

Epidemiological, clinical, and virological features of influenza outbreaks in Pune, India, 1980

B. LALITHA RAO,¹ S. S. KADAM,² KHORSHED M. PAVRI,³ & V. S. KOTHAVALÉ⁴

During the course of continuous surveillance of influenza in 1980 in Pune, India, which has a tropical monsoon climate, three outbreaks of acute respiratory infection (ARI) were investigated in March (hot season), in July–September (rainy season), and in November (cold season); sporadic cases during the interepidemic months were also studied. The first outbreak was associated with influenza A virus (H3N2), the second with influenza A viruses (H3N2) and (H1N1) and influenza B virus, but fewer influenza viruses were isolated during the third outbreak. The illnesses affected all age groups including infants and adults over 60 years of age, although the paediatric age group was mainly affected. The ARI outbreaks associated with the hot and cold seasons commenced at about the time the weather changed whereas the mixed influenza A (H3N2) and A(H1N1) outbreaks occurred in the middle of the rainy season.

Influenza epidemics and pandemics are characterized by rapid spread and high morbidity and in temperate climates usually occur in the winter months. Pandemic waves have been reported in the summer months in tropical countries (1). However, there are few reports on the seasonal occurrence of influenza epidemics in the tropics. Therefore continuous surveillance of influenza has been undertaken in Pune, India, for several years.

The present study describes the epidemiological, clinical, and laboratory investigations of three outbreaks of acute respiratory infections (ARI) in 1980; two of these were due mainly to influenza viruses.

MATERIALS AND METHODS

Surveillance

Continuous monitoring of influenza was carried out in Pune by weekly visits to a local dispensary. It is situated in a locality with a population of low socio-economic status and has a daily attendance of about 100 patients. Whenever a relatively large number of patients with respiratory infection were seen, daily visits were made to collect specimens from as many as possible of the respiratory cases.

¹ Senior Research Officer, National Influenza Centre, National Institute of Virology, Pune, India.

² Research Assistant, National Influenza Centre, National Institute of Virology, Pune, India.

³ Director, National Influenza Centre, National Institute of Virology, Pune, India.

⁴ Assistant Medical Officer of Health, Pune Municipal Corporation, Pune, India.

Collection of specimens

Throat/nasal swab specimens and blood samples were collected from patients during the acute phase of their illness. Convalescent blood samples were collected from a few patients 2–4 weeks after the collection of acute blood samples. The swab specimens were collected in sterile transport medium with penicillin and streptomycin and stored at -70°C . The serum samples were held at -20°C .

Virus isolation and serology

Embryonated chicken eggs (9–11 days old) were employed for processing the throat/nasal swab specimens for virus isolation. The specimens not showing any haemagglutination (HA) after two passages were considered as negative. The method described by Palmer et al. (2) was followed for isolation of viruses, conducting haemagglutination and haemagglutination inhibition (HI) tests with guinea-pig RBCs for identification of isolates and for determination of the rise in HI antibody titre in paired serum samples.

RESULTS

Epidemiological features

In the present study, a case with one or more of the following acute respiratory conditions, with or without systemic manifestations, was regarded as a case of acute respiratory infection: common cold, pharyngitis, laryngitis, tracheitis, bronchitis, bronchiolitis, pneumonia, or bronchopneumonia.

During the course of continuous influenza surveillance a higher incidence of acute respiratory infection was noted in three peaks during 1980—in March, July–September, and November (Fig. 1). Sporadic cases of suspected influenza during the remaining months of the year were also investigated. Over 1200 cases of upper respiratory infection were seen during the year and specimens were collected from half of these. Almost all of these patients were seen at one dispensary—the Lion's Club Corporation dispensary, Pune-9. Special enquiries made among public health personnel indicated the occurrence of outbreaks in other parts of the city. Staff members of the National Institute of Virology, and their relatives, constituted a small proportion of the cases.

Pune has a tropical monsoon climate, with a hot season (summer) from March to May, a wet season (rainy season) from June to September with October as a transitional hot month, and a cold season (winter) from November to February. During 1980, rainfall of 788.3 mm was recorded in Pune, which is above the annual average (714.7 mm). The two ARI outbreaks in the hot and cold seasons commenced at about the time of the change in the weather whereas the rainy season outbreak occurred in the middle of the rainy season (Fig. 1).

Clinical features

The illness affected all age groups, including both infants and adults over 60 years of age; the paediatric age group constituted about 50% of the cases in all the three outbreaks.

In many instances, several members of the same family, mostly children, were ill at the same time. These patients presented with the symptoms of fever, rhinorrhoea, sore throat, cough, body aches, and weakness. Only a few of the patients presented with all the symptoms. Most of the patients presented with a febrile illness accompanied by one or two of the respiratory symptoms. In young children, the respira-

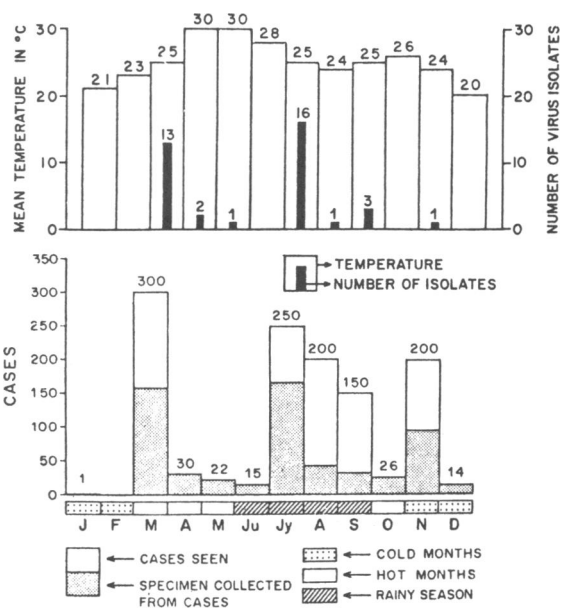


Fig. 1. Monthly data on mean temperature, number of cases of acute respiratory infection, and number of influenza virus isolates.

tory illness was quite severe. The striking clinical feature in some patients during the March outbreak was a hacking cough, while it was rhinorrhoea in a large number of the patients during the July–September outbreak.

Virus isolation and serological results

From the 414 specimens collected and processed during the three ARI outbreaks, 35 isolates were obtained (Fig. 1, Table 1), whereas the 107 specimens collected from sporadic cases during the remaining

Table 1. Total number of cases seen, specimens processed and virus isolated during the three outbreaks

Period	Total no. of cases seen	No. of throat and nasal swabs processed	No. of isolations	No. similar to A/Texas/11/77 (H3N2) and variants	No. similar to A/Brazil/11/78 (H1N1) and variants
March 1980	300	86	13	12	1
July–September 1980	600	230	20 ^a	10	9
November 1980	200	98	2 ^b	1	—

^a One was identified as influenza virus B.

^b One isolate was not identified.

months of the year yielded only 3 influenza A(H3N2) isolates—2 in April and 1 in May. Of the 38 isolates, 37 were identified as influenza A or B viruses; 1 isolate could not be identified. The majority of these isolations were from children, but viruses were isolated from persons of all ages, including a 7-month-old infant and a 65-year-old person.

Of the 13 influenza virus isolates obtained during the March (hot season) influenza outbreak, 12 were A(H3N2) strains and one was identified as an A(H1N1) strain, indicating the predominance of the H3N2 strains.

During the extensive July–September (wet season) influenza outbreak A(H3N2) and A(H1N1) strains were isolated with equal frequency (10 and 9 isolates, respectively). During this outbreak, one influenza B strain was also isolated, from a 1½-year-old male child in September. Of 23 paired serum samples collected during this outbreak, 6 showed significant seroconversion—2 to H3N2, 2 to H1N1, and 2 to B/Hong Kong/5/72 strains—confirming the involvement of many types and subtypes.

During the November outbreak (cold season) only 1 influenza A (H3N2) strain and 1 other unidentified isolate were recovered. Paired sera from 2 patients collected during the same outbreak did not show any evidence of recent influenza A or B infection. It is probable therefore that other respiratory agents caused this small-scale outbreak.

Confirmation of the isolated strains

Of 38 influenza isolates, 18 were sent to the WHO Collaborating Centre for Reference and Research on Influenza in Atlanta, Georgia, USA; these comprised 8 influenza A(H3N2) and 10 influenza A(H1N1) strains. These strains were identified as similar to the currently prevalent drifted H3N2 and H1N1 strains. The H3N2 strains were related to A/Texas/1/77, A/Bangkok/1/79, and intermediate strains. The H1N1 strain isolated in March resembled A/Brazil/11/78 and the H1N1 strains isolated in July resembled the new variant group A/England/333/80 and

A/India/6263/80. The latter virus is at present being used by the World Health Organization as a reference H1N1 variant strain (3).

DISCUSSION AND CONCLUSIONS

The one-year study presented here demonstrates the circulation of two subtypes of influenza virus type A, as well as type B influenza viruses in all the three seasons of the year, in Pune, a city with a tropical climate.

The activity of H3N2 strains was predominant during the short March 1980 influenza outbreak although some H1N1 activity was also noted. However, during the prolonged July–September influenza outbreak, H3N2 and H1N1 strains were isolated with equal frequency and influenza B infections were also demonstrated. The combination of virus strains, together with the wet weather, probably contributed to this extensive outbreak.

Seasonality of outbreaks in Pune

The occurrence of influenza outbreaks (non-pandemic) in Pune in the summer and in the rainy season during 1980 is consistent with previous experience. During 1978 and 1979, influenza outbreaks occurred in the hot season in Pune (4, 5) and in 1976 an influenza outbreak occurred in the rainy season (B. L. Rao, unpublished data, 1976). These observations may be helpful in planning future influenza surveillance activities in Pune and in other tropical and subtropical areas.

The influenza A(H1N1) variants A/England/333/80-like and A/India/6263/80 were isolated in Pune, India, in July 1980, and subsequently they were isolated from epidemics in temperate regions from November 1980 to April 1981 (6) and spread worldwide throughout 1981 (7). Thus influenza surveillance in Pune has been an early indicator of the epidemic spread of new influenza A(H1N1) strains.

ACKNOWLEDGEMENTS

The authors are greatly indebted to Dr Alan P. Kendal of WHO Collaborating Centre for Reference and Research on Influenza, Atlanta, Georgia, USA, for promptly identifying our influenza strains and for his kind cooperation and encouragement throughout the study.

The authors are grateful to Dr S. N. Ghosh, Dr H. R. Bhat, and Dr V. P. Chodankar of the National Institute of Virology for their helpful suggestions during the preparation of this article, and are also grateful to the technical staff of the influenza section of the Institute for their kind cooperation and assistance during this investigation.

RÉSUMÉ

CARACTÈRES ÉPIDÉMIOLOGIQUES, CLINIQUES ET VIROLOGIQUES DE
TROIS ÉPIDÉMIES DE GRIPPE À PUNE (INDE), 1980

Au cours de la surveillance continue de la grippe en 1980 à Pune (Inde), qui a un climat tropical avec mousson, on a enquêté sur trois épidémies d'infections aiguës des voies respiratoires, survenues en mars (saison chaude), en juillet-septembre (saison des pluies) et en novembre (saison froide); des cas sporadiques observés pendant les mois interépidémiques ont également été étudiés. La première épidémie était associée à un virus grippal A(H3N2), la deuxième avec des virus grippaux A(H3N2) et (H1N1) ainsi qu'avec un virus grippal B, mais au cours de la troisième épidémie il y a

eu moins de virus grippaux isolés. Les maladies ont sévi parmi tous les groupes d'âge, y compris les nourrissons et les adultes de plus de 60 ans, mais le groupe des enfants a été principalement atteint. Les épidémies d'infections aiguës des voies respiratoires associées aux saisons chaude et froide ont commencé à peu près au moment où le temps a changé, tandis que les épidémies grippales mixtes A(H3N2) et A(H1N1) se sont produites au milieu de la saison des pluies.

REFERENCES

1. KILBOURNE, E. D. *The influenza viruses and influenza*. New York, Academic Press, 1975, pp. 508-510.
2. PALMER, D. F. ET AL. *Advanced laboratory techniques for influenza*, Atlanta, Department of Health, Education and Welfare, 1975 (Immunology Series No. 6, Procedural Guide).
3. *Weekly epidemiological record*, **56**: 57-64 (1981).
4. RAO, B. L. ET AL. Investigations on the outbreak of influenza A/USSR/77 virus strain in Pune, Maharashtra in 1978. *Indian journal of medical research*, **70**: 681-686 (1979).
5. RAO, B. L. Investigation of 1979 influenza outbreak by types A and B influenza viruses in Pune, India. *Indian journal of chest diseases and allied sciences*, **22** (3): 143-145 (1980).
6. *Weekly epidemiological record*, **56**: 153-160 (1981).
7. *Weekly epidemiological record*, **56**: 281-288 (1981).