

Influenza A (H1N1) in India: A systematic review of cases from 2010–2020.

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Date of Submission: 02-09-2020

Date of Acceptance: 19-09-2020

ABSTRACT-Influenza virus (H1N1) caused seasonal influenza, is an acute respiratory infection that spreads to whole worldwide. The first case of influenza A virus pandemics in India came to light in May 2009 in Hyderabad city of Telangana. Human-to-human transmission led to considerable morbidity and mortality within the country until December. The total number of seasonal influenza cases in India from the year 2010 to 31st July, 2020 is 1,73,488.

Decreasing ambient temperature is often associated with influenza weather. The viral particle's ability to survive long term in cold temperatures also plays an important role. Besides, coagulation during winter serves as a co-contributing factor in facilitating the spread of the influenza virus. The environmental temperature leads to physical stress and energy loss due to thermal regulation, which weakens the immune system and thereby increases the host's likelihood of infection.

The prevention of epidemics in India was possible only by quick and efficient measures taken by the Government. Soon after cases were registered at Pune, Maharashtra, and other places across the country, steps were taken to revise the guidelines for the control of the disease in India. Classification of cases in health facilities and home environments, classification of cases, providing treatment to appropriate persons, public education, and other appropriate measures proved to be very effective in due course of time.

In this paper, we discussed the total cases and mortality due to seasonal influenza virus in the states and union territories in India from the year 2010 to the year 2020.

Keywords-Seasonal Influenza Virus, H1N1 Incidence, Temperature.

I. INTRODUCTION

The seasonal influenza virus (H1N1) causes ~ 500,000 deaths worldwide every year and

infects 5 to 15% of the human population [1]. The annual recurrence of seasonal epidemics is attributed to the continued development of H1N1 viruses, which enable them to survive immunity induced by prior infection or vaccination, and the ability of those viruses to be efficiently transmitted by humans through respiration is done drops, direct contacts, and fomites. H1N1 virus vaccines are effective in preventing the spread of seasonal H1N1 virus epidemics but must be updated regularly to keep pace with the development of circulating viruses [2].

H1N1 viruses are viruses of the Orthomyxoviridae family that have single-stranded, negative-sense, fragmented RNA genomes. The majority of seasonal influenza virus burden is associated with two types of influenza viruses: A and B as well as C viruses that spread to humans but cause less severe disease [3]. Influenza A is a virus in humans originating from birds and pigs [4]. Their familiarization and subsequent adaptation to humans have caused a global pandemic, for example, the 1918 flu, (Spanish flu) and 2009 flu (swine flu) epidemics, after which they continued to prevail in the population of the human as seasonal viruses' influenza. The Influenza A viruses have also been classified into subtypes based on a combination of haemagglutinin (HA) and neuraminidase (NA) glycoproteins on their surfaces. There are recently 11 NA subtypes and 18 HA subtypes [5], most of which are transmitted in wild birds, but only three combinations are widely disseminated in humans: A / H1N1, A / H2N2, and A / H3N2. Of these, the A / H1N1 and A / H3N2 subtype viruses recently cause seasonal influenza virus pandemics. Influenza B virus (BoX1) has no known animal reserves and has been circulating in humans since at least 1940 [6] (when the first influenza B virus was isolated), although they may have been in humans for a very long time has aired. Influenza B viruses fall into two major lineages i.e.

B / Victoria and B / Yamagata that originated from each other in the 1970s [7,8].

The first case of influenza A virus epidemic 2009 in India was reported in May 2009 in Hyderabad city of Telangana [9]. Human-to-human transmission led to substantial morbidity and mortality within the country by December [9,10]. After the second epidemic wave in early 2010, about 50,000 cases in India were reported during the epidemic period, with a case fatality rate of 6.1% [11]. In later seasons, the annual incidence of influenza virus epidemic 2009 decreased as in India, with about 5000 cases or less reported nationally annually. In spite, in 2015 and 2017, widespread pandemics occurred with approximately 43,000 and 39,000 cases are reported, as well as estimated 3000 and 2300 deaths respectively [12]. Particularly affected states include Maharashtra, Gujarat, Rajasthan, and Madhya Pradesh, 75.6% (n = 2261/2991) of all deaths nationally in 2015 and 2017, and 72.1% (n = 1634/2266). In a few states, the case fatality rate up to 20% in 2015, and in 2017 i.e. 30% are reported [13].

Circulation of H1N1 pandemics 2009 during post epidemic years

Soon after the emergence of the pandemic influenza virus in May 2009, the strain replaced the largely circulating seasonal influenza virus A (H1N1) and influenza virus A (H3N2) viruses. Since 2010, the pandemic strain pandemic influenza virus continued to spread in India, but, along with the already ongoing influenza virus; Pandemic influenza virus A (H3N2) and pandemic influenza virus B, completely replacing seasonal pandemic influenza virus A (H1N1). The spread of these three influenza viruses continued with seasonal activity in the winter months of 2012–2013 until the resurgence of the pandemic influenza virus in several Indian states [14,15].

Post epidemic resurgence

After 2010, the pandemic influenza virus reappeared in many western and northern states or union territories of the country during the winter months of 2012–2013. The resurgence currently continuing since December 2014 however seems to be worse than the previous one, leading to more than 30,000 cases and 2000 deaths across the country as on 28 March 2015, compared to 2012 with 5044 cases and 405 deaths [16] and in 2013 there were 5250 cases and 692 deaths [17]. Waves of resurgence lead to a greater number of hospitalizations and deaths due to pandemic

influenza virus than the rest of the year and appear at intervals of 1.5–2 years.

Role of the temperature

Meteorological parameters are also vital causes of influencing infectious diseases like the influenza virus [18]. The phenomena of both resurgent waves in India during the winter months indicates the possible role of low ambient temperatures. The temperate regions of both the northern and southern hemispheres exhibit a synchronous seasonal influenza peak during their months of winter. While a year of activity is observed in tropical and subtropical regions with annum or bi-annum peaks in various countries. India is a large country with a diverse climate that exhibits two seasonal activities, one during the monsoon months which is observed in most parts of the country with a tropical climate and the other in the winter period that is the temperate region of the extreme northern part is celebrated in Country [19-21].

Declining ambient temperature is often associated with influenza weather. The ability of the viral particle to survive for a long time in cold temperatures also plays an important role [22]. In addition, coagulation during winter serves as a co-contributing factor in facilitating the spread of the influenza virus. It has also been proposed that a decrease in the temperature of the environment leads to an increased physical stress and energy loss due to thermal regulation, which weakens the immune system and thereby increases the host's likelihood of infection [22].

II. METHODS

Searching Method:

The survey includes an investigation into the English-language distributed seasonal influenza virus (H1N1). The EMBASE database was accessed through PubMed and Google Scholar. The keywords "influenza virus (H1N1)", "States and Union Territories", "Temperature", were used. These keywords will cover more data about the seasonal influenza virus in India, but can be expected without ignoring related inquiries about it.

Study population:

Study population Annually new cases of seasonal influenza have been officially reported in states and union territories and cumulative confirmed cases in all states and union territories and regions from 2010 to 2020 have been counted. The population data was collected from the reports released on the official websites of the National Centre for Disease Control" Ministry of Health &

Family Welfare, Government of India (Designed and Developed by Center for Health Informatics). Thus, no ethical review was required.

III. RESULTS AND DISCUSSION

Case Study in India:

Annual cases of seasonal influenza have officially collected in India from 2010 to 31 July, 2020 (Figure 1). Total cases and mortality of seasonal influenza in the year 2010 to year 2020, states and union territories (Figure 2-Figure 12)[12,23]. From 2010 to 31 July 2020, the highest number of patients have conformed in these states or union territories due to seasonal influenza (Figure 13) [12,23] and the highest number of patients have died in these states or union territories due to seasonal influenza (Figure 14)[12,23]. The states Nagaland, Arunachal Pradesh, Meghalaya, Sikkim, and union territory Andaman and Nicobar have only ten cases or death cases (within a ten) of seasonal influenza reported from 2010 to 31 July 2020 and in-state Manipur, Mizoram, Tripura and In union territory, Daman and Diu, Dadra and Nagar Haveli have only hundred cases or death cases (within a hundred) of seasonal influenza reported from 2010 to 31 July 2020 (Figure 15-16)[12,23]. The only one, Lakshadweep, India's smallest union territory, is not any patient of seasonal influenza from 2010 to 31 July 2020 [12,23].

Discussion:

In India, this epidemic has resulted in 27,236 cases and 981 mortality in 2009 as well as in 2010, 20,604 cases, and 1,763 mortality are reported. Influenza activity has been reported every year since then, especially in winter. However, 2017 was an uncommon year, with the spreading the virus rapidly to various regions of the country, and showing the epidemiology features from past years in terms of duration i.e. two peaks observed, location (infection being the first of some Was reported for north-eastern states) and individuals (comparatively more cases among children). According to the National Center for Disease Control (NCDC), a total of 6,701 seasonal influenza H1N1 cases and 226 deaths have been reported in India. Rajasthan (2,363) has the highest number of cases are reported followed by Delhi (1,011) and Gujarat (898). Rajasthan had the highest number of deaths (85), followed by Gujarat (43) and Punjab (30). During the 1918 epidemic, India had the highest number of deaths (10–20 million) in any country, the highest percentage of total deaths (4.39%) in the world[23,24].

In the period following the epidemic, the last major outbreak in India occurred in 2015 with 42 592 cases and 2990 deaths cases are reported. This was followed by reduced transmission time during the year 2016 when 1786 cases and 265 death cases were registered[24].

During 2017, a total of 38 811 laboratory-confirmed cases and 2266 deaths were reported to Integrated Disease Surveillance Programme, which is more than eight times the number of deaths that of the previous year and nearly three times higher than that observed during the epidemic year, 2009. Gujarat (7709 cases and 431 deaths), Maharashtra (6144 and 778), Rajasthan (3619 and 279), and Madhya Pradesh (802 and 146) were reported to have the greatest burden of seasonal influenza cases and mortality. Simultaneously, these four states contributed nearly half (47%) the cases and more than two-thirds (69%) of mortality are registered in India[24].

In states with more than 100 deaths, the case fatality ratio (CFR) was in Madhya is 18.2% Pradesh to in Gujarat is 5.6%. These rates of seasonal influenza are far higher than those reported in most countries for the epidemic[25]. In Gujarat, the maximum number of 431 deaths occurred, among them 15 to 60 years (67.9%), followed by greater than 60 years of age (22.9%), with only 25 deaths (5.8%) among children under 5 years of age. 259 (60%) patients who died in the state during 2017 had one or more comical conditions; The most common heart diseases (35%); diabetes (28%); Lung diseases (12%) and kidney diseases (renal)(9%)[24].

In summary, this study shows that seasonal influenza cases and mortality in India for the last ten years.

Action by Government of India

During the recent revival, the Ministry of Health and Family Welfare, Government of India, resumed the process of public awareness and education through various means to safeguard broadcasts. Evidence-based vaccination for all high-risk groups is possible for the Ministry of Health and Family Welfare, Government of India, given the lack of information about the actual disease burden of influenza and its effect on all high-risk groups was not possible. Vaccination is recommended only for staff and health care workers who are likely to come into contact with influenza patients, laboratory personnel who are involved with influenza testing, and members of the "rapid response team" who are prone to influenza outbreaks Let's examine [26].

IV. CONCLUSION

The first positive case of epidemics influenza virus was reported in May 2009 in India and by the end of the year 2010, there were 20604 cases with 1763 deaths. The country experienced three waves during the 2009–2010 epidemic, the first in September 2009, the second after the second wave in December and the third in 2010 when the end of the epidemic was declared. Annual cases of seasonal influenza have officially gathered in India from 2010 to 31 July 2020. The total number of cases of seasonal influenza in states and union territories from the year 2010 to the year 2020 is 1,73,488.

From 2010 to 31 July 2010, Maharashtra (32,377), Gujarat (27,200), Rajasthan (22,922), Delhi (16,121), Karnataka (15,657) and Tamil Nadu (10,668) more cases were reported and from state Jharkhand (154), Chandigarh (306), Assam (308), Bihar (456), seasonal influenza cases are reported within 500. The Year 2010, 2015, 2017,

2018, 2019 is the maximum number of seasonal influenza cases are reported i.e. 20604, 42592, 38811, 15266, 28798 respectively and the Year 2011 and 2014 is the lowest number of seasonal influenza cases are reported i.e. 603 and 937 respectively. The Year 2015 and 2017 recorded the highest number of seasonal influenza death cases are reported i.e. 2990 and 2270 respectively as well as the year 2011 and 2020 recorded the lowest number of seasonal influenza deaths i.e. 75 and 44 respectively.

CONFLICT OF INTEREST

No conflict of interest

V. ACKNOWLEDGMENT

Authors would like to acknowledge the facilities provided by M.M. (Deemed to be University) Mullana (Ambala) for carrying out this work. Mr Siddhartha Dan would like to thank I.K. Gujral Punjab Technical University Jalandhar, Punjab.

Figures and Tables

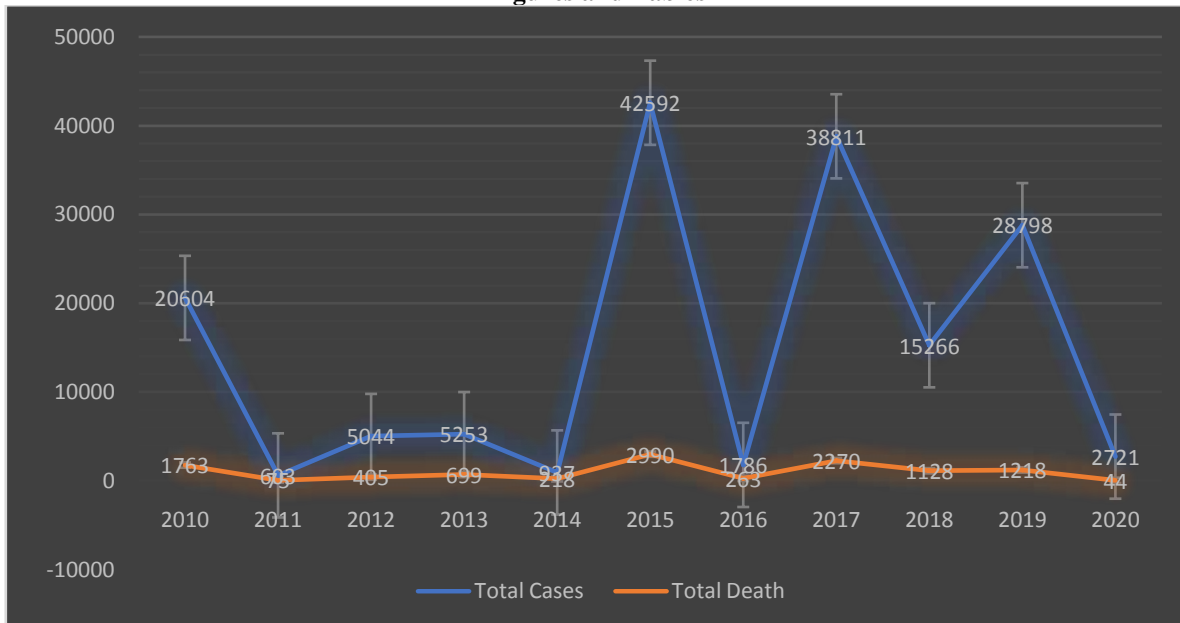


Figure 1: Total cases and mortality of seasonal influenza from 2010 to 31 July, 2020.

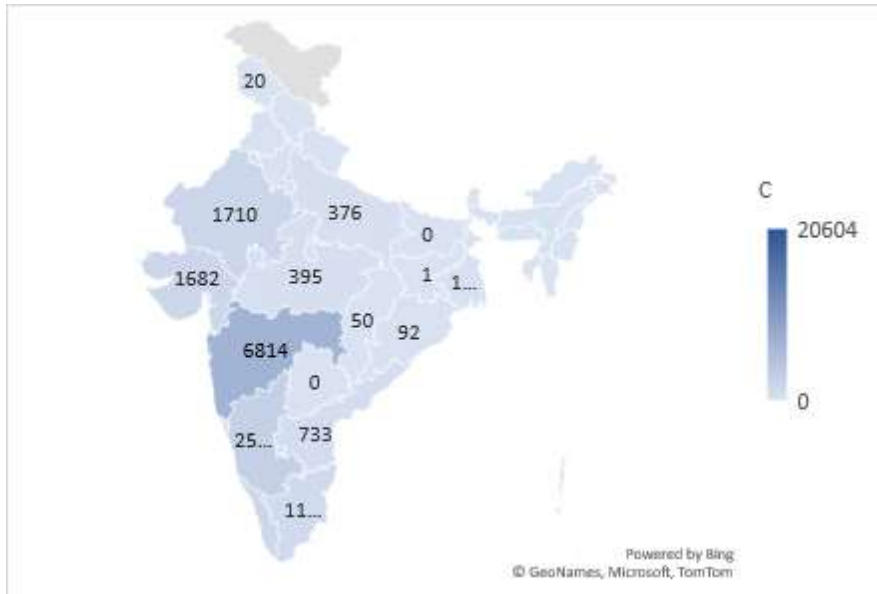


Figure 2: Total cases and mortality of seasonal influenza in 2010.

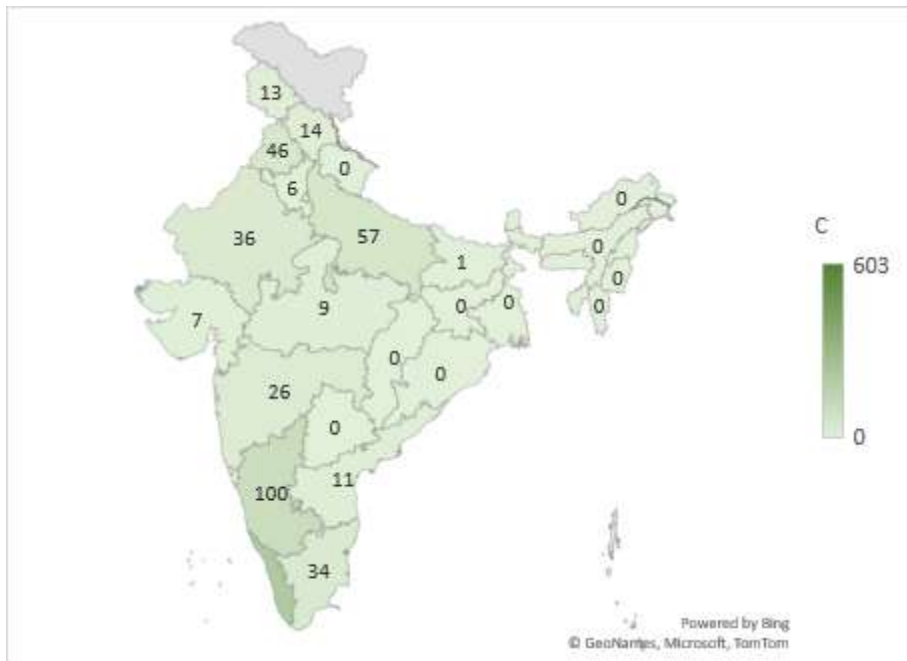


Figure 3: Total cases and mortality of seasonal influenza in 2011.

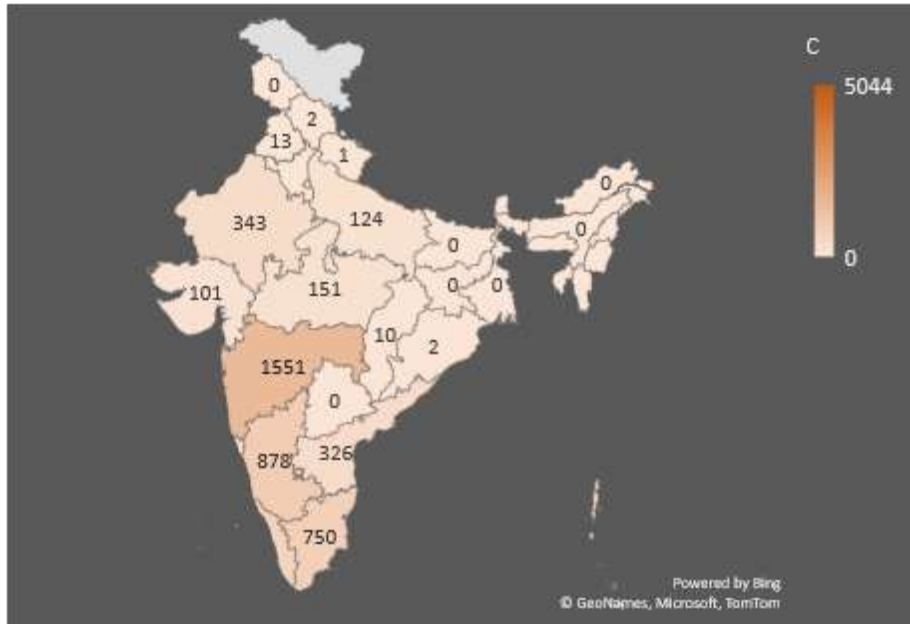


Figure 4: Total cases and mortality of seasonal influenza in 2012.

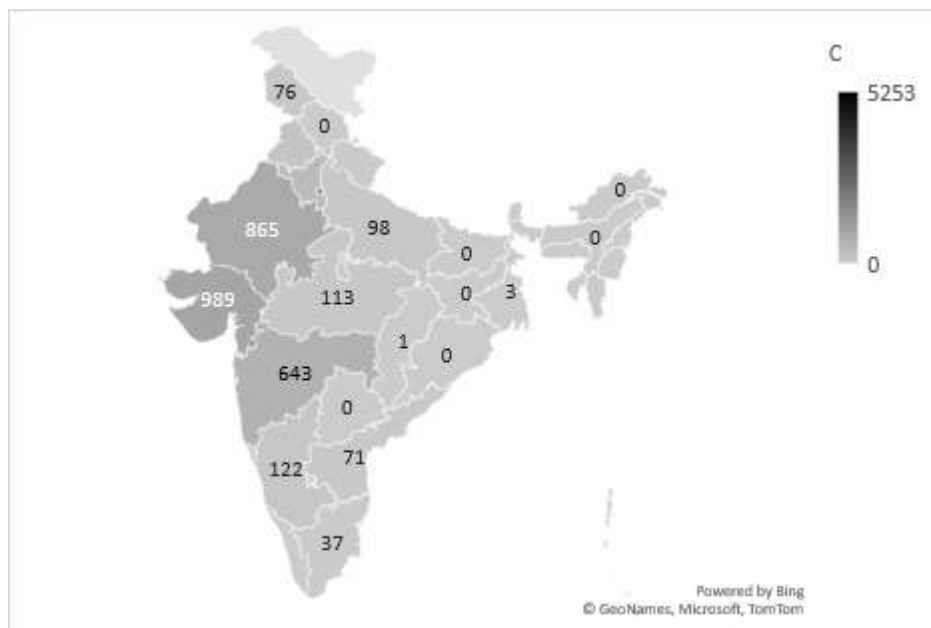


Figure 5: Total cases and mortality of seasonal influenza in 2013.

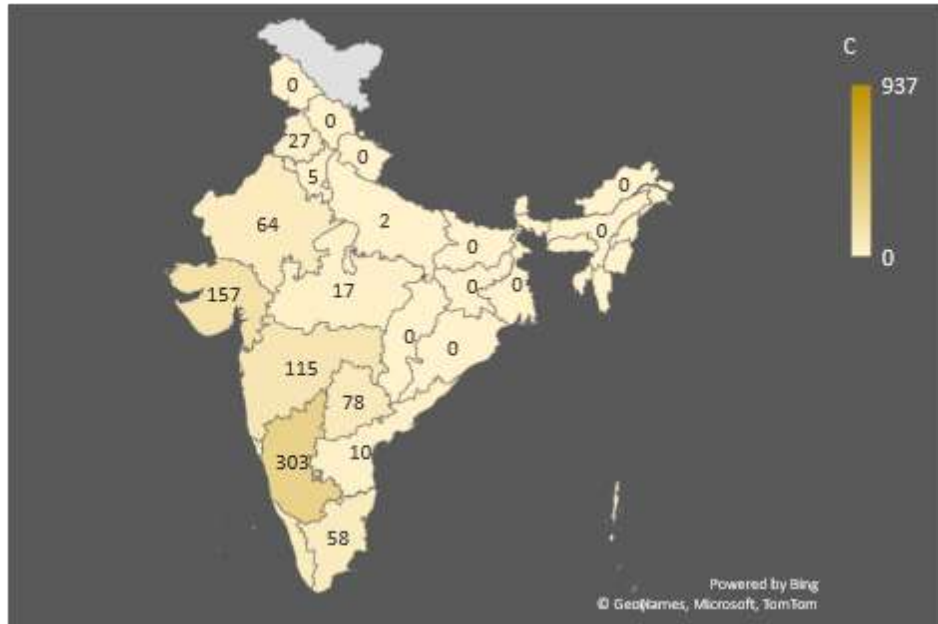


Figure 6: Total cases and mortality of seasonal influenza in 2014.

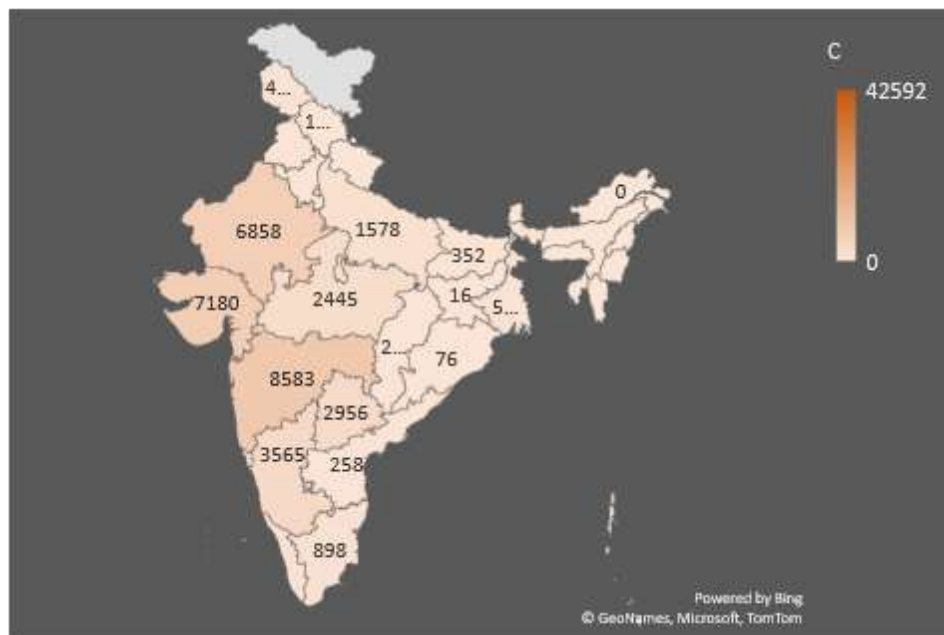


Figure 7: Total cases and mortality of seasonal influenza in 2015.

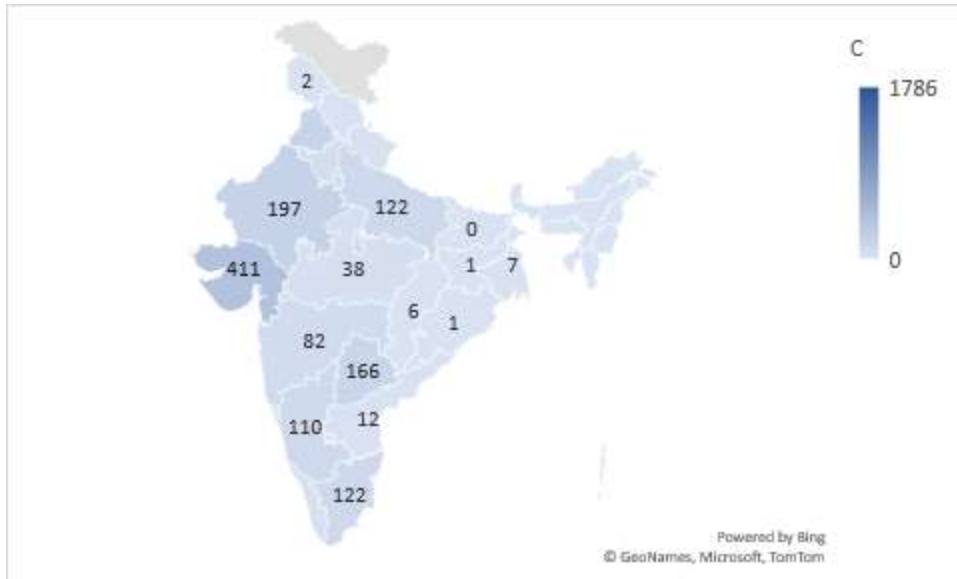


Figure 8: Total cases and mortality of seasonal influenza in 2016.

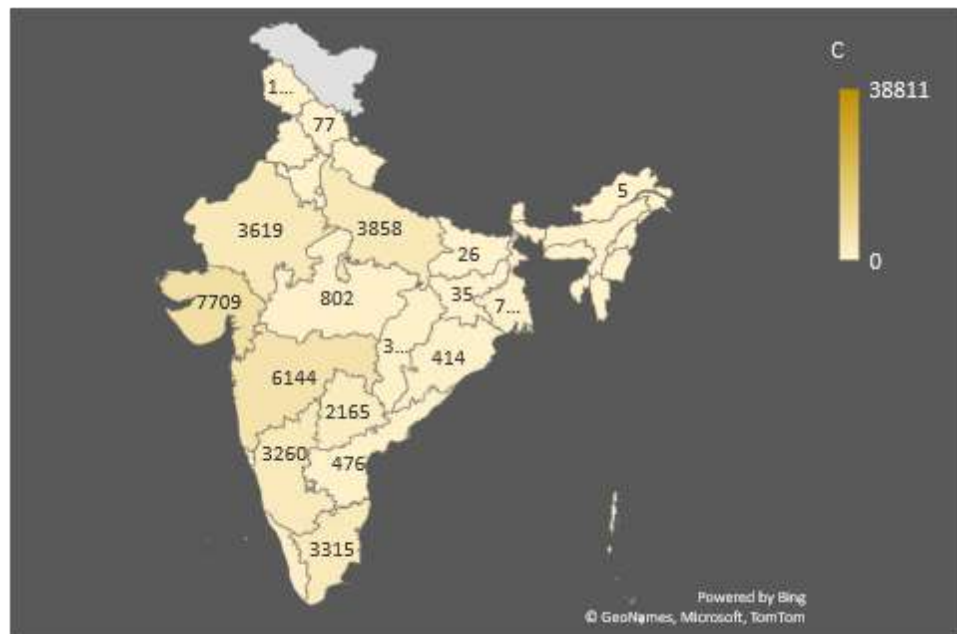


Figure 9: Total cases and mortality of seasonal influenza in 2017.

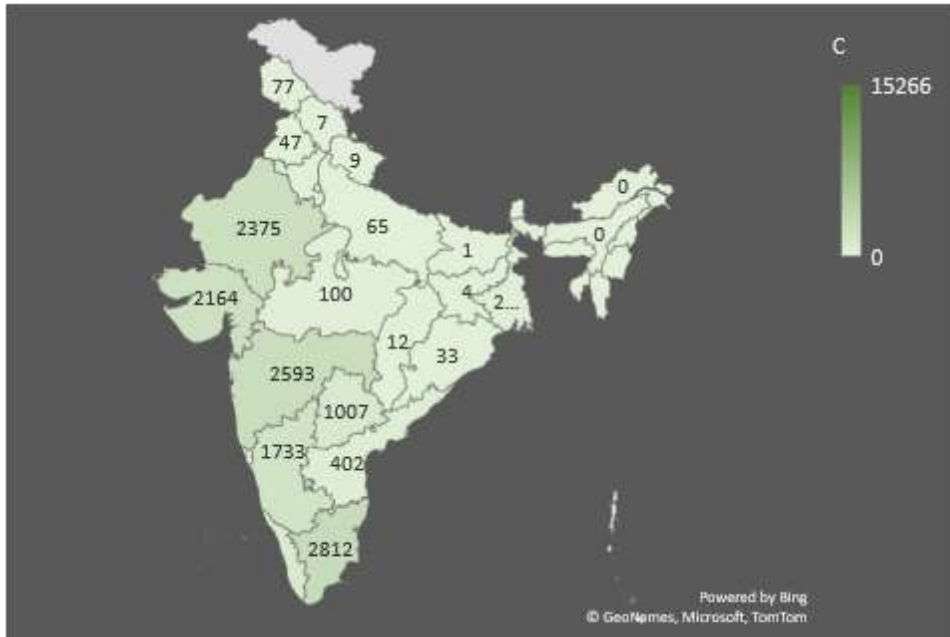


Figure 10: Total cases and mortality of seasonal influenza in 2018.

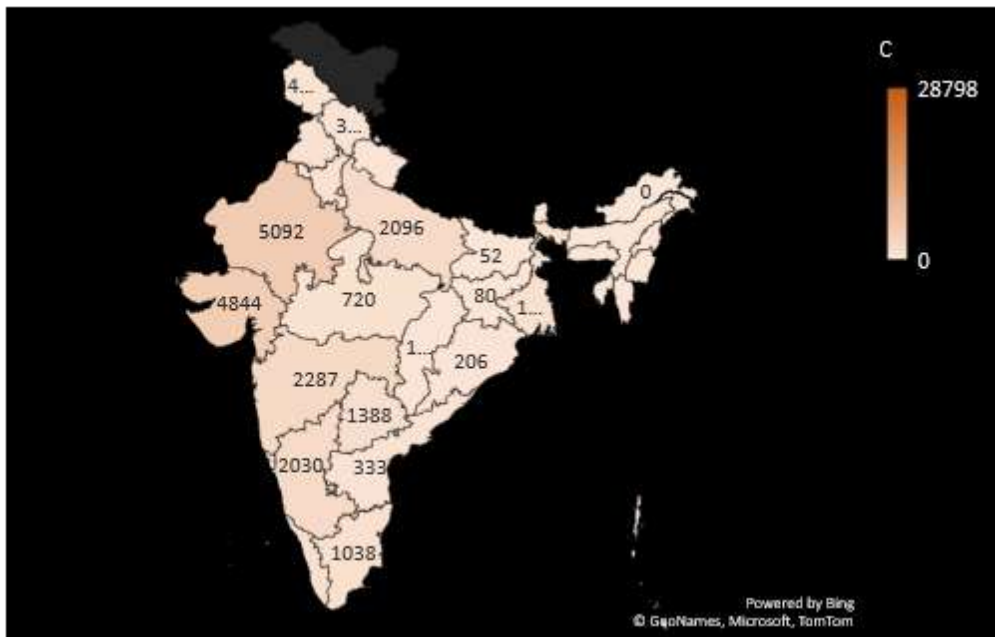


Figure 11: Total cases and mortality of seasonal influenza in 2019.

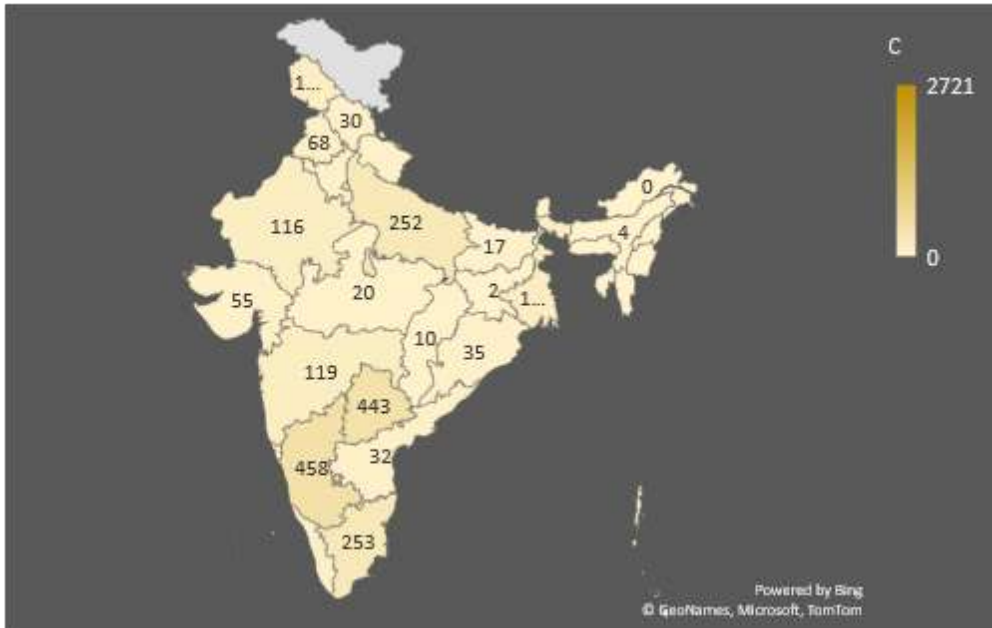


Figure 12: Total cases and mortality of seasonal influenza in 01 January,2020 to 31 July,2020.

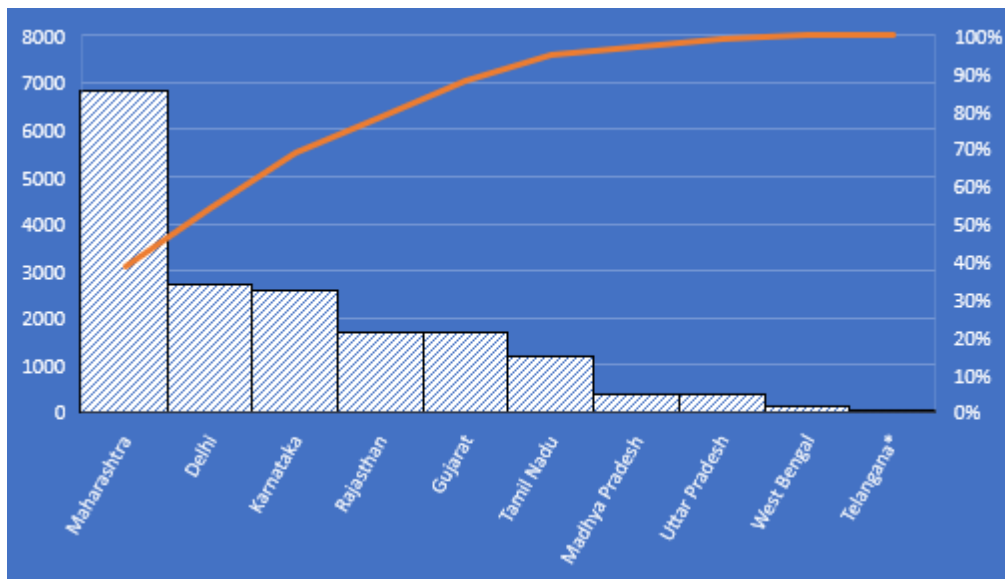


Figure 13: Total cases of seasonal influenza from 2010 to 31 July,2020

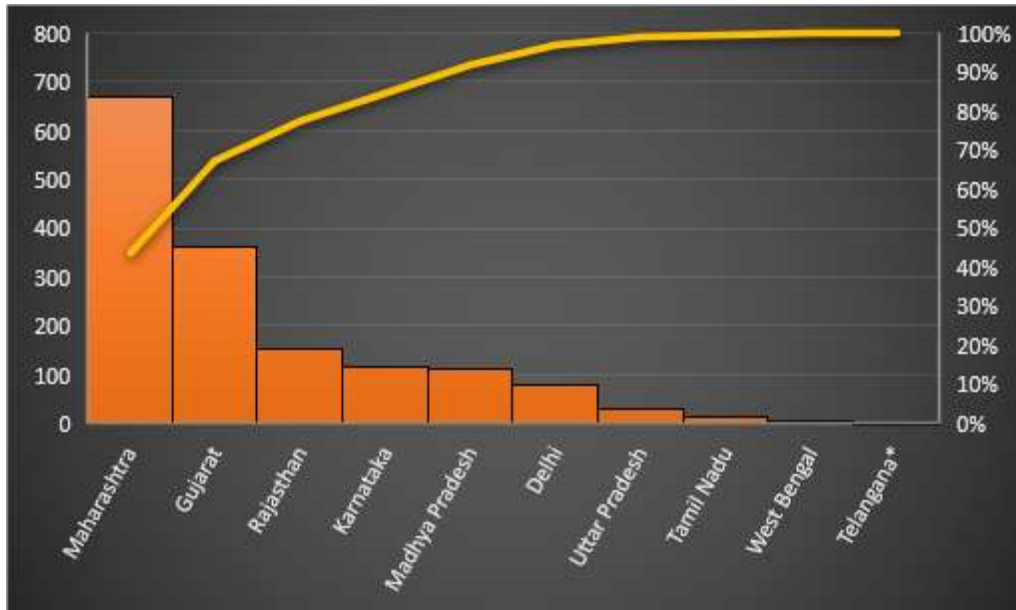


Figure 14: Total mortality of seasonal influenza from 2010 to 31 July, 2020

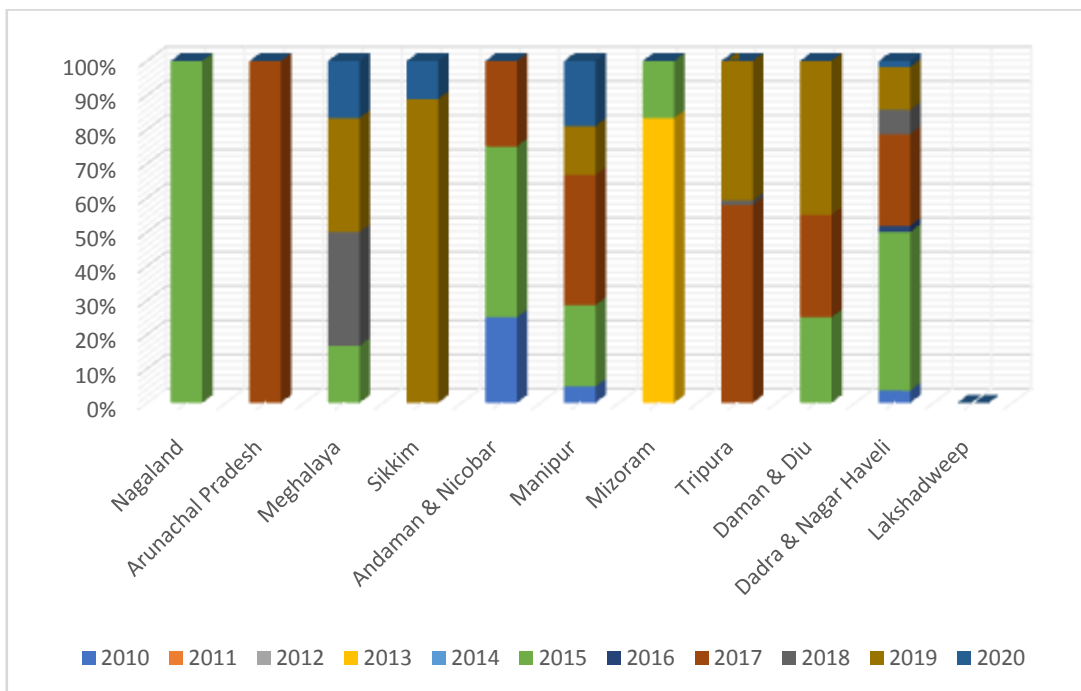


Figure 15: Only 10–100 seasonal influenza cases have been reported in these states from 2010 to 31 July 2020.

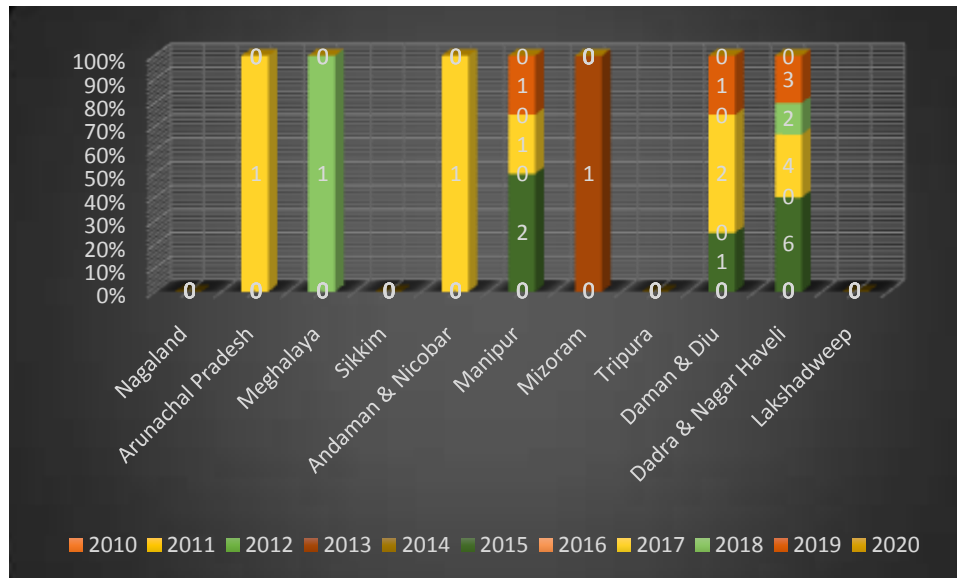


Figure 16: Only 10–100 seasonal influenza death cases have been reported in these states from 2010 to 31 July 2020.

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