



## Outbreak investigation of influenza A (H1N1) in Pali district, Rajasthan, India, June 2016

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### ABSTRACT

Influenza A (H1N1) caused 18,449 deaths globally in 2009-2010 and 3,907 deaths in India from 2009- 2013. Pregnant women are at high risk. In June 2016, a pregnant woman tested H1N1-positive in Bhildeva village, Pali district, Rajasthan. We investigated to confirm and describe the outbreak, describe case management and response, and to make recommendations for prevention and control. We analyzed H1N1 January 2014-May 2016 data. We defined a suspect case as fever and cough between 15 May-15 June 2016 in a Bhildeva village resident and conducted active surveillance by house-to-house survey. We reviewed medical records and interviewed index case's family. We compared and analyzed case management against government protocol. During January 2014- May 2016, Bhildeva village, Pali district had no H1N1 cases. We identified 21 suspect cases (attack rate: 6%); 13 (62%) were females, and 10 (47%) were relatives of index case. Median age was 22 years (range: 1-40 years). All had fever (21, 100%), cough (18, 86%), nasal secretion (6, 28%), head ache (5, 23%), body ache (2, 9%), and sore throat (1, 5%). All cases received prophylaxis, advised isolation, and demonstrated respiratory hygiene. Index case was a 24-year-old pregnant woman (23 week gestation, gravida 3) who received only one antenatal check-up at 12 weeks gestation. She initially visited two unqualified practitioners. Seven days after illness onset, she visited a private medical provider but died one week later. Three days before illness onset, she was exposed to a family member with respiratory illness. In June 2016, Pali district, Rajasthan had influenza A (H1N1) outbreak. Immediate response and case management as per protocol minimized transmission. Late diagnosis and management of high-risk index case probably contributed to death. Educate unqualified/qualified practitioners about detection, monitoring of symptomatic high-risk groups, and referral to reduce morbidity and mortality.

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### Introduction

Influenza A (H1N1) a subtype of influenza A resulting from triple re-assortant transmits through airborne droplets from person-to-person.[1-4]. With an incubation period of 1-4 days H1N1 is the most common cause of human influenza.[1-3] Symptoms of H1N1 are fever, cough, runny nose, sore throat, headache, body aches, fatigue, diarrhea, and vomiting. Influenza A (H1N1) virus began in Mexico and United States in 2009.[1-3] It rapidly spread to all continents and caused considerable human suffering and adversely impacted the economy worldwide.[1, 2] During 2009-2010, from various countries 18, 449 H1N1 deaths were reported.[1-3, 5] In April 2009, WHO declared emergence of H1N1, a public health emergency of international concern and in June 2009, raised the phase of pandemic alert to six, indicating the emergence of the new influenza pandemic.[1-5]

In India, the Integrated Disease Surveillance Programme (IDSP) closely monitors H1N1 across the country and declares an outbreak when one or more suspect case is laboratory confirmed in an area where no cases have been

reported in the past.[6] First confirmed case of pandemic influenza A (H1N1) was reported in on 13 May 2008.[3, 6] Till 2013, 58690 cases and 3907 deaths have been reported in the country.[6, 7] In Rajasthan, the first case of influenza H1N1 was reported in July 2009 in the state capital, Jaipur.[6] According to IDSP, till 2013 in Rajasthan there have been 5980 H1N1 cases and 537 deaths.[6, 7]

H1N1 surveillance in the country is complimented with interventions from national and state government to prevent transmission, morbidity, and mortality.[6] Vaccines, antiviral drugs (Tamiflu), as well as information and education are disseminated.[6] Consequently, incidence and fatality has reduced considerably; in 2012, only 343 cases and 60 deaths were reported.[6] [7]

Pregnant women, elderly, children, and immune compromised are at high-risk of H1N1. Studies from India and other countries indicate that pregnant women are disproportionately affected and have poorer outcomes compared to others.[8-14] It is known that pregnant women were more likely to be hospitalized, develop complications

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such as pneumonia, septic shock, acute respiratory distress, multi-organ failure, and death during the influenza pandemics of 1918, 1957, and 2009.[15-18]

On 2 June 2016, a pregnant woman from Bhildeva village, Pali district, Rajasthan tested positive for H1N1. IDSP announced the outbreak and district rapid response team (RRT) started the investigation. This article describes influenza H1N1 outbreak as well as case management and response in Bhildeva village, Pali district, Rajasthan. Recommendations for prevention and control are discussed.

### Methodology

We analyzed H1N1 data from IDSP weekly laboratory reports for year 2014, 2015 (week 1-52) and week 1-23 for year 2016 for Pali district, Bhildeva village and bordering villages: Raas and Bhawariya. IDSP weekly laboratory reports at district headquarter maintains a record of laboratory confirmed H1N1 cases and deaths every week. These reports were analyzed to confirm the outbreak.

We searched for H1N1 cases in all 49 houses among 357 residents of Bhildeva village. Suspect H1N1 case was acute onset of fever and cough between 15 May-15 June 2016 in a resident of Bhildeva village. Probable case was acute onset of high grade fever ( $>38^{\circ}\text{C}$ ) with cough, severe sore throat, breathlessness, chest pain, drowsiness, fall in blood pressure, and sputum mixed with blood, between 15 May-15 June 2016 in a resident of Bhildeva village. A laboratory confirmed H1N1 case was any probable case whose throat swab tested positive for H1N1 through real time reverse transcriptase polymerase chain reaction (RT-PCR) using the US Centers for Disease Control and Prevention protocol for influenza A (H1N1) between 15 May-15 June 2016. A team of five investigators: medical officer (1), nurse (2), and health volunteer (2) used an unstructured questionnaire for data collection. We expanded passive surveillance to schools, work sites, childcare centers and to the health facilities of neighboring village, Raas. Expanded passive surveillance included reporting of cases of cough, cold with sore throat to the Medical Officer, Bhildeva. Information related to recent human illness or death and mass gathering in village in past 15 days was solicited through key informant interviews. Case management (treatment and follow-up) information was collected from Medical Officer, Bhildeva.

We initiated investigation of the index H1N1 positive case, a pregnant woman from Bhildeva village, Pali district, Rajasthan, on 4 June 2016. Medical and laboratory records of the index case were reviewed at the health facilities where she was treated. In-depth unstructured interviews, in native language, were conducted with the family members of the index case and with the healthcare providers of the sub-center (Paliyawas) at Bhildeva village. During the interviews, questions related to exposure to potential risk factors such as travel history, contact with sick persons, and pregnancy care were asked.

We compared suspect and index case management against the Ministry of Health and Family Welfare (MOHFW) H1N1 case management protocol.[3, 19] Descriptive analysis was done using MS Excel.

### Results

Analysis of IDSP weekly laboratory reports (January 2014-week 23 of 2016) of Pali district and villages Bhildeva, Raas, and Bhawariya showed occurrence of H1N1 cases and deaths in this region of Rajasthan. In 2014, Pali district reported one case of H1N1 during week 14-26 (April-June); this case was not from Bhildeva, Raas, or Bhawariya village.

Total 75 cases and 20 deaths occurred in Pali district during week 1-26 (January-June) of 2015, however, none of the cases or deaths were from any of the three villages. Until week 23 (January-early June) of year 2016, three cases and one death were reported from Pali district. One case and one death reported during week 14-23 of year 2016 was the index cases from Bhildeva village. In 2016, there were no cases and deaths from Raas and Bhawariya villages. Review of H1N1 cases and death during 2014-16 confirm H1N1 outbreak in Bhildeva village, Pali district, Rajasthan.

Pali district RRT started active case search and prevention activities within 24 hours notification of H1N1 outbreak. During the house-to-house case search in Bhildeva village 21 suspect cases, none probable and laboratory confirmed H1N1 cases were found. Of the 21 suspect cases, 13 (62%) were females and median age was 22 years (range: 1-40, standard deviation: 12.98). The suspect cases had fever (21, 100%), cough (18, 86%), nasal secretion (6, 28%), head ache (5, 23%), body ache (2, 9%), and sore throat (1, 5%). Village attack rate was 6% and all 21 cases were found in four of 49 houses. About half (10, 47%) were relative of index case. No cases were found through enhanced passive surveillance from schools, work sites, childcare centers and health facilities of neighboring village, Raas during 4-15 June 2016. No human deaths or mass gathering was reported during May 2016 in the village.

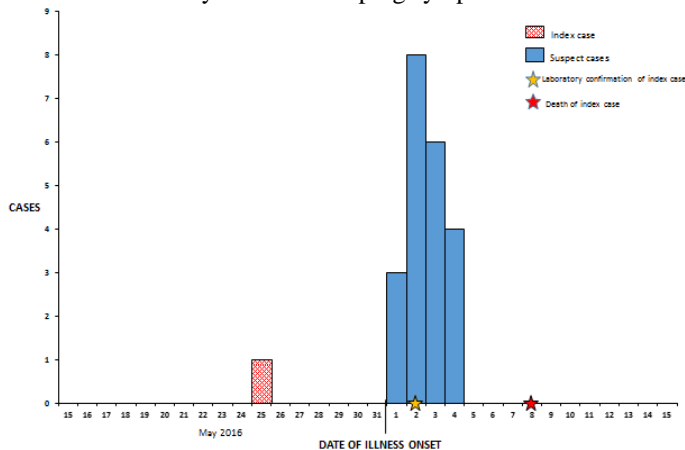
All (21) suspect H1N1 cases were given post-exposure prophylactic oseltamivir, were followed either until seven days or until symptoms resolved, were advised to remain in isolation till symptoms resolved, and were demonstrated hand hygiene for infection prevention. Suspect cases were managed as per MOHFW protocol.

Index case was a 24-year-old pregnant woman (gestation: 23 weeks; gravida: 3) from Bhildeva village, Pali district, Rajasthan. She is survived by two children (male: 1, 3 years old; female: 1, 1 year old). She lived in a large family of 30 members (males: 13; females: 17). Although, the primary occupation of the family is agriculture but her husband worked in a cement factory. She received first antenatal check-up at 12 weeks gestation on 11 February 2016 from the auxiliary nurse midwife of Paliyawas village. She was given one tetanus toxoid injection and hundred iron-folic acid supplementation capsules.

When index case developed fever and cough on 25 May 2016 she visited an unqualified practitioner in Raas village who prescribed her antibiotics (cefepodoxime and amoxicillin) and analgesics (ibuprofen) for three days. The unqualified practitioner also tested her negative for malaria. On 28 May 2016, she visited a private provider in Beawar city in Ajmer district as her symptoms persisted. Later, on 30 May 2016 she visited another unqualified practitioner in Raas village and continued treatment for two days. On 1 June 2016, when she met staff nurse at the community health center in Raas village with severe breathlessness she was immediately referred to the Jawaharlal Nehru Medical College and Hospital (JNMCH), Ajmer. On reaching Ajmer, she opted for in-patient treatment at a private hospital instead. A series of laboratory test (complete blood count, renal profile, liver profile, electrocardiography, echocardiography, ultrasound, and chest x-ray) were done on admission. Throat swab was collected on 2 June 2016 and was tested for influenza A (H1N1) using RT-PCR at the Department of Microbiology, JNMCH, Ajmer. Sample tested positive for H1N1. She was treated with antiviral drugs (oseltamivir) and ventilator

support at the private hospital for two days. On 4 June 2016 she was shifted to the isolation ward of the intensive care unit, JNMCH, Ajmer. On 8 June 2016, she died at this facility at 4.30 pm.

In-depth interview with the family of the index case revealed that three days before (22 May 2016) she reported sick, she made a day trip to Bhawariya village where she came in contact with a 60-year-old relative suffering from unusual respiratory illness. This relative was undergoing treatment at the Amrit Kaur Government Hospital, Beawar, Ajmer. The family did not report any other travel or arrival of visitors during 15-21 May 2016. Index case management when compared to MOHFW protocol revealed that she was high-risk and she received recommended diagnosis and treatment seven days after developing symptoms.



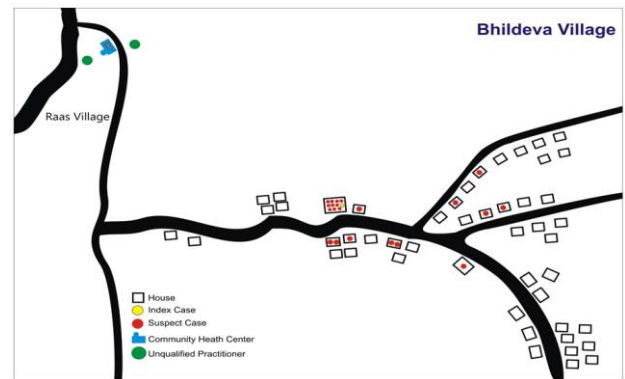
**Figure 1. Index and suspect influenza A (H1N1) cases, Bhildeva village, Pali district, Rajasthan, India, May-June, 2016 (N=22).**

## Discussion

Bhildeva village in Pali district, Rajasthan had influenza A (H1N1) outbreak in June 2016. Timely intervention by district RRT led to detection of suspect cases and minimized transmission. Adherence to H1N1 suspect case management protocol of MOHFW averted associated morbidity and mortality.[19] The high-risk index case received late diagnosis and recommended treatment from a competent healthcare provider which probably contributed to her death.

H1N1 cases and deaths in Pali district usually occur early in the year (January-June). We recommend active influenza A (H1N1) surveillance among high-risk population during first six month of calendar year. Both qualified and unqualified health practitioners as well as community members can be informed about the signs and symptoms of influenza A (H1N1). Pamphlets in local language that describe H1N1, signs and symptoms, referral facilities, and prevention methods can be distributed. Frontline healthcare workers need to monitor and screen symptomatic high-risk groups such as pregnant women, children, and elderly. They need to facilitate referral of high-risk groups to competent health facilities and providers. Our recommendations are consistent with those made by other investigators in India.[4, 11-13, 20]

The most important factor that affects the outcome in H1N1 remains early initiation of proper treatment during pregnancy.[3, 19] MOHFW recommends immediate antiviral treatment to pregnant women with suspect or confirmed H1N1 influenza preferably within 48 hours after onset of symptoms.[3, 19] Studies have shown that delayed initiation of antivirals can cause critical illness or death.[8, 10, 14]



**Figure 2. Index and suspect influenza A (H1N1) cases, Bhildeva village, Pali district, Rajasthan, India, May-June, 2016 (N=22).**

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