Original Article

Clinico-epidemiological profile of Influenza A H1N1 cases at a tertiary care institute of Uttarakhand

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Abstract

Introduction: The swine (H1N1) virus responsible for worldwide pandemics since 2009 is now causing seasonal epidemics. Since then alarming spikes of swine flu cases have been reported from Uttarakhand every year. There are limited studies conducted in this Himalayan belt to evaluate the clinical and epidemiological profile of the patients admitted in tertiary care hospitals. **Aims & Objectives:** This study aims to summarize the clinical and epidemiological attributes of swine flu and to approximate the burden of Influenza A H1N1 (Swine Flu) cases in this Himalayan belt. **Material and Methods:** Clinical and epidemiological characteristics of influenza A H1N1 cases from October 2018 to April 2019 were retrospectively and descriptively analyzed using data from the Medical Records Section and the isolation ward at Shri Guru Ram Rai Institute of Medical and Health Sciences; Shri Mahant Indiresh hospital. **Results:** A total of 1126 (51.6%) patients were tested of which 30% (338) patients were found to be H1N1 positive. Maximum cases and positivity were detected in the months of January (26.4%), February (50.3%), and March (14.8%), and the patients in the age groups of 41–50 (21.9%) and 51–60 years (19.3%) accounted for majority of the cases. The most common symptoms were fever (85.8%), cough (82.2%), sore throat (82%), and breathlessness (71.3%). A case fatality ratio of 10.9% was observed. A significant statistical association (p value < 0.00001) was reported between co-morbid conditions and death. **Conclusion:** According to the results of this study, close caution should be exercised in case of patients infected with H1N1 particularly those with co-morbidities.

Keywords: Co-morbidity, H1N1, pandemic, swine flu, tertiary care center

Introduction

Influenza virus is a frequent human pathogen that can cause severe respiratory threats and consequent loss of human lives. The H1N1 virus or "swine flu" virus belongs to the family of Orthomyxoviridae that are RNA viruses and include three subtypes influenza A, B, and C.[1] Swine influenza virus (SIV) or S-OIV (swine-origin influenza virus) refers to any strain of the influenza virus group that is endemic in pigs. Influenza C and subtypes of influenza A known as H1N1, H1N2, H3N1, H3N2, and H2N3 are the recognized SIV strains.[2] Genomic variations are a common occurrence in orthomyxoviruses which can be readily attributed to genetic drift caused by point mutations and genetic shift caused by recombination of genomic segments. Hence, the peril of widespread pandemics is always there whenever a new type of influenza strain appears in the human population as the virus can rapidly spread from one person to another.[3] Because of this potential to cause epidemics and pandemics, influenza has always been at the focus of patients, physicians, and health organizations.[4]

In the year 2009, India witnessed the worst outbreak of Swine flu as the virus infected almost 27, 236 people and killed more than 981 across the country and in 2010, 20, 604 cases and 1763 were reported. However, now influenza infections continue to be reported every year and particularly post 2017 the virus also

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started showing typical epidemiological characteristics different from previous years particularly in terms of periodicity; two peaks were observed: between January and March, and July and September. In 2018, the country saw a steep plunge in the number of affected people and number of deaths had also halved but it yet again almost doubled in 2019; 28,798 cases and 1,218 deaths.[5]

Since the number of studies related to Influenza A H1N1 is limited particularly clinico- epidemiological profile in the Indian scenario and more so very few studies are there from this Himalayan region of Uttarakhand, this study is an effort to give at least some insight of clinical and epidemiological profile of Influenza A H1N1 cases from this region.

Material and Methods

A retrospective, descriptive study was carried out at the Shri Guru Ram Rai Institute of Medical and Health Sciences; Shri Mahant Indiresh hospital. The study was approved by the institutional research board and ethics committee. Data of swine flu cases from October 2018 to April 2019 were considered to study the epidemiology and ascertain the degree plus severity of Influenza A H1N1. The epidemiological characteristics like demographic characteristics, clinical profile, and outcome were analyzed thoroughly. The study population included all the patients suspected to be infected with influenza A H1N1. The study was approved by the institutional research board and ethics committee on 23-09-2018.

The data of clinical and epidemiological profile of the patients were received from the record section of the hospital. All the details of demographic profile and clinical presentations including the contact numbers of the patients were well maintained in the hospital medical record section. A secondary data analysis was prepared in Microsoft Excel Software and basic statistical measures like mean, median, percentage, etc. were calculated.

Shri Mahant Indiresh hospital is a 1200-bedded teaching institute hospital wherein screening, testing, and treatment of H1N1 patients was done according to the guidelines of the Ministry of Health and Family Welfare, New Delhi.[6] A screening facility and Infectious disease ward with critical care provision for Influenza A H1N1 patients was established to offer the necessary medical care and facilities. Patients were admitted in the infectious disease ward from screening center, out patients department, and emergency department.

All the patients who presented with swine flu-like symptoms were categorized according to guidelines issued by Ministry of health and family welfare into categories A, B, and C.[6] Category-A included patients with mild fever plus cough/ sore throat with or without body ache, headache, diarrhea, and vomiting. Category-B patients consisted of; B1 with signs and symptoms of category-A plus high-grade fever, sore throat, and B2 with high-risk conditions. Category C included patients with breathlessness, chest pain, drowsiness, fall in blood pressure, sputum mixed with blood, bluish discoloration of nails in addition to the above signs, and symptoms of Categories-A and B. The patients having signs and symptoms of Categories A and B were given oseltamivir and taken for follow-up after 24 and 48 h. Category-C patients were admitted and treated accordingly. Suspected samples (nasopharyngeal and throat swabs) were sent for Real time Reverse transcription PCR to the molecular lab of the institute.

Results

A total of 2178 patients were screened and 1126 (51. 6%) were identified as suspected cases and tested for Influenza A H1N1. And 30% (338) patients were found to be H1N1 positive out of 1126 patients. Among them 206 (60.9%) were male and 132 (39.1%) were female. Minimum and maximum age of the positive patients was 2. and 85 years, respectively. Mean (±standard deviation) age was 37.5 (±18) years. Maximum positivity for influenza A H1N1 was found in the age groups 41–50 years (21.9%) followed by 51–60 age group (19.3%), both in male and female. The age group >80 years comprised only 1.5% (5) of the total cases. Population at the extremes of age (0–10) and (>70 years) formed 16.5% of total positive cases. Maximum case fatality ratio (CFR) was seen in patients >70 years of age followed by patients in >40–60 years [Table 1]. And 65% patients were from the urban areas, whereas patients from rural areas constituted 35% of the confirmed patients.

Minimum duration of hospital stay of admitted patients was 3 days and maximum was 10 days. Mean (±standard deviation) duration of stay in the hospital was 6.5 (±1.7) days. Among the admitted patients 210/338 (62.1%), 173 patients were discharged from the hospital but 37 (17.6%) patients succumbed to the infection. However, 128 (37.9%) patients who tested positive were treated on an OPD basis and no fatalities were reported from these patients. The rate of positivity was higher in male population 60.9% as compared to the female population 39.1%. The positivity rate was highest during months of January (26.4%), February (50.3%), and March (14.8%) 2019 showing that the epidemic was on peak in this

Table 1: Age-wise morbidity and mortality due to influenza A H1N1

Age groups	Positive	Percentage	Deaths	Percentage	Case fatality ratio
0-10	31	9.1%	0	0	0
11-20	11	3.3%	1	2.7%	9.0
21-30	37	10.9%	4	10.8%	10.8
31-40	56	16.5%	5	13.5%	8.9
41-50	74	21.9%	8	21.6%	10.8
51-60	65	19.3%	11	29.7%	16.9
61-70	39	11.6%	3	8.1%	7.6
71-80	20	5.9%	4	10.8%	20
81-100	5	1.5%	1	2.8%	20
Total	338	100%	37	100%	10.9

season. However, maximum deaths were seen in January (54.1%) followed by in February (32.4%) [Figure 1].

Table 2 shows that major clinical presentations were fever (85.8%), cough (82.2%), sore throat (82%), and breathlessness (74.8%). Majority of patients however presented with combination of symptoms like cough, sore throat, fever, headache, and body aches.

Among all the confirmed swine flu patients 108 (32%) were suffering from one or more comorbid conditions. Among them 98 (29%) patients were suffering from hypertension, followed by 62 (18.3%) from diabetes mellitus, 21 (6.2%) from ischemic heart disease, 37 (10.9%) from chronic obstructive pulmonary disease (COPD)/bronchial asthma and 11 (3.2%) patients from chronic renal failure. 47 (13.9%) patients were suffering from other diseases like hypothyroidism, hepatitis, or typhoid fever [Table 3].

Out of 37 patients, who died due to H1N1 infection, 29 patients also suffered from some form of co-morbid condition. Table 4 shows that there was a statistically significant association between co-morbid conditions and death; (*P* value- < 0.00001, df-1).

Discussion

In case of H1N1, the clinical presentations and epidemiological characteristics of patients may exhibit differences with relation to different geographical locations and diverse time periods. In the current study, an attempt was made to show various characteristics of patients presenting with swine flu at tertiary care hospital in Dehradun, Uttarakhand. Our study shows that out of total patients tested 30% were positive for H1N1 and a CFR of 10.9% was observed. A positivity rate of 39.3% was also seen in a study by Singhal and Kothari from southern Rajasthan.[7] Augmented CFRs have been reported by Siddharth *et al.* (25.4%) and Gaikwad and Haralkar (63%).[8,9] A study conducted in this same geographic region by Jethani *et al.* from November 2016 to July 2017 have reported 30 confirmed admitted patients, whereas our study shows an obvious increase in the number of positive admitted patients (210/338) during our study period.[10] Despite higher number of cases and increased rate of positivity the CFR was still lower which could be attributed to factors like the accessibility of our hospital as it is located in the vicinity of the loci of infected areas and catered to a maximum number of patients even from the nearby hilly areas. Majority of the positive patients in our study were from age group 41–50 years of age (21.9%) followed by patients in the 31–40 years age group (16.5%). However, other age groups like 21–30 (10.9%) and 61–70 (11.6%) were also affected. So, rather our cases were from a broad spectrum of age groups >21 to 70. Similar involvement of a broad age spectrum (18–50) has also been reported by Mehta *et al.*[11] Maximum positivity (37.5%) for H1N1 influenza virus has also been reported in the age group of 40–55 years by Sidhu *et al.*[3] Mean age (±standard deviation) of the confirmed cases was 37.5 (±18) years with a range of 2 years to 85 years which is in concurrence with a study by Sardar *et al.* (mean age 38 (±18) years); however, in a study conducted by Samra *et al.* mean age of the patients was 29 years.[1,12]

Urban area patients, i.e., from Dehradun and surrounding areas like Sahranpur, Roorkee, Haridwar, Poanta Saheb constituted 65% of the patients and 35% were from rural areas mostly from the hilly regions of Uttarakhand. However, Singhal *et al.* have reported 53.1% positivity from rural areas and 46.8% from

Table 2: Clinical features of positive patients (*n*=338*)

Symptoms	Frequency	Percentage
Fever	290	85.8%
Cough	278	82.2%
Sore throat	277	82%
Breathlessness	253	74.8%
Headache and body ache	269	79.6%
Nasal catarrh	241	71.3%
Bilateral pneumonia	32	9.5%
Hemoptysis	24	7.1%

*One patient can present with multiple symptoms

Table 3: Distribution of co-morbidity among the positive patients (*n*=338)*

Co-morbidity	Frequency	Percentage
Hypertension	98	29
Diabetes mellitus	62	18.3
Others (pregnancy, hypothyroidism, hepatitis, typhoid fever)	47	13.9
COPD/asthma	37	10.9
Ischemic heart disease	21	6.2
Chronic renal failure	11	3.2
Tuberculosis	4	1.1
No comorbidity	230	68

*Multiple responses

Table 4: Association of outcome with co morbidity (*n*=338)

Co-morbidity	Death	Recovered
Present	29	79
Absent	8	222
Total	37	301

The Chi-square value is 41.18. The *P*<0.00001: Significant at *P*<0.05. df=1

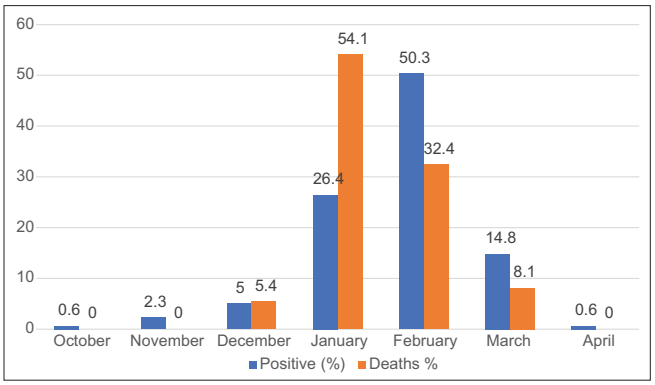

Figure 1: Month-wise distribution of positive cases (*n* = 338)

urban areas.[7] In our study, rural population mostly from higher hilly regions were lesser because three more tertiary care centers located in Srinagar, Rishikesh and Jolly Grant are nearer and more accessible to them than our tertiary care center which is located in the heart of the city. Our study showed a higher rate of positivity in males (60.9%) as compared to 39.1% in females. Higher rates of morbidity by this infection in males (61%) as compared to 39% in females has also been reported by Sujatha in a study from Hyderabad.[13] Other studies also showed the same pattern.[11,14,15] This could be due to the fact that males have more contact and more exposure to the infected due to higher number of males working outside than females in most parts of India.

Maximum number of cases and maximum positivity was seen for the months of January, February, and March; 26.4%, 50.3%, and 14.8%, respectively. The preceding and succeeding months showed a considerable decline in the number of cases. Similar findings with peak in like months (Jan, Feb, March) have also been reported by Sujatha *et al.* from Hyderabad and Jayadeva *et al.* from Bangalore.[13,15] Other research studies on H1N1 reported that the usual peak of H1N1 epidemic is between September and December.[16-18] In our study, the peak in the number of positive cases was in the month of February, probably because of harsh winter and unusual rains during that part of the year. Inadequate hygiene and crammed urban infrastructure could have compounded the problem. Also, the difference in periodicity of surges of H1N1 in different places may be influenced by the topography and epidemiological factors particular for that place.

Most common clinical presentations in our study were fever (85.8%), cough (82.2%), sore throat (82%), and breathlessness (74.8%). Similar findings have also been reported by Gaikwad and Haralkar with 95.4% patients having fever, cough (82.32%), sore throat (49%), and dyspnea (23.9%).[9] Fever (97.7%), cough (86.4%), sore throat (54.5%), and dyspnea (45.45%) were also the predominant symptoms in a study conducted by Mehta *et al.*[11] Many other studies have also reported these as principal symptoms.[19-21] It is an established fact that various co-morbidities can significantly worsen the disease trajectory and our study also affirms the same. Significant co-morbidities like diabetes mellitus, hypertension, ischemic heart disease, COPD etc. were found to be similar with the other studies.[11,20] Out of 37 deaths, 29 (78.37%) were associated with co-morbidities and a statistically significant association was seen between the two reiterating the fact that patients with co-morbidities have a high risk of poorer clinical outcome. This is in concurrence with a study by Sardar *et al.* wherein the outcome (death) and its association with co-morbidity was statistically significant.[1]

Thus, H1N1 infections can have huge implications on public health infrastructure as the transmission can occur by mildly ill or even pre-symptomatic patients, which amplifies manifold the complexity of epidemic prevention and control. Similar clinical symptoms as common influenza makes them all the more difficult to be identified as soon as possible.[22] Hence, primary care physicians, where the patients first report, need to adopt preventive and therapeutic modules based on like studies in their respective geographical areas so that the background knowledge of seasonal trends and other socio-demographical factors can make the difference in their diagnostic approach.

Conclusion

To summarize, this study can provide a baseline for clinicians and public health personnel to comprehend the clinico-epidemiological profile of swine influenza (H1N1) cases particularly in this hilly region to analyze, treat, and to generate preventive methods in the near future. Winter months are associated with a steep rise in the number of cases maximally presenting with acute upper respiratory tract symptoms however with associated co-morbidities grave clinical outcomes can be expected. Timely intervention and a background knowledge of clinico-epidemiological profile of patients with swine flu in this Himalayan region can reduce the percentage morbidity and mortality. Being a retrospective study, there was a however a selection bias and all the parameters and tests were evaluated on clinico-epidemiological requirements and were not standardized according to a protocol. Also, no comparative controls could be included in this study. The limitation of this study is thus the lack of controls and for all the patients data for some variables were not obtainable. This study provides hospital-based epidemiological data, but wider community-based studies are warranted to attain a more precise and accurate understanding of influenza A H1N1.

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Conflicts of interest

There are no conflicts of interest.

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