

Outbreak Investigation of Influenza in Pazaru VDC of Jajarkot District of Nepal

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ABSTRACT

Background: An outbreak investigation study was conducted in Pazaru, one of the initially affected Village Development Committees (VDCs) of the Jajarkot district in Nepal following an outbreak of respiratory illness in early 2015. The objectives of this study were to identify the cases and magnitude of the outbreak.

Methods: A cross-sectional study was carried out in mid-April 2015 covering five most affected wards of Pazaru VDC to assess the patients using standard case definition for Influenza like Illness (ILI). Throat and nasal swabs were collected and sent to the National Influenza Center (NIC) in Kathmandu for laboratory confirmation.

Results: The throat swab samples tested at NIC found Influenza A H1N1 pdm09. The attack rate was calculated to be 3% in ward number 9 and 41% in ward number 8. Wavelength of the infection was nearly two weeks in both the wards. Nearly 54% of the specimens were positive for Influenza A H1N1 pdm09. There was no ILI case fatality in the study area. Children aged 0-15 years were most affected. Majority of the patients presented with symptoms of fever, cough and sore throat.

Conclusions: Conclusions: There was gradual decline in the number of cases in all five wards suggestive of development of natural immunity in the community. True severity of the outbreak was not accurately reflected as compared to media reports.

Keywords: Influenza A H1N1 pdm09; influenza like illness; Jajarkot; Nepal; outbreak investigation; Patan Academy of Health Sciences.

INTRODUCTION

There have been number of influenza epidemics and deaths caused by different influenza viruses in the past decades. The most recent pandemic 2009 was caused by the Novel virus, standardized as the influenza A H1N1 pdm09 by WHO, which is quite different to the previous seasonal Influenza A H1N1 virus.^{1,2} The virus had two genes from flu viruses that normally circulate in pigs in Europe and Asia, a bird (avian) influenza gene and a human influenza gene.³⁻⁴

The latest outbreak in the region was in India in 2014 and early 2015 resulting 22,240 cases and 1198 deaths.⁵ In Nepal, the first influenza A H1N1 pdm09 case was detected in a person traveling from the United States

of America (USA).^{4,6} The virus has been responsible for increasing number of cases over the years. The peak of influenza is shifted towards spring from winter season.⁷

Jajarkot is one of the most remote and least developed hill districts of Nepal.⁸ Difficult geographical terrain, food deficit state as well as low awareness about health and hygiene among inhabitants have raised the district's vulnerability to morbidity and mortality by minor and curable diseases.⁸ The district has suffered from an outbreak of Cholera in may 2009, which later spread to nearby districts affecting 67000 people and claiming 371 lives.^{9,10}

During the first week of April 2015, unconfirmed reports of high numbers of acute respiratory

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illnesses (ARI) occurring in Jajarkot district due to an unknown cause but having symptoms like fever, cough, headache, bodyache and chest pain suggestive of influenza came out through different media. A team consisting of physician, public health and laboratory personnel was mobilized to Pajaru, one of the initial affected village development committees (VDCs) in the district, for the outbreak study. The major objectives of the study were to confirm the outbreak and identify the magnitude of the outbreak.

METHODS

A cross-sectional study was carried out in Pajaru VDC covering five most affected wards in mid-April 2015 for investigating the outbreak. The study adopted following methods:

Based on the media report of the outbreak of acute respiratory illness in Jajarkot, Epidemiology and Disease Control Division (EDCD), Department of Health Services mobilized an investigation team to the affected areas for investigation of outbreak and devising appropriate response. Accordingly, a team comprised of physician, public health and laboratory personnel from EDCD, Patan Academy of Health Sciences (PAHS) and NIC was mobilized to Pajaru. A standard case definition of Influenza like illness ('a person with sudden onset of fever $>38^{\circ}\text{C}$ (100.4°F) and cough or sore throat in the absence of other diagnosis' was considered as a case) was planned to be used to screen the possible Influenza A cases during field investigation.¹¹ Fever was measured and persons with history of fever within 7 days and under antipyretic were also considered to be counted as the case.

The team, upon arrival to Pajaru, reviewed the VDC and health facility data, gathered secondary information like total and affected population and their distribution by age and sex, geographical variations, ongoing services, etc and together with local health workers developed a field work plan.

The team organized two health camps covering most affected five wards of Pajaru VDC. One camp was organized in Tikachaur (Ward No. 9) for 2 days (12-13 April 2015) and other in a secondary school of Rintakura (Ward no. 8) for 4 days (14-17 April 2015), the latter also covered ward no. 4, 6 and 7. Assessment of Influenza like illness (ILI) cases was done using the standard case definition along with line listing of other patients. An index case was discovered. Throat and nasal swab (of children) were collected and sent immediately to the NIC for laboratory confirmation. The verbal autopsy was

also taken from close contacts including mothers of two neonates reported dead recently during the outbreak in ward 4 and 5.

Sterile viral transport medium was used to keep throat and nasal swabs of the cases, which were then transported under the cold chain to the NIC in Kathmandu. Samples were tested for confirmation of Influenza A H1N1 pdm09 by Reverse Transcriptase Polymerase Chain Reaction (RT-PCR). Besides, throat specimens of 5 people, exposed with two cases of neonatal deaths reported during the field study period at Pajaru, were also taken and sent for RT-PCR.

Data of patients visiting the camps were collected using the ILI form used by NIC/PAHS Data entry was done using Microsoft Excel (version 2010) and descriptive statistics were calculated.

Wavelength was calculated as the duration between rise and fall in the number of ILI cases. Attack rate was calculated.

Ethical approval (Reg.no. 382/2016) was received from Nepal Health Research Council (NHRC)

RESULTS

Pajaru is one of the 30 VDCs situated centrally in the Mid-Western remote hill district of Jajarkot. Total population of VDC is 6362 (Females 3168, Males 3194) with under five age group (1553 people) being the largest, age-group 24-45 (1190 people) being the second largest and age group 75 and above (16 people) being the smallest.¹² According to the Population and Housing Census 2011, average family size is 5.76 and the sex ratio was 94.81.¹³ It is one of 11 VDCs in the district that faces high recurrences of acute food crisis.⁸

Attack rate of ILI was 3 to 41% and nearly 54% of the samples (7 out of 13) were positive for Influenza A H1N1 pdm09. The wavelength of Influenza A H1N1 in Tikachaur (ward number 9) was 2 weeks as both primary and index case had fallen ill from 28 March 2015. The number of cases decreased from April 10, 2015 and became usual by April 13, 2015 (Fig 1). Similarly, both the index and primary case were same in Rintakura (ward number 8) who had no exposure history and had fallen ill from 31 March 2015. Ward numbers 4, 6, 7 and 8 had wavelength of 17 days as the cases came to camp till April 17, 2015. The number of cases that came to the camp on 15th, 16th and 17th April, 2015 could be thought as usual since the proportion of affected population were less than 2% on a weekly basis.

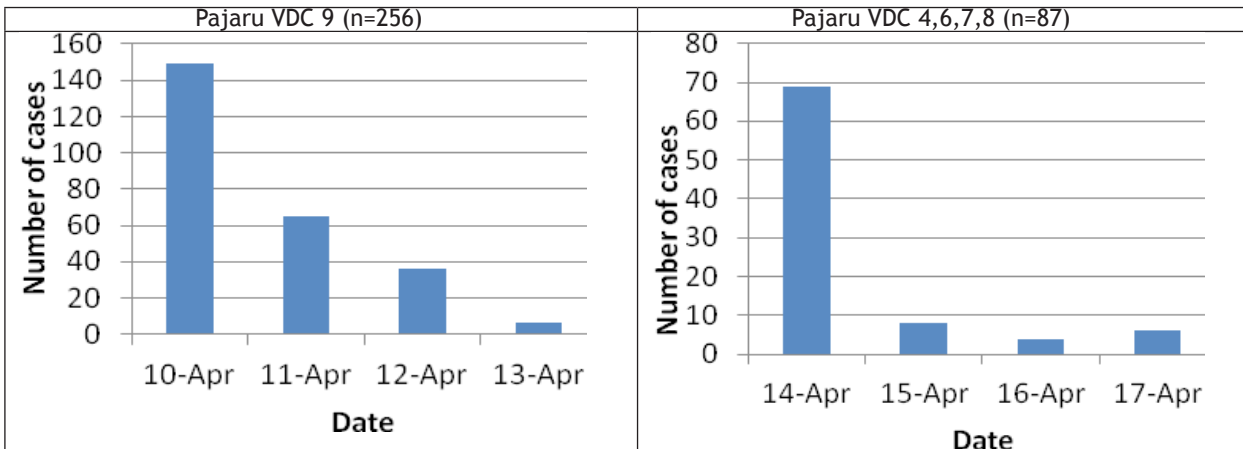


Fig 1. Incidence of ILI cases in Pajaru VDC during the outbreak

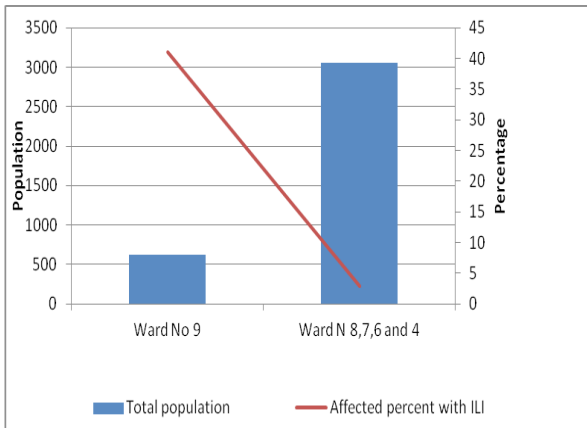


Fig 2. Attack rate of Influenza A H1N1 in Pajaru VDC

The number of cases on April 10 and April 14, 2015 was high as the camps were set from those days. The attack rate in ward number 9 was high (41.03%) compared to that in ward numbers 4, 6, 7 and 8 combined (2.83%) (Fig 2).

Proportion of positive specimens for Influenza A H1N1 in ward number 9 was 100% and in ward numbers 4,6,7,8 (combined) was 45.45% (Fig 3).

The gender distribution of Influenza like illness shows that male and female were almost equally effected in ward no. 9. The children (0 to 15 years) were affected more than the other age groups (Fig 4).

Majority of the patients presented with the symptoms of fever, cough and sore throat in both the health camps (Table 1).

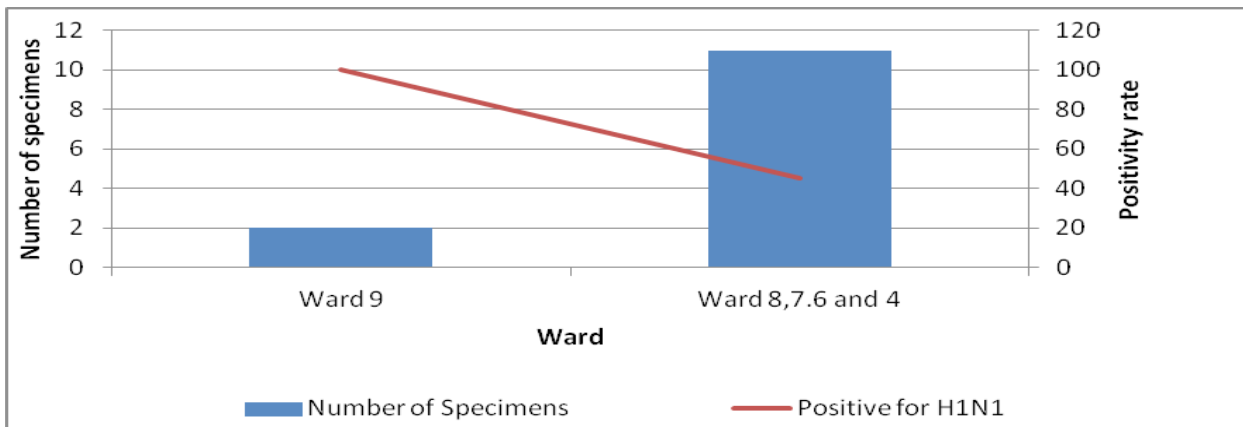


Fig 3. Specimen Positivity for Influenza (to be inserted by here)

There was no case fatality due to Influenza A H1N1 in the study area. Two neonatal deaths reported in wards 4 and 5 were ruled out because samples taken from 5 people to whom the neonates were exposed were negative for Influenza A and B. The verbal autopsy conducted there also indicated that they were already and during the period of neonatal deaths developed the symptoms of

ILI. The verbal autopsy conducted with the close contacts of the neonates including mother further revealed that the neonates had history of home delivery; there was absence of tetanus toxoid immunization to the mother during antenatal period and umbilical infections were present in the neonates.

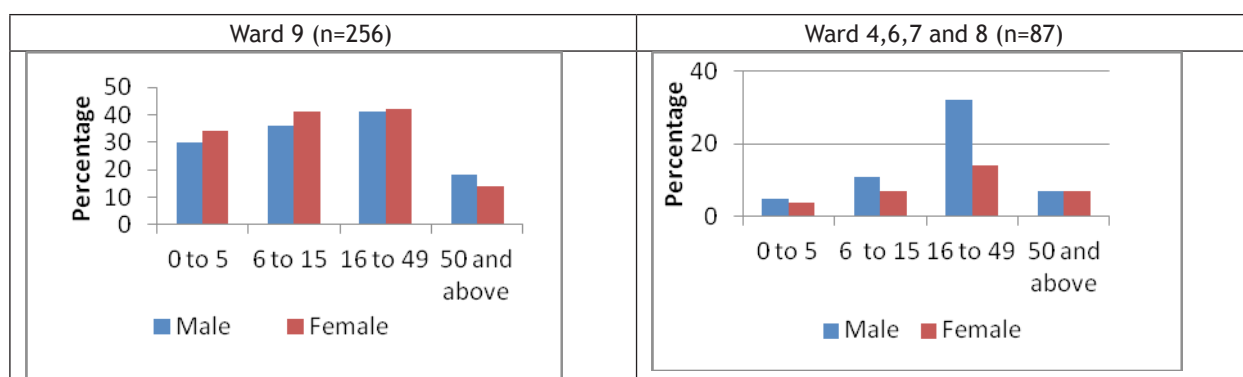


Fig 4. Age and gender distribution of ILI cases of Pajaru VDC

Table 1. Clinical Manifestations of ILI Cases in five wards of Pajaru VDC

Ward No. 9 (n=256)		Ward No. 4,6,7 and 8 (n=87)	
Symptoms	Percentage	Symptoms	Percentage
Fever	94.92	Fever	98.85
Cough	87.11	Cough	95.40
Sore throat	50.00	Sore throat	60.92
Chills	25.78	Chills	13.79
SOB	24.22	SOB	10.34
Myalgia	29.69	Myalgia	8.05
Diarrhoea	4.30	Diarrhoea	3.45
Vomiting	2.34	Vomiting	1.15
Bodyache	39.45	Bodyache	13.79
Rhinorrhoea	19.92	Rhinorrhoea	3.45
Death	0	Death	0

DISCUSSION

The attack rate of Influenza A H1N1 pdm09 in different wards of Pajaru VDC of Jajarkot district was found to be 3% to 41%. The wavelength was measured to be 14 days to 17 days. Nearly 54% of the samples (7 out of 13) were positive for Influenza A H1N1 pdm09 with 100% positive in ward number 9 as compared to only 45.45% in rest of the wards (4,6,7,8) combined. The children (0 to 15 years) were affected more than the other age groups. There was no case fatality due to Influenza A H1N1 in the study area.

The outbreak of influenza in India has raised the issue of mutation in the current circulating strain of the virus. Such mutation could lead to escape from neutralizing antibodies elicited by the current H1N1 vaccine component A/California/07/2009.¹⁴ Also, according to WHO Collaborating Centre for Reference and Research on Influenza, Tokyo, Japan, there seem to be two virus strains that have shown resistance to antiviral drugs. However, the health authorities of India have denied this possibility of mutation.³ The outbreak at Pajaru VDC of Jajarkot could have

been initiated by the migrant Nepalese workers who returned home from India. However, the primary and index cases of Pajaru VDC had no history of migrant labor in India and the samples have not been sent to the reference laboratory for genetic sequencing yet. Another possibility of the initiation of the outbreak could have been the School Leaving Certificate (SLC) examination in Nepal during the third week of March 2015, where many students sit closely to one another for almost a week. Similar finding has been suggested by another study on Jajarkot influenza outbreak 2015.¹⁵ Children aged up to 15 years were more affected in this study because they have very low immunity from previous infection. However, another study done in 2015 reported of majority positive cases among economically productive age group.¹⁵ Such differing findings may be due to difference in population composition among the district and Pajaru VDC.

Getting infected with any influenza virus, including 2009 H1N1, causes the body to develop immune resistance to that virus so it is unlikely that a person would be infected with the identical influenza virus

more than once. However, people with weakened immune systems might not develop full immunity after infection and might be more likely to get infected with the same influenza virus more than once.³ This could have been the reason for gradual decline in the number of ILI cases in Pajaru VDC. Similar pattern was also observed in the neighboring VDCs affected during the outbreak in the following weeks based on the conversation with the District Health Office. During the health camps, preventive measures such as maintaining hand hygiene, covering nose and mouth during sneezing and coughing, avoiding large gathering and maintaining a distance of one meter during conversation with people were stressed upon to the community.

The attack rate was high in ward number 9 because the human residence was dense and people lived closely to each other. But the attack rate in ward number 4, 6, 7 and 8 was low because the area is huge and human residence is more scattered. Regarding the secondary attack rate of Influenza A H1N1 Virus in several states of US in household contacts for acute-respiratory-illness (ARI) was 18 % to 19% and 8% to 12% for ILI.¹⁶ The difference of attack rate in Pajaru VDC could be due to differences in human settlement, human behavior during the outbreak and climate (temperature and humidity). Sample Positivity rate during Influenza season or Influenza Peak in Nepal from 2011 to 2014 is found to be between 35 to 55%⁴ Total sample positivity in the outbreak of Pajaru VDC was 53.8% which is comparable to national seasonal positivity rate.

There was no case fatality due to Influenza A in Pajaru VDC during the period of study. Although the media reported three deaths in Pajaru VDC, none were directly attributable to Influenza. Two neonatal deaths in the study area were ruled out of influenza as the samples collected from five close contacts tested negative. Further, the history from verbal autopsy suggested the cause of two deaths to be most likely due to neonatal sepsis. Another death reported in an adult had signs and symptoms suggestive of rabies following jackal bite. The severity of a particular flu virus strain can be better understood by an effective surveillance system.³ The role of media is particularly important in the beginning of the outbreak, to create an informed public so that they are well informed and equipped to protect themselves.¹⁷ In this outbreak, the media did not seem to reflect the severity of the illness accurately creating panic in the community. Likewise, the unavailability of trained health personnel in sanctioned posts as well as inadequate preparedness and low capacity of the

district health system to respond to such outbreak could be noted, as also reported by other researchers.¹⁵

CONCLUSIONS

People in the community need to change their behavior related to hand washing, social distancing and respiratory etiquette as preventative measures during the period of outbreak. We should not panic until there is substantial evidence regarding the mutation and virulence of Influenza A H1N1 virus. The capacity of the district health system's preparedness needs to be strengthened so as to better response to such outbreak in future.

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