Research Article

Epidemiological and virological characterization of influenza A virus subtype H1N1 at tertiary-care hospital, Ahmedabad

Nidhi Barot, Mahendra Vegad, Sumeeta Soni, Lavanya Devi V, Vibhuti Patel

Department of Microbiology, BJ Medical College and Civil Hospital, Ahmedabad, Gujarat, India.
Correspondence to: Nidhi Barot, E-mail: Nsbnidhi208@gmail.com

Received June 8, 2015. Accepted July 10, 2015

Abstract

Background: In April 2009, a new strain of influenza virus, A H1N1, started to spread in various parts of the world, and the first case was reported on May 16, 2009.[1] The associated morbidity and mortality have made it a major health burden. In this study, we have investigated samples of patients with suspected influenza-like illnesses (ILIs) received at civil hospital, Ahmedabad, from January 1, 2015 to March 15, 2015.

Objective: To study the epidemiologic and virologic profiles of patients found positive for influenza A H1N1 at a tertiary-care hospital.

Materials and Methods: Nasopharyngeal and oropharyngeal swab specimens from patients presenting with ILI were received and subjected to real time RT-PCR (rRT-PCR) for detection and characterization of swine influenza and other seasonal influenza.

Result: Of the 6,197 specimens tested, 3,242 and 866 yielded swine H1N1 and seasonal influenza virus, respectively. Most specimens were received from children aged <10 years (22.8%). Among those with confirmed swine H1N1 infection, 1,679 (51.79%) were female subjects.

Conclusion: The high proportion of respiratory specimens positive for influenza A H1N1 was owing to higher transmissibility of H1N1 than other seasonal influenza viruses. The age distribution of cases of influenza A H1N1 infection suggests that children and young adults could be targeted for interventions to reduce transmission during an influenza pandemic.

KEY WORDS: H1N1, real time reverse transcriptase polymerase chain reaction (rRT-PCR) assay, tertiary-care hospital.

Introduction

Influenza A (H1N1) virus was identified in humans in Mexico and the United States in April 2009[2] and has since spread worldwide.[3] The transmissibility of the influenza A H1N1 virus was estimated to be higher than that of other seasonal influenza viruses.[4] Influenza A H1N1 infections have been primarily seen among young children, suggesting that they are the most vulnerable to infection.[5] In the clinical diagnosis of influenza, nucleic acid testing by reverse transcriptase polymerase chain reaction (RT-PCR) has widely replaced traditional virus culture owing to shorter turnaround time and increased sensitivity.[6] To limit community or hospital transmission, and to initiate antiviral therapy on time, the rapid detection of the virus in suspected cases remains crucial.[7] Most cases of H1N1 infection present as mild or subclinical pneumonia. With this background, this study was conducted to compare epidemiologic and virologic characteristics of H1N1-positive patients with those of uninfected and those of infected with other seasonal influenza viruses.

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.0806201522	

Materials and Methods

Laboratory confirmation of A (H1N1) influenza virus was made by taking two–oropharyngeal and nasopharyngeal swabs of persons suspected of having influenza-like illness (ILI) in accordance with the protocol from Centers for Disease Control and Prevention (CDC), as recommended by the WHO.[8]

Specimen Collection

Samples were received from patients with ILI admitted at civil hospital (OPD and indoor) and at the private health sector, which encompasses private clinics and hospitals. A total of 6,197 samples were received in universal viral transport media at 4°C with demographic and clinical details of each patient from January 1, 2015 to March 15, 2015.

Virus Detection

All the specimens were tested using the CDC real-time reverse-transcription polymerase chain reaction (rRt-PCR) protocol for detection and characterization of human and swine influenza virus.[8] This detection kit includes panels of oligonucleotide primers and probes for the identification of influenza A virus, seasonal subtype swine A and swine H1N1. For performing rRT-PCR assays, we extracted RNA from specimen using the QIAamp Virus RNA Kit (Qiagen). We performed the RT-PCR assays using a Qiagen RT-PCR kit as recommended by the manufacturer. Purified RNA was reverse transcribed and amplified, and reactions were first incubated at 50°C for 30 min, followed by 95°C for 10 min, then thermal-cycled for 45 cycles (95°C for 15 s, 57°C for 30 s for each cycle.).

Data Analysis

We recorded the demographic and clinical characteristics of patients with suspected and confirmed cases of H1N1 infection. The χ^2-test was used for analysis. *P* values of <0.05 were considered to be statistically significant.

Result

A total of 6,197 specimens were received from January 1 to March 15, of which 3,242 (52.31%) cases were confirmed positive for novel strain of influenza subtype H1N1, and 866 (13.97%) cases were positive for other seasonal influenza strain.

Overall, the majority of the specimens received (22.84%, 1,416 of 6,197) and the confirmed cases of H1N1 infection (21%) involved children aged < 9 years [Table 1]. Among patients with confirmed swine H1N1 infection, 1,679 (51.79%) were female subjects [Table 2].

The most common symptoms were cough (78%) and fever (77%), followed by sore throat (62%) and dyspnea (52%) in confirmed positive cases for H1N1 [Table 3]. Among patients admitted at civil hospital, Ahmedabad, a total of 1,377 samples were received from January 1 to March 15, 2015, of which 735 (53%) were positive for H1N1, and 180 deaths were reported. A case-fatality rate was reported to be 24%.

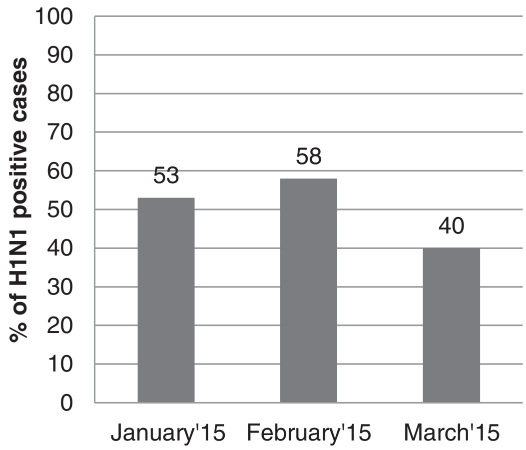

Figure 1: Prevalence of H1N1 infection cases January-March 2015.

Discussion

Although cases of H1N1 infection were reported throughout the year 2014, a peak was observed in March 2014. Suddenly, number of samples and positivity rate increased with an average of 55% in January–February 2015. The peak of the cases were reported in the month of January–February, the classical season of influenza [Figure 1]. As reported earlier, individuals aged 0–9 years accounted for the highest number of cases of H1N1 infection (21%). Thus, to reduce transmission during an epidemic, this population might be a key target for vaccination. The most common symptoms with which patients presented were fever, cough, sore throat, and difficulty in breathing. Among patients with confirmed swine H1N1 infection, 1,679 (51.79%) cases were female subjects.

Comparison with Other Studies

The outbreak predominantly affected the young age group (0–9 years). Similar studies conducted in Maharashtra and Delhi reported the most affected age group as 20–39 years.[12,13] The variance might be owing to a greater number of pediatric samples than other age group. The time of occurrence also corresponds to that of peak season of transmission.[14] The symptom distribution is also consistent with studies conducted in Kolkata, China, Saudi Arabia.[9,10,11] Our study revealed that female subjects encountered more frequent infections than male subjects, which may vary with different studies; however, there was no statistical difference in symptoms between swine H1N1 and other seasonal influenza infection.

Strengths and Limitations

High prevalence and mortality may be attributed to the study population restricted to a small geographical area.

Table 1: Age distribution among patients infected with swine H1N1 and other influenza virus

Age group (years)	Total sample, *n* = 6,197	A H1N1 positive, *n* = 3,242		Other influenza, *n* = 866		Negative, *n* = 2,089		Swine H1N1 vs. negative	Swine H1N1 vs. other influenza A
	No.	No.	%	No.	%	No.	%	*P*	*P*
0–9	1,416	695	21	201	23.21	520	24.89	0.003	0.26
10–19	428	163	5	75	8.66	190	9.1	0.001	0.001
20–29	864	448	14	125	14.43	291	13.93	0.9	0.6
30–39	813	483	15	107	12.36	223	10.67	0.001	0.05
40–49	779	447	14	102	11.78	230	11.01	0.002	0.1
50–59	861	513	16	112	12.93	236	11.3	0.001	0.03
60–69	613	315	10	91	10.51	207	9.91	0.8	0.4
70–79	309	132	4	33	3.81	144	6.89	0.001	0.7
≥80	114	46	1	20	2.31	48	2.3	0.01	0.06

*Considered statistically significant when $P < 0.05$.

Table 2: Sex distribution among patients infected with swine H1N1 and other influenza virus

Sex	Total sample, *μ* = 6,197	A H1N1 positive, *μ* = 3,242		Other influenza, *μ* = 866		Negative, *μ* = 2,089		Swine H1N1 vs. negative			Swine H1N1 vs. other infuenza A		
	No.	No.	%	No.	%	No.	%	OR	CI	*I*	OR	CI	*I*
Male subjects	3,169	1,563	48.21	467	53.93	950	45.48	1.11	0.99–1.2	0.05	0.7	0.6–0.9	0.002
Female subjects	3,028	1,679	51.79	399	46.07	1,139	54.52	–	–	–	–	—	—

*Considered statistically significant when $P < 0.05$.
OR, Odds Ratio; CI = Confidence Interval.

Table 3: Clinical symptoms analysis of patients infected with swine H1N1 and other influenza virus

Clinical symptoms	A H1N1 positive, *μ* = 3,242		Other influenza, *μ* = 866		Negative, *μ* = 2,089		Swine H1N1 vs. negative			Swine H1N1 vs. other influenza A		
	No.	%	No.	%	No.	%	OR	CI	P	OR	CI	P
FFever	2,522	77.79	610	70.44	1,665	79.7	0.9	0.7–1.02	0.09	1.4	1.2–1.7	0.01
SoCoughre Throat	2,028	62.55	494	57.04	1,381	66.11	0.9	0.7–0.96	0.01	1.2	1–1.4	0.003
CoSore throatugh	2,557	78.87	641	74.02	1,710	81.86	0.8	0.7–0.9	0.01	1.3	1.1–1.5	0.002
RhRhinorrheainorrhea	206	6.35	57	6.58	111	5.31	1.2	0.9–1.5	0.11	1	0.7–1.3	0.8
DDyspneayspnea	1,692	52.19	412	47.58	1,150	55.05	0.9	0.7–0.9	0.04	1.2	1–1.3	0.01

*Considered statistically significant when $P < 0.05$.
OR, Odds Ratio; CI, Confidence Interval.

Geographical conditions have not been accounted, which may have a significant impact on prevalence and morbidity.

Conclusion

It can be concluded from this study that the prevalence of influenza A (H1N1) is high in the month of January to March among children (0–9 years). The most common symptoms with which the patients presented were fever, cough, and sore throat.

Preventive interventions that can be used to reduce H1N1 transmission are H1N1 vaccination to priority groups such as school-going children and health-care and emergency medical service personnel; incorporation of infection control practices as a part of standard precautions; triage procedures and engineering controls that separate ill patients from the infected ones.

References

1. Kashinkunti MD, Gundikeri SK, Dhananjaya M. Study of clinical profile of patients with H1N1 Influenza in a teaching hospital of North Karnataka. Indian J Res Rep Med Sci 2013;3(3):53–5.
2. Centers for Disease Control and Prevention (CDC). *Update: Swine Influenza A (H1N1) Infection—California and Texas, April 2009*. MMWR Morb Mortal Wkly Rep. 2009 1;58(16): 435–7.

3. World Health Organization. *Pandemic (H1N1) 2009—update 64, 04, September 2009*. Geneva: WHO, 2009. Available at: http://www.who.int/csr/don/2009_09_04/en/index.html
4. Fraser C, Donnelly CA, Cauchemez S, Hanage WP, Van Kerkhove MD, Hollingsworth TD, et al. Pandemic potential of a strain of influenza A (H1N1): early findings. Science 2009;324(5934): 1557–61.
5. Dawood FS, Jain S, Finelli L, Shaw MW, Lindstrom S, Garten RJ, et al. Emergence of a novel swine-origin influenza A (H1N1) virus in humans. N Engl J Med 2009;360(25):2605–15.
6. Petric M, Comanor L, Petti CA. Role of the laboratory in diagnosis of influenza during seasonal epidemics and potential pandemics. J Infect Dis 2006;194(Suppl 2):S98–110.
7. World Health Organization. *WHO Guidelines for Pharmacological Management of Pandemic (H1N1) 2009 Influenza and other Influenza Viruses*. Geneva: WHO. 2009. Available at: http://www.who.int/csr/resources/publications/swineflu/h1n1_guidelines_pharmaceutical_mngt.pdf
8. Shu B, Wu KH, Emery S, Villanueva J, Johnson R, Guthrie E, et al. Design and performance of the CDC real-time reverse transcriptase PCR swine flu panel for detection of 2009 A (H1N1) pandemic influenza virus. J Clin Microbiol 2011;49(7): 2614–9.
9. Biswas DK, Kaur P, Murhekar M, Bhunia R. An outbreak of pandemic influenza A (H1N1) in Kolkata, West Bengal, India, 2010. Indian J Med Res 2012;135(4):529–33.
10. Li YQ, Qian Q, Fang LQ, Yang H, Wei MT, Gao Y, et al. Epidemiological characteristics of 420 influenza A (H1N1) cases confirmed in the early stage of the epidemic in mainland China. Zhonghua Liu Xing Bing Xue Za Zhi 2009;30(11):1102–5.
11. AlMazroa MA, Memish ZA, AlWadey AM. Pandemic influenza A (H1N1) in Saudi Arabia: description of the first one hundred cases. Ann Saudi Med 2010;30(1):11–4.
12. Gurav YK, Pawar SD, Chadha MS, Potdar VA, Deshpande AS, Koratkar SS, et al. Pandemic influenza A(H1N1) 2009 outbreak in a residential school at Panchgani, Maharashtra, India. Indian J Med Res 2010;132:67–71.
13. Choudhry A, Singh S, Khare S, Rai A, Rawat DS, Aggarwal RK, et al. Emergence of pandemic 2009 influenza A H1N1, India. Indian J Med Res 2012;135(4):534–7.
14. Centers for Disease Control and Prevention (CDC). *The Flu Season*. Available at: http://www.cdc.gov/flu/about/season/flu-season.htm

How to cite this article: Barot N, Vegad M, Soni S, Devi LV, Patel V. Epidemiological and virological characterization of influenza A virus subtype H1N1 at tertiary-care hospital, Ahmedabad. Int J Med Sci Public Health 2016;5:55-58

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