Original Research

SEASONAL TRENDS, DEMOGRAPHIC DISTRIBUTION, AND CLINICAL CHARACTERISTICS OF RT-PCR CONFIRMED INFLUENZA A (H1N1) CASES IN RAIPUR, CHHATTISGARH

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ABSTRACT

Background: Influenza A (H1N1) remains a significant public health concern, with seasonal outbreaks leading to considerable morbidity.

Aim: To analyze the seasonal trends, demographic distribution, and clinical characteristics of RT-PCR confirmed Influenza A (H1N1) cases reported in Raipur, Chhattisgarh, in order to understand the epidemiological pattern, identify high-risk groups, and support effective public health planning and preventive measures.

Methods: During the study period, 305 clinical samples were tested for Influenza A (H1N1) using RT-PCR, with a cycle threshold (CT) value ≤35 considered positive. Demographic, seasonal, and clinical symptom data were analyzed.

Results: Of the 305 samples, 37 (12.13%) tested positive for H1N1. Gender distribution showed near-equal positivity between males (51.35%) and females (48.65%). The highest positivity rate was observed in the 11–20 years age group (23%), followed by the 41–60 years (13%) and 21–40 years (11%) groups. Seasonal analysis revealed a peak during the monsoon season (21 cases), followed by autumn (11 cases) and winter (4 cases), indicating a clear seasonal transmission pattern. Respiratory symptoms were predominant, with breathlessness and cough being the most common, while systemic symptoms such as fever, sore throat, nasal discharge, body ache, and abdominal pain were also frequently reported.

Conclusion: H1N1 positivity showed no significant gender difference but varied across age groups and seasons, with monsoon being the peak period. Respiratory symptoms dominated the clinical profile. These findings highlight the importance of enhanced surveillance and targeted preventive measures during high-transmission seasons.

Keywords: Influenza A (H1N1), RT-PCR, Molecular Diagnosis, Clinical Profile, Tertiary Care Hospital, Raipur, Chhattisgarh.

INTRODUCTION

Influenza A (H1N1) is a novel strain of the influenza A virus that emerged through triple genetic reassortment, incorporating gene segments from avian, swine, and human influenza A viruses (World Health Organization (2009); Sriram et al. (2010). Subtyping is based on antigenic variations in two surface glycoproteins Hemagglutinin (HA) and Neuraminidase (NA) which play essential roles in viral pathogenicity. HA mediates viral attachment to host cells by binding to sialic acid receptors, whereas NA facilitates viral release and spread by cleaving these receptors (World Health Organization (2019). H1N1 is an enveloped, negative-sense, single-stranded RNA virus with a segmented genome (Agrawal et al.).

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Influenza remains a significant public health concern worldwide, causing seasonal epidemics and, occasionally, global pandemics. While seasonal outbreaks occur annually, pandemics arise when antigenically novel strains, such as H1N1, acquire the ability to spread efficiently among humans (World Health Organization (2020). The 2009 H1N1 pandemic originated in Mexico, rapidly spreading worldwide (World Health Organization (2010). In India, the first case was reported in Hyderabad on May 16, 2009, and the World Health Organization (WHO) declared the post-pandemic phase on August 10, 2010 (World Health Organization (2009). H1N1 continues to circulate in swine populations globally, with the potential for further reassortment and emergence of novel variants (World Health Organization (2010).

Interspecies mixing of avian and human influenza strains within swine hosts can generate new strains capable of sustained human-to-human transmission, leading to recurrent outbreaks. Notably, in 2017, India

reported a significant rise in H1N1 cases compared to previous years (World Health Organization (2009); World Health Organization (2020). Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) remains the gold standard for laboratory confirmation due to its high sensitivity and specificity (World Health Organization (2020).

The clinical spectrum of H1N1 infection ranges from mild symptoms such as fever, cough, sore throat, and nasal discharge to severe manifestations, including breathlessness, pneumonia, acute respiratory distress syndrome (ARDS), and even death (Talha et al. (2024).

The present study was conducted at the Virology Laboratory, Pt. Jawaharlal Nehru Memorial Medical College, Raipur, using samples from suspected H1N1 patients attending Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur, Chhattisgarh, between January 2024 and February 2025, to determine the molecular detection rates and assess the clinico-epidemiological profile of confirmed cases.

MATERIAL AND METHODS

A retrospective analysis was conducted on suspected patients of H1N1 virus infection. The study period was from January 2024 to February 2025. Relevant clinical information, such as medical history and clinical symptoms such as fever, breathlessness, cough, sore through, and body ache. Data was collected and documented for each patient. Specimens were collected in VTM using nasopharyngeal swab, oropharyngeal swab and transported to the Virology lab of Microbiology department, Pt. JNM Medical College, Raipur, Chhattisgarh, India. RNA extraction from the viral samples was performed using a standardized kit (HipurA Viral RNA purification kit) as per the recommended guidelines and SOPs. All samples were processed and tested by using a qRT-PCR kit (Quantiplus Multiplex FLU RT PCR Kit) V 2.0 HUWEL. The test results were verified using pre-designed primer for RNase P gene accurate identification of the viral strain. The primer sequence for P gene was RNase P forward-AGA TTT GGA CCT GCG AGC G, RNase P reverse- GAG CGG CTG TCT CCA CAA GT, RNase P Probe- FAM-TTC TGA CCT GAA GGC TCT GCG CG. Clinico-epidemiological profile of the all patients were recorded in prescribed format.

RESULT

During the study period, a total of 305 clinical samples were received for testing. Out of these, 37 samples tested positive for Influenza a (H1N1). Test interpretation was based on the cycle threshold (CT) value, with samples considered positive if the amplification curve crossed the threshold at or before 35 cycles.

Gender-wise Positivity

Analysis of the data revealed that although female patients were more frequently suspected of having Influenza A (H1N1), the positivity rate was comparable between males and females (Male: 51.35%, Female: 48.65%) (Table 1).

Age-wise Distribution

Patients were categorized into five age groups. The highest positivity rate (23%) was observed in the 11–20 years age group, followed by 41–60 years (13%) and 21–40 years (11%) (Table 2).

Seasonal Variation

Monthly analysis showed a distinct seasonal trend in H1N1 positivity. The highest number of cases occurred during the monsoon season (21 cases), followed by autumn (11 cases) and winter (4 cases), indicating a seasonal fluctuation in transmission. This trend underscores the importance of targeted surveillance during peak seasons (Graph 1).

Clinical Symptom Profile

Among H1N1-confirmed patients, respiratory symptoms were predominant, with breathlessness and cough being the most common. Systemic symptoms, including fever, sore throat, nasal discharge, body ache, and abdominal pain, were also frequently reported (Graph 2).

DISCUSSION

After the containment of the 2009 H1N1 pandemic outbreak, which marked a significant event in global public health history, India implemented comprehensive control measures. These included extensive surveillance, deployment of rapid response teams, and public awareness campaigns, which helped limit the initial spread and manage subsequent waves (Dawood et al. (2009); Choudhry et al. (2012). Following the containment phase of 2009–2010, the virus transitioned into a seasonal influenza strain, reappearing annually with varying intensity between 2011 and 2023 (Garten et al. (2009). Several localized outbreaks were recorded during this period, including major surges in 2015, 2017, and 2019, with varying morbidity and mortality depending on state-level preparedness (Narain and Bhatia (2010); Chadha et al. (2015).

In Chhattisgarh, sporadic cases were reported between 2013 and 2019 with occasional spikes, particularly during the monsoon and early winter months, periods known to favor respiratory virus transmission due to increased humidity and indoor crowding (Directorate of Health Services, Government of Chhattisgarh (2020). The 2019 surge saw a moderate increase in hospitalizations and mortality in areas with limited

healthcare infrastructure (Chadha et al. (2015). From 2020 to 2023, H1N1 circulation was relatively muted, likely due to widespread COVID-19 containment measures such as mask usage, social distancing, and travel restrictions which also reduced the spread of other respiratory viruses (Olsen et al. (2020); Saha et al. (2020). In 2023 and early 2024, India witnessed a moderate resurgence of H1N1 cases, particularly during seasonal peaks (Talha et al. (2024). In Chhattisgarh, occasional clusters were reported, again peaking in the rainy and early winter months (Directorate of Health Services, Government of Chhattisgarh (2020).

The present study was conducted to assess the epidemiology, clinical profile, and presentation of H1N1 cases in Raipur district of Chhattisgarh between January 2024 and February 2025. A total of 305 respiratory samples were tested, of which 37 were confirmed positive for H1N1. Although this number was lower than during previous outbreaks, the presence of confirmed cases and the seasonal trend indicates that H1N1 continues to circulate and may cause outbreaks under favorable conditions.

Data analysis showed that although male patients were more frequently suspected of having influenza, the positivity rates were nearly equal between males (51.35%) and females (48.65%). The higher suspicion rate among males may relate to increased inflammatory responses to respiratory viruses or occupational exposures that elevate the risk of infection (Klein and Flanagan (2016); Vom Steeg and Klein (2019). Additionally, testosterone—the primary male hormone—may suppress certain immune functions, potentially increasing male susceptibility (Furman et al. (2014).

Age-wise analysis revealed that the 11–20 years age group had the highest positivity rate (23%), followed by the 41–60 years (13%) and 21–40 years (11%) groups. This may reflect greater exposure among younger individuals due to increased mobility and social interactions (Viboud et al. (2003).

Symptom analysis showed that breathlessness (29%), cough (24%), and fever (13%) were the most common, consistent with the respiratory tropism of H1N1 (Chadha et al. (2015)). Other symptoms included sore throat (10%), body ache (5%), abdominal pain (5%), nasal discharge (2%), chest pain (2%), and late-onset fever (2%). Breathlessness is attributable to lung inflammation and impaired oxygen exchange, cough to irritation of the respiratory tract, and fever to systemic immune activation. Body ache is mediated by cytokine release, abdominal pain may reflect rare gastrointestinal involvement, and chest pain can result from severe coughing or lung inflammation (Short et al. (2014); Paules and Subbarao (2017).

The seasonal distribution showed peak positivity during July (11 cases), August (10 cases), and September (9 cases). This is consistent with earlier studies indicating that H1N1 activity in India peaks during the monsoon and early winter months, likely due to favorable climatic and social conditions for viral transmission (Tamerius et al. (2013); Chadha et al. (2021).

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Data Availability: All datasets generated or analyzed during this study are included in the manuscript.

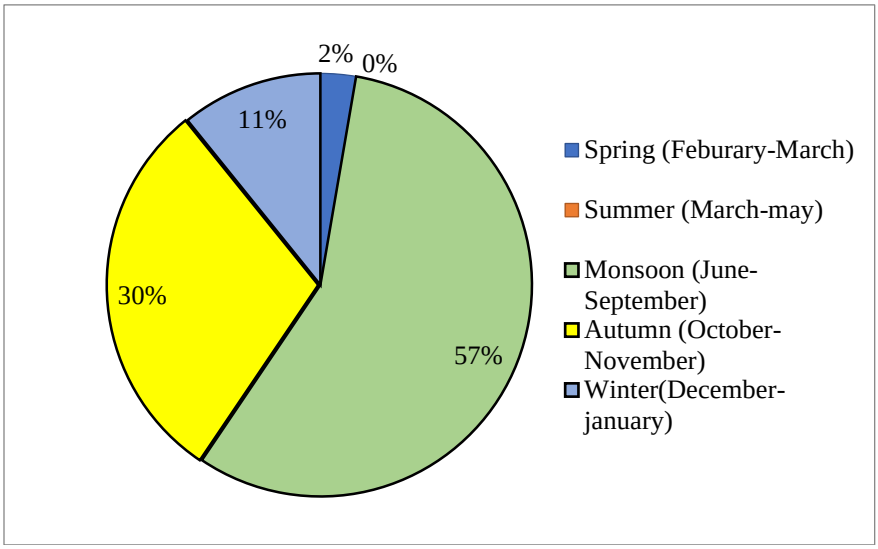
Tables and Graphs

Table 1: Gender-wise distribution of H1N1 positivity

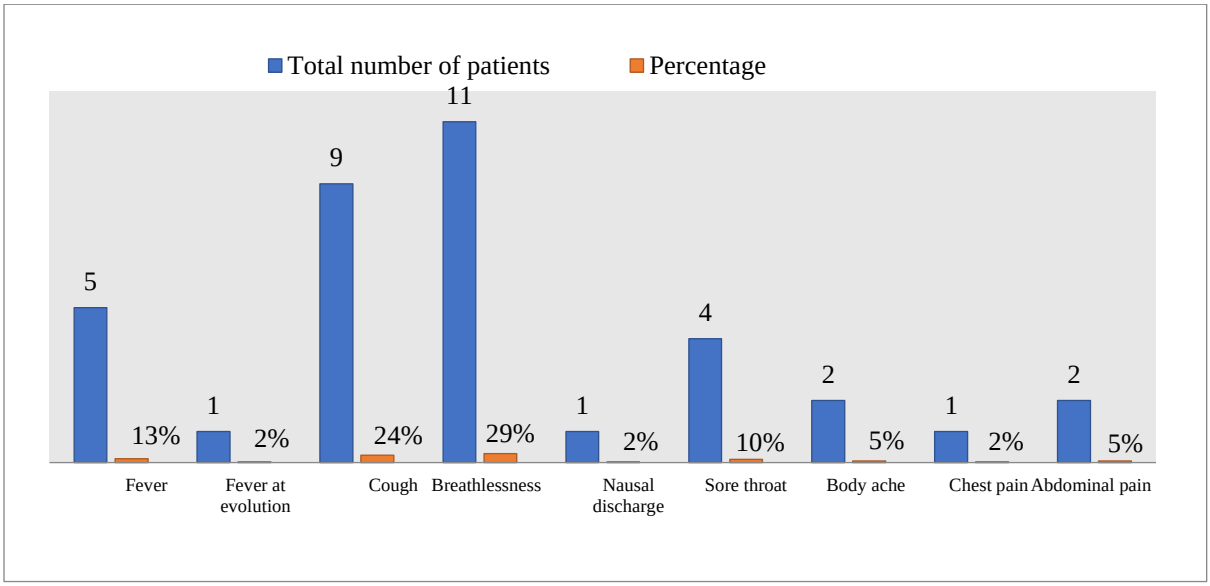
Total Positive Cases (n=37)	Male n (%)	Female n (%)
37	19 (51.35%)	18 (48.65%)

Table 2: Age-wise distribution of H1N1 positivity

Age Group (years)	Total Patients	Positive Cases	Positivity (%)
0–10	32	3	9%
11–20	21	5	23%
21–40	87	10	11%
41–60	73	10	13%
≥61	92	9	9%



Graph 1. Distribution of H1N1 positivity according to Seasonal Variation



Graph 2. Distribution of clinical symptoms among H1N1-Confirmed Patients

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