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# Epidemiological Characteristics Including Seasonal Trend of Hospital Based H1N1 Cases in Amravati District of Maharashtra, India

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**Abstract**

*Background*: Influenza A (H1N1) is an acute respiratory infection caused by influenza virus H1N1 subtype A. It is highly contagious virus. It causes significant morbidity and mortality and spread in community. *Objectives*: To identify epidemiological characteristic including seasonal pattern of hospital based patient suspected with H1N1 infection. *Methods*: Hospital based retrospective study was designed from January 2017 to December 2019. The data was collected from District Hospital Amravati, Maharashtra. *Results*: In the present study, a total of 547 samples were tested and 127(23.21%) were recorded positive for H1N1. Most numbers of these cases were from young adults (34.55%) in age group between 15-30 years and less were observed in old age group (10.23%) in age group of >60 years. Female (58.26%) were infected more than male (41.73%). Total two peaks of infection were noticed. One was summer season (April) & second was in winter season (October) in year 2017 while one peak of infection was noticed in winter season in year 2018 and 2019. *Conclusion*: Epidemiological parameters and seasonal pattern of Influenza A (H1N1) gives ideas to create the awareness and to improve the control strategies to minimize the morbidity & mortality and spread of disease.



**Keywords***:* Influenza A (H1N1), Seasonal trend, Epidemiological characteristics.

## Introduction

Influenza viruses are highly unstable and capable of causing pandemics. A novel influenza virus can result through the exchange of genetic material among viruses from different animal, avian or human hosts. During the 20th century, three pandemics in 1918, 1957 and 1968 were all caused by different novel virus strains.[1] Most recently in 2009, a strain of influenza A (H1N1) virus pdm 2009 emerged in Mexico and spread all over the world.[2] WHO declared it a pandemic.[3] Since then, A (H1N1) pdm 2009 has replaced the previous A (H1N1) seasonal strain of influenza and has been seen regularly as a seasonal virus. In India, this pandemic resulted in 27 236 cases and 981 deaths in 2009 and 20 604 cases and 1763 deaths during 2010.[4] Since then, influenza activity continued to be reported every year, especially in winter. However, 2017 was an unusual year, with the virus spreading rapidly in various parts of the country, and showing epidemiological characteristics different from previous years in terms of period (two peaks observed), place (infection reported for the first time from some of the northeastern states) and person

(comparatively more cases among children).[5]

The Integrated Disease Surveillance Programme (IDSP) under the National Centre for Disease Control is entrusted with the responsibility of disease surveillance in the country and monitors the situation on a weekly basis with a view to detect early warning signals of any impending outbreak or any changes in epidemiology of diseases of public health importance and rapid respond thereto. During the post-pandemic period, the last major outbreak in India occurred in 2015 with 42 592 reported cases and 2990 deaths. This was followed by a low transmission period during 2016 when 1786 cases and 265 deaths were recorded. During 2017, a total of 38 811 laboratory confirmed cases and 2266 deaths were reported to IDSP, which is more than eight times the number of deaths compared to the previous year and nearly three times higher than seen during the pandemic year, 2009. The largest burden was reported from Gujarat (7709 cases and 431 deaths), followed by Maharashtra (6144 and 778), Rajasthan (3619 and 279) and Madhya Pradesh (802 and 146). Together, these four states contributed nearly half (47%) the cases and more than two-thirds (69%) of deaths reported in India. In comparison to previous years when increase in cases was observed in February-March, two peaks of influenza activity were observed in 2017: one during the winter months from February to April (peak in March) and then again more pronounced during summer months from August to October (peak in September). Most influenza activity in northern India was seen during the summer months, but in outhern and western India, cases occurred mostly during winter months. There was clustering of cases within the states, localized to a few districts such as Mumbai, Thane and Pune in Maharashtra and Jaipur in Rajasthan. Another observation was that some northeastern states such as Arunachal Pradesh and Tripura, which had never reported influenza A (H1N1) cases over the past 8 years, notified cases for the first time in 2017. These observations require looking into so as to understand the changing ecological and transmission dynamics, as well as potential changes in awareness and testing. Among states with more than 100 deaths, the case fatality ratio ranged from 18.2% in Madhya Pradesh to 5.6% in Gujarat. These rates are far higher than those reported in most countries for H1N1pdm.[6] In Gujarat, most of the 431 deaths reported to have occurred were among those between the age of 15 and 60 years (67.9%), followed by > 60 years of age (22.9%), with only 25 deaths (5.8%) among children under 5 years of age. As many as 259 (60%) patients who died in the state during 2017 had one or more comorbid conditions; the most common being cardiovascular conditions (35%); followed by diabetes (28%); lung diseases (12%) and renal diseases (9%). Based on molecular analysis of isolates from Chennai and Pune, the dominant flu strain in India during 2017 was A/ Michigan/7/2009 (H1N1) pdm09 virus, replacing A/California/7/ 2009 (H1N1) pdm09 seen during 2016.[7] In fact, the A/Michigan/ 7/2009 (H1N1) pdm09 strain has been isolated in Indian's for the first time. During 2017, a total of 38 811 laboratory confirmed cases and 2266 deaths were reported to IDSP, which is more than eight times the number of deaths compared to the previous year and nearly three times higher than seen during the pandemic year, 2009. The largest burden was reported from Gujarat (7709 cases and 431 deaths), followed by Maharashtra (6144 and 778), Rajasthan (3619 and 279) and Madhya Pradesh (802 and 146). Together, these four states contributed nearly half (47%) the cases and more than two-thirds (69%) of deaths reported in India. Hence this study was designed to identify the epidemiological characteristics including seasonal trend of swine flu in hospital based patients which affects the spread and severity of diseases in our region.

**Material and Methods:**

*Study design and duration*: A hospital based retrospective study was conducted during the period of January 2017 to December 2019 for a 3 years period.

*Cases and Categorization*: All the influenza like cases visited identified Government health facilities/hospitals, Amravati were categorized in category A, category B and category C as per the guidelines on categorization of Influenza A (H1N1) cases given by Ministry of Health & Family Welfare, India (Revised on 05.10.09).[8]

*Inclusion and exclusion criteria*: Patients presented with clinical features of Category C were included in study. We also received patients having features suggestive of Influenza A (H1N1) but they were from category A and category B and they were excluded from study.

*Sample size*: A total of 547 cases were included in the study and their throat/ nasopharyngeal/ nasal swabs were collected and tested during study period.

*Data preparation*: A specially designed data collection form was used to collect some epidemiological data like age, sex, location and

communication details of studied cases from laboratory records during study period.

*Testing method*: Specimens were collected from all patients by using sterile nylon flocked swab. Samples were placed in 3-mL viral transport medium. All the samples were tested by Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR).

*Statistical analysis*: All the relevant data collected and analyzed using Microsoft Excel. Statistical analysis was done by proportion. P value less than 0.05 considered as statistically significant at 95% confidence level.

*Ethical Considerations*: This is a retrospective analysis of routine laboratory work, so an ethical consideration was not necessary.

**Table 1**: Distribution of total samples tested for H1N1

| Sr. No. | Positive for H1N1 | Negative for H1N1 | Total Tested Sample |
|---|---|---|---|
| 01 | 127 | 420 | 547 |

During the 3 year study period, a total of 547 samples were tested for H1N1 and their results were shown in Table 1. Positivity during study period for H1N1out of total tested was 23.21%.

**Table 2**: Age and sex wise distribution of confirmed cases of H1N1

| Variables | Tested (n=547) | Positive for H1N1 (n=127) |
|---|---|---|
| Age (in years) | | |
| <15 yrs | 64 | 16 (12.5) |
| 15-30 yrs | 169 | 39 (30.7) |
| 30-45 yrs | 141 | 32 (25.1) |
| 45-60 yrs | 121 | 27 (21.2) |
| > 60 yrs | 52 | 13 (10.2) |
| Sex | | |
| Male | 232 | 53 (41.7) |
| Female | 315 | 74 (58.2) |

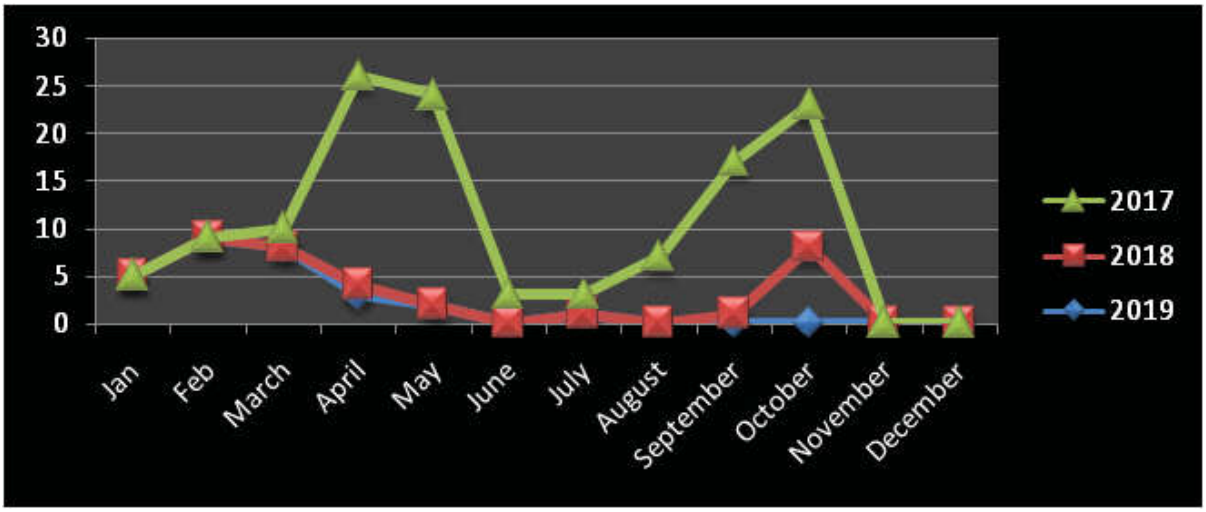


**Fig. 1**: Trends of Swine flu cases (tested and positive) according to months (Jan. 2017 - Dec 2019)

Age, sex and location wise distribution of confirmed cases of H1N1 was shown in Table 2. In our study, maximum numbers of H1N1 patients were from young adults (30.7%) in age group between 15-30 years and (12.5%) in age group of <15 years. Least infection identified in older age group. Mean age of cases was 26.50 years. Infection rate was higher in female (58.2%) than male (41.7%).

In our region two peaks of epidemic of H1N1 were observed during year. One was summer season (April) & second was in winter season (October) in year 2017 while one peak of infection was noticed in winter season in year 2018 and 2019 (As shown in Fig.1).

## Discussion

Influenza A viruses causes recurrent outbreaks at the local or global scale, with potentially severe consequences for human health and the global

economy. Positivity during study period for H1N1out of total tested in our study was 23.21% which was little bit high than study of Singh M et al was (22.2%), Siddharth V et al was (29.58%) and Sharma CP et al was (29.06%).[9-11] High prevalence may be due to hospital base study and it was restricted to small geographical area when compared against the entire state or country.

In present study, maximum (30.7%) of H1N1 patients were from young adults age group of 15-30 years followed (12.5%) in age group of <15 years. Least infection identified in older age group. Similarly a study done by Singh M et al found that more than half of cases i.e. 50.6% were in the age group of 15-30 years which was slightly higher than our study and this age group was not followed by paediatrics age group, but followed by patients in the 30-45 years age group with 19.4% cases which is not in accordance to our study and <15 year age group comprised only 11.2% cases.[9] More proportion of cases in the young population may be due to lack of pre-existing immunity but still exact reason for this is not known.

In our study, infection rate was higher in female (58.2%) than male (41.7%). Similar results were also found in a study by Singh M et al that maximum (67.4%) of cases were females as compared to males (32.57%).[9]

Month-wise analysis of influenza activity in the present study showed that in our region two peaks of epidemic of H1N1 were observed during study year. One was summer season (i.e. April) & second was in winter season (i.e. October) in the year 2017. Increased influenza activity in rainy season also observed in other research.[12-14] 2nd peak of infection was noticed in winter season in the year 2018 and 2019. Some research pointed out that influenza activity increased in cold temperature and in low solar radiation.[15-17] Exact reason for increase influenza activity in winter is not known but when temperature drops people spend more time indoors, making it easier for the virus to spread. IDSP data show that the epidemiology of influenza A (H1N1) is changing in terms of geographical distribution, age and seasonality. The evolving situation and the associated risk factors need continued monitoring and investigation with respect to the seasonal pattern of distribution of the disease, possibly linked with climatic conditions, seen during 2017. Understanding the genetic epidemiology of the virus in India would be helpful.[18]

Influenza A (H1N1) continues to pose a major challenge to public health, causing many deaths each year and will continue to do so well into the foreseeable future. Adults of working age appear to be most seriously affected. Therefore, there is a need to have a high index of suspicion and to ensure that such patients are attended to in a timely manner. The Government of India has issued a clinical management protocol which outlines the clinical presentation of seasonal influenza, the high-risk groups, and provides guidance on laboratory investigations, treatment protocol including criteria for administration of antivirals and supportive therapy.[19] These national guidelines must be adhered to by healthcare workers so that deaths can be prevented.

**Conclusion:**

The incidence of H1N1 influenza was higher in young individual especially during winter months. The presence of local unique seasonal pattern and its changes emphasizes to start the vaccination before the start of season and to optimize public health interventions to contain this deadly infection. Adults of working age appear to be most seriously affected. Therefore, there is a need to have a high index of suspicion and to ensure that such patients are attended to in a timely manner. Influenza viruses cause annual epidemics and occasional pandemics that have claimed the lives of millions. Before the start of year understanding the role of specific perceptions in motivating people to engage in precautionary behavior may help health communicators to improve their messages about outbreaks of new infectious disease generally and swine flu specifically.

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