviral drugs to the suspected persons, specially to the women in reproductive age group.

Hygienic measures must be strictly followed to contain the spread of the virus and perhaps to avoid an epidemic. Our experience showed that if these measures are implemented quickly and correctly, even non-vaccinated individuals are able to effectively protect themselves. To avoid new epidemics and complications preventive measures should be started at the beginning of winter season.

### Future research

Why the morbidity and mortality is high in women specially in pregnant women needs further in-depth study.

### Limitation of study

Although patients in this study comprised a sizeable proportion of cases from Jodhpur and the adjoining districts of the Western Rajasthan , the findings of this study need to be carefully extrapolated and cannot be generalized to a large population. This is one of the limitations of our study. Secondly, we restricted our study to only hospital; therefore, many cases of Influenza A H1N1 may have been missed. Not being a community-based study, we may not be able to calculate the exact measures of epidemiology. Thirdly, regional geographical conditions have not been accounted for, which may have a significant impact on prevalence and morbidity. There may be a small number of cases that may have been missed out, although every attempt was taken to include all the cases, but this figure would not have been significant.

### CONCLUSION

The incidence and mortality from H1N1 in Western Rajasthan was significantly higher in young, more during the winter months. H1N1 influenza can cause severe illness and death in pregnant and postpartum women; regardless of the results of testing, prompt evaluation and antiviral treatment of influenza-like illness should be considered in such women.

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