
ORIGINAL ARTICLE

An Epidemiological Study of Confirmed H1N1 Admitted Cases in an Infectious Disease Hospital, Pune

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Abstract:

Background: Pune was at the epicenter of Influenza A (H1N1) epidemic that struck the country during the middle of 2009. Initially all the persons with a positive PCR test for H1N1 were customarily admitted to the infectious disease hospital; but later on the facility for admission of severe category of patients was made available at two other hospitals in Pune city. *Objectives:* To know the epidemiological features of Influenza A (H1N1) during the initial stages of the epidemic. *Method and Materials:* All the patients admitted to the infectious disease hospital during June-October 2009 with a confirmed Influenza A (H1N1) PCR test were considered for the study. *Statistical analysis:* Mean, SD, Inter-quartile Range, Chi-square. *Results:* Less than 30 years comprised 87.6 percent and students were in majority (63.38 %) out of the total 284 patients studied. The mean duration of illness for H1N1 was 6.8 days (inter-quartile range of 5-8 days). The clinical picture was almost similar in both male and female patients. Co-morbid conditions were observed in 15.8 percent patients. The complication rate in patients with respiratory co-morbid conditions was significantly higher. Initially, the proportion of patients with history of for-

eign travel was high; later on their proportion decreased to a very low level while an increase in the proportion of patients with history of contact with a known H1N1 patient was observed as the epidemic progressed. Nearly half of the families had not taken Oseltamivir chemoprophylaxis while 35.6 percent patients were administered Oseltamivir within 48 hrs of starting of symptoms. There was no mortality in the patients studied. *Conclusions:* A study of 284 confirmed cases of Influenza A (H1N1) in Pune city showed epidemiological features of the disease such as age, gender, history of contact, foreign travel, co-morbidity and complication rate and the oseltamivir prophylaxis.

Key words: Influenza A(H1N1), Swine-flu, Oseltamivir chemoprophylaxis

Introduction:

Influenza is a major threat to health throughout the world, causing substantial illness and death each year [1]. The 2009 flu pandemic is a global outbreak of a new strain of Influenza virus identified in April 2009 and commonly referred to as “Swine Flu” caused by Influenza A (H1N1) virus. The first case of this disease was reported in Mexico on 18th March, 2009. Subsequent international spread led World Health Organization (WHO) to declare pandemic Phase-6’

for this Novel influenza on 11th June, 2009 [2]. Influenza A (H1N1) has high risk of transmission (20%-30%) and affects mainly young and healthy adults (20-60 yrs) [3]. Presentation of Influenza A (H1N1) varies from asymptomatic infection to serious complicated illness that may include exacerbation of other underlying condition and severe viral pneumonia with multi-organ failure and death [3]. There is also concern that the virus could mutate later and become more virulent and less susceptible to any new vaccine.

As of 23rd July 2010, more than 214 countries and overseas territories or communities worldwide have reported laboratory confirmed cases of pandemic (H1N1) 2009 influenza virus infection, including at least 18,366 deaths [4]. The first case of Novel Influenza A (H1N1) in India was reported on 11th May 2009 from Hyderabad [5]. A recent spurt of 1147 cases and 75 deaths has been observed in the occurrence of H1N1 in the country this year; again Maharashtra has borne the brunt of the problem with 497 cases and 23 deaths [6]. Since the start of the epidemic, Maharashtra state has reported 11935 confirmed cases with 967 deaths due to H1N1 out of the total 49544 cases and 2891 deaths respectively in the country till 29th April 2012 [6]. The panic started with first death due to H1N1 on 3rd August, 2009 in Pune city. So far a total of 2,375 & 551 confirmed cases of H1N1 have occurred in the twin cities of Pune and Pimpri-Chinchwad while 188 & 47 deaths have been reported from these two cities respectively [6].

The present study was taken up to know the epi-

demiological features of confirmed Influenza A (H1N1) patients during the initial stages of the epidemic.

Material and Methods:

Infectious Diseases Hospital, (IDH), Pune is a 60 bedded infectious disease hospital of Pune Municipal Corporation situated in the centre of city with indoor as well as outpatient facility. This is a hospital record based study conducted on confirmed H1N1 patients admitted to this hospital during June-October 2009 after obtaining the Institutional Ethics Committee approval. Operational Definition of a "suspected case" was an acute respiratory tract infection characterized by sudden onset of any of the following: fever, headache, myalgia, running nose, sore throat, cough, breathlessness, etc [6].

The guidelines on categorization of H1N1 patients during screening for home isolation, testing, treatment, and hospitalization were revised by the Govt. of India [7] and accordingly, the testing of suspected patients of H1N1 was limited to Category C patients i.e. severe patients only.

Out of 800 suspected cases tested at this hospital during this period, 367 patients were positive for H1N1. Initially all the persons with a positive PCR test for H1N1 were customarily admitted to the infectious disease hospital; Soon the indoor-admission facilities were started in Aundh Chest Disease Hospital, Pune while the Intensive Care Unit facility for admitting critically ill patients was started in Sassoon General Hospital of B.J. Govt. Medical College, Pune. Hence, out of the 800 suspected cases 83 patients were advised admis-

sion to these two hospitals as they were in severe category. Hence these 83 patients have not been included in the present analysis and those 284 patients admitted to IDH, Pune hospital only are considered. The information of admitted patients was collected in a predesigned proforma regarding socio-demographic profile, clinical history, treatment, duration of hospital stay and complications if any from the records of the hospital. Final outcome of the patient was confirmed by a telephone call to each patient. Information on duration of chemoprophylaxis of family members and development of secondary cases in family was also obtained telephonically from each patient. The detailed epidemiological information of the 83 patients advised admission to Aundh Chest Disease Hospital, Pune or Sassoon General Hospital of B. J. Govt. Medical College, Pune was not available and hence not included in the present study.

A “confirmed case” of Novel Influenza A(H1N1) virus infection was defined as a person with an acute respiratory illness having any of the symptoms like fever, running nose, sore throat, cough, breathlessness etc. with swab positive by Real Time PCR for Novel Influenza A(H1N1) virus infection conducted by National Institute of Virology(NIV), Pune.

Co-morbid conditions with Influenza AH1N1 included in this study were [8]:

1. Persons (adults or children) with underlying medical conditions such as chronic pulmonary disease, asthma, cardiac disease, hypertension, chronic re-

nal and hepatic diseases, diabetes mellitus and similar metabolic disorders.

2. Immune-suppressed (including HIV-infected persons, and persons on immunosuppressive medications).
3. Adults and children with any condition (e.g. cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders)
4. Morbid obesity (BMI > 30)
5. Children and adolescents who are receiving long-term aspirin therapy and who might be at risk for experiencing Reye’s syndrome after influenza virus infection;
6. Pregnant women

Results:

The present study was conducted at Infectious Disease Hospital, Pune from June to October 2009 and a total of 284 admitted confirmed H1N1 cases were included.

A majority i.e. 127(44.72%) cases were in 11-20 years age group. Less than 30 years constituted 249(87.6%) of the patients. The age-distribution was almost similar in both the genders (Table 1). Majority of patients i.e., 258(90.85%) were Hindus followed by Muslims-6(2.11%) and Christians- 10(3.52%). Out of total 284 patients, a majority i.e. 180(63.38%) were students.

The two most common symptoms among the patients were fever-237(83.45%) and cough-214(75.35%). Other symptoms were running nose-111(39.08%), sorethroat-93(32.75%), body ache/headache-62(21.83%), vomiting-

Table 1: Age and Sex wise distribution of H1N1 cases

Age in completed yrs	Female	Male	Total	Cumulative
0 – 10	36 (24.82)	32 (23.02)	68 (23.94)	68 (23.94)
11 – 20	73 (50.34)	54 (38.85)	127 (44.72)	195 (68.66)
21 – 30	16 (11.03)	38 (27.34)	54 (19.01)	249 (87.68)
31 – 40	8 (5.51)	9 (6.47)	17 (5.99)	266 (93.66)
41 – 50	8 (5.51)	2 (1.44)	10 (3.52)	276 (97.18)
51 – 60	3 (2.07)	2 (1.44)	5 (1.76)	281 (98.94)
>60	1 (0.69)	2 (1.44)	3 (1.06)	284 (100.0)
Total	145 (100.0)	139 (100.0)	284 (100.0)	284 (100.0)

Note: Figures in parentheses indicate percentages

39(13.73%), breathlessness-28(9.86%), weakness-14(4.93%), diarrhea-13(4.58%) and other symptoms - 34 (11.97%) which included fatigue, giddiness, pain in abdomen, haemoptysis, redness of eyes, haemetemesic, malaena, chest pain and convulsions. In nearly half of the total cases i.e., 144(50.70%) the duration of illness was 6-9 days. The mean duration of illness for H1N1 was 6.82 days with S.D. of 6.01 days and median was 6.0 days with an interquartile (Q_1 - Q_3) range of 4-8 days.

Out of the total 284 cases admitted during June to October 2009, a large number of patients i.e. 139(48.94%) were admitted in the month of August 2009. Thereafter a decrease in the number of cases was observed. History of foreign travel during 8 days prior to starting of

symptoms was obtained in 25 (8.80%) of the patients. But, later on as the epidemic progressed, the proportion of patients with history of foreign travel decreased to a very low level (Table 2). Out of these 25 patients with history of foreign travel, 4 patients (16%) were less than 12 years; 7(28%) were 12-19 years and 14(56%) were above 19 years of age. The countries visited by these 25 patients were USA 10(40%), UK and Europe 6(24%), Singapore 5(20%), Austria 2(8%), Germany 1(4%) and Canada 1(4%).

Table 2: Month wise distribution of cases according to foreign travel in the 8 days prior to onset of symptoms

Month of admission	History of foreign travel		Total
	Present	Absent	
June 09	3(100.0)	0(0.00)	3 (1.6)
July 09	11(13.92)	68(86.08)	79 (27.81)
August 09	12(8.63)	127(91.37)	139 (48.94)
September 09	0(0.00)	53(100.0)	53 (18.67)
October 09	0(0.00)	10(100.0)	10 (3.52)
Total	25(8.80)	259(91.20)	284(100.0)

Note: Figures in parentheses indicate percentages calculated horizontally.

History of contact with a known case of H1N1 was present in 153(53.87%) patients. In the month of June 09, all patients had history of foreign travel and history of contact in a known H1N1-endemic foreign country. In the month of July, 8(10.1%) patients had history of contact while in the month of August, 102(73.4%) had this history and in September 22(41.51%) and October only 1(10%) case had history of

contact. On further analysis, it was observed that, proportion of patients with history of contact with a known H1N1 patient anywhere including in their own community, increased as the epidemic progressed (Table 3). Both history of contact as well as history of travel in the 8 days prior to onset of symptoms was present in 8(10.1%) patients.

Table 3: Month wise distribution of cases according to history of contact during the 8 days prior to onset of symptoms

Month of admission	History of Contact with H1N1 case		Total
	Present	Absent	
June 09	3(100.0)	0(0.00)	3(100.0)
July 09	8(10.13)	71(89.87)	79(100.0)
August 09	102(73.38)	37(26.62)	139(100.0)
September 09	31(58.49)	22(41.51)	53(100.0)
October 09	9(90.00)	1(10.00)	10(100.0)
Total	153(53.87)	131(46.13)	284(100.0)

Note: Figures in parentheses indicate percentages

One or the other co-morbid conditions were present in 45(15.84%) patients. Out of these, 15 (33.34%) developed complications while the complication rate in patients without co-morbid conditions was 56(23.43%). However, this difference was not significant statistically. ($p>0.05$) (Table 4). Out of total 71 cases that developed complications, majority of patients (66.2%) had received Oseltamivir treatment after 72 hrs of starting symptoms.

13.86% as compared to 40.51% among those who had started oseltamivir 72 hours after onset of symptoms i.e., the rate of complications increased as the time gap of starting Oseltamivir from onset of symptoms increased ($p<0.01$) (Table 6). On further analysis, it was found that, none of the family-members of 137(48.24%) patients had taken Oseltamivir chemoprophylaxis while 147 (51.76%) families had received chemoprophylaxis for atleast 5 days. Only 2

Table 4: Distribution of cases according to co-morbid conditions and complications

Co-morbidity	Complications		Total
	Present	Absent	
Present	15 (33.34)	30 (66.66)	45 (100.0)
Absent	56 (23.43)	183 (76.57)	239 (100.0)
Total	71 (25.0)	213 (75.0)	284 (100.0)

Chi-square value is 1.98 with df=1, p=0.159. N.S.

Note: Figures in parentheses indicate percentages

Various types of respiratory co-morbid conditions like chronic obstructive pulmonary disease, asthma, allergic bronchitis, etc. were noted in 21(7.39%) patients. The complication-rate among these patients was 9(42.86%) while that among patients without any respiratory co-morbidity was 62(23.57%) and this difference was statistically significant ($p<0.05$) (Table 5). Out of 284 patients 101(35.69%) patients had received oseltamivir within 48 hrs of starting symptoms, while 66(23.32%) received oseltamivir within 48 - 72 hrs. and 116(41.99%) received this drug after 72 hrs. of starting the symptoms. One patient, who had twin pregnancy refused to take Oseltamivir. Rate of complications among patients who started Oseltamivir within 48 hours of onset of symptoms was

cases occurred among these families who had received chemoprophylaxis as against 37 among those who did not receive chemoprophylaxis ($p<0.01$).

Table 5: Respiratory co-morbid conditions and complications among cases

Respiratory co-morbidity	Complications		Total
	Present	Absent	
Present	9(42.86)	12(57.14)	21(100.0)
Absent	62(23.57)	201(76.43)	263(100.0)
Total	71(25.0)	213(75.0)	284(100.0)

Chi-square value is 3.857 with df=1, p<0.05. Sig

Note: Figures in parentheses indicate percentages

Table 6: Complication rate by time of receipt of Oseltamivir treatment

Time gap in hrs	Developed complications	No complications	Total
<48 hr	14(13.86)	87(86.14)	101(35.69)
48-72hr	10(15.15)	56(84.85)	66(23.32)
>72hr	47(40.51)	69(59.49)	116(41.99)
Total	71(25.09)	212(75.91)	283(100.0)
Chi-square =25.83 df=2 p<0.01. Highly sig.			

Note: Figures in parentheses indicate percentages

It was observed that a total of 39(13.73%) secondary cases occurred in the families of 35 patients. In 32(11.27%) cases, one family member was affected besides the index case, in 2(0.70%) cases, two family members were affected and in 1 case, three family members were affected.

Out of the 23 patients who took discharge against medical advice, one patient (4.34%) absconded during hospital stay while 9(39.13%) patients needed admission to higher centers for severe breathlessness, respiratory failure, altered sensorium, suspected cerebral malaria, co-infection with salmonella typhi with DIC. Three patients (13.04%) required ICU admission; two(8.70%) patients were put on ventilator and one(4.34%) patient was put on O₂ mask. All these patients were cured and discharged.

There was no mortality observed among the patients studied.

Discussion:

Fever (83.45%) and cough (75.35%) have been the two most commonly reported symptoms, the other symptoms being running of nose, sore throat, body ache & headache, vomiting breath-

lessness, weakness, and diarrhea. Similar clinical findings have been observed by other studies [9-11].

This study has revealed that a large proportion (44.72%) of patients have been in 11-20 years age group with majority of the patients being less than 30 years while the proportion of old age patients has been very small i.e. 1.06% only. This is in contrast to peak periods of seasonal influenza, when influenza hospitalizations are more common among persons 65 years of age or older and those under the age of 5 years [12]. The Canadian study has [13] also found that proportion of influenza A (H1N1) 2009 has been highest in those aged 10-19 years (42%); while in Bangalore [9] study, majority of patients have belonged to 16-35 years. The age-distribution has been almost similar in both the genders; male and female ratio being 0.9:1. Earlier studies from Bangalore [9] and Surat [11] have showed male preponderance while Singapore study [14] has shown female preponderance. Pune was at the epicentre of influenza A (H1N1) that struck the country during middle of 2009. Initially during the outbreak, it was mandatory to refer all suspected as well as confirmed H1N1 patients to Infectious Diseases

Hospital, Pune for admissions. Irrespective of the severity of symptoms/ clinical picture, all the suspected patients were tested for influenza A (H1N1) virus infection by laboratory testing of throat and nasal swab specimens. If sample was found positive, that patient was shifted to isolation ward and treatment with Oseltamivir was started. If sample was negative the patient was discharged if his clinical condition was stable. Soon the indoor-admission facilities were started in Aundh Chest Disease Hospital, Pune while the Intensive Care Unit facility for admitting critically ill patients was started in Sassoon General Hospital of B. J. Govt. Medical College, Pune.

Out of 800 suspected cases tested at this IDH hospital during this period, 367 patients were positive for H1N1. Out of the 800 suspected cases 83 patients were advised admissions to Sassoon General Hospital of B J. Govt. Medical College, Pune or Aundh Chest Diseases Hospital, Pune as they were in severe category. Hence these 83 patients have not been included in the present analysis and the 284 patients admitted to IDH, Pune hospital only are considered i.e., the patients in severe category are not included in the present study. This explains the zero mortality observed in the present study. Thereafter, when the number of patients to be tested became unmanageable, the facilities for swab collection as well as treatment with Oseltamivir were started at 53 screening centers spread across the city. The indoor facility was also created at 13 private hospitals in Pune and Pimpri-Chinchwad twin cities. Hence, these additional indoor facilities at various other hospitals coupled with the restriction of admissions to severe category only led to a drop in the num-

ber of admitted patients during the second half of study period in the IDH hospital.

Month wise distribution of cases showed that majority of patients were admitted in the month of August as the outbreak progressed from foreign travelers to school children to general community. Also as the epidemic progressed and transmission became widespread, complete case ascertainment became prohibitive, physicians were recommended to primarily test patients in special risk groups or those with severe illness only [8] The proportion of samples sent for confirmatory testing is likely to have decreased after the epidemic became more widespread and testing recommendations were changed to focus on severe cases. Confirmatory testing of non-severe cases may have decreased many-fold following the change in recommendations.

The first four patients had acquired the infection due to their foreign travel. The infection from fourth patient, who had returned from USA, spread to his relative- a school boy and he was the first indigenous case. Thereafter, the cases occurred mainly among the linked school students. It was observed that 25 (8.8%) gave history of foreign travel during 8 days prior to onset of symptoms. They had visited mainly western countries such as USA, UK, Europe and Singapore. All these countries had officially reported human cases of influenza A (H1N1) during that period [2]. Initially, the proportion of patients with h/o foreign travel was high; later on their proportion decreased to a very low level, thus demonstrating the presence of disease in the local community due to freely circulating virus.

Majority i.e., 159(55.98%) were adults; the rest

being children

The history of contact with a known case of influenza A (H1N1) was present in 153 (53.87%) cases and 8 patients (2.82%) had both history of contact and history of travel in the 8 days prior to onset of symptoms. School contacts were a common source of infection as majority 180 (63.38%) were students. In the Bangalore study, 17% of the patients had history of foreign travel to influenza A (H1N1) affected countries, 6.3% had h/o contact with influenza A (H1N1) cases and 6.3% had history of both travel and contact [9]. In a Moroccan study, 21.5% patients had travelled to infected region [10].

The household transmission rate in the present study was 12.31% while in an Australian study; it was 27.9% [15].

Out of 284 patients, 101 (35.56%) patients received Oseltamivir within 48 hrs of starting symptoms. Out of total 71 cases that developed complications, majority of patients (66.2%) had received Oseltamivir treatment after 72 hrs of starting symptoms. It was observed that rate of complications increased as the time gap of starting Oseltamivir increased. In the Surat District study, those patients who received Oseltamivir within 48 hour of onset of illness were all cured and all the patients who died none had received Oseltamivir within 48 hrs [11].

The complication-rate in patients with respiratory co-morbid conditions was significantly higher as compared to those without. The major co-morbid conditions observed were asthma, COPD, allergic bronchitis and rhinitis, hypertension and diabetes.

Limitations:

First, patients who became infected in their community and did not go to the hospital were not included in our study. Second, the epidemiological data regarding the patients treated on outpatient basis was incomplete. This is inevitable in the early phase of the epidemic as the surveillance systems were still evolving.

Conclusion:

Close observation of patients infected with the 2009 pandemic influenza A (H1N1) virus infection provided us with several epidemiological information. The influenza A (H1N1) virus infection affected young people particularly, with co-morbid respiratory disorders. Risk factors with ICU admission were older age, long duration of symptoms, asthma, obesity, abnormalities of chest radiography, leukocytosis.

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