

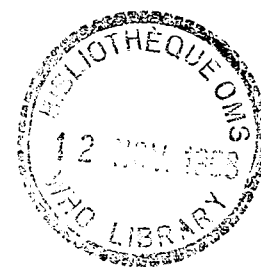


A SHORT REPORT ON EPIDEMIOLOGICAL FINDINGS
OF SMALLPOX OUTBREAKS IN THE CITY OF MADRAS

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by

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INTRODUCTION

Madras city has been one of the important endemic areas for smallpox with an incidence of about 1000 cases annually in non-epidemic years and 3000 to 4000 cases annually in epidemic years. On 2 October 1963, a Smallpox Eradication Programme was inaugurated as a part of the national programme. The attack phase of the programme ended 31 March 1966, and the city entered into the consolidation phase. There was a dramatic decline in the incidence of smallpox following the implementation of the smallpox eradication programme. There were 725 cases in 1965, 75 in 1966, 38 in 1967 and only 25 cases during the first half of 1968. To define the pattern of occurrence of this residual number of cases, detailed epidemiological studies of every reported case were undertaken this year. Support for this effort was provided by the World Health Organization and the Indian Council of Medical Research. This report summarizes epidemiological findings of individual outbreaks of smallpox that occurred in Madras city during the first half of 1968.

SUMMARY OF FINDINGS

There were 13 outbreaks of smallpox reported in Madras city during the first six months of 1968. These 13 outbreaks resulted in a total of 25 cases, 24 of which were definitely confirmed as smallpox and one, a death due to smallpox at home, was considered as a presumptive case. Details with respect to investigations in each of these outbreaks are set forth in the Annex. There were nine deaths, of which three occurred at home and six in the hospital. Five of the deaths were amongst the unvaccinated, and four amongst the vaccinated. Two previously vaccinated cases experienced the haemorrhagic type of smallpox.

Of the 13 outbreaks, eight were single-case outbreaks with no further transmission; three were two-case outbreaks with occurrence of one secondary case in each; one resulted in three secondary cases and one, the largest outbreak in this series, resulted in three secondary cases and four tertiary cases. In total, therefore, 13 primary cases were responsible for eight secondary cases and four tertiary cases.

Of the five outbreaks in which further transmission occurred, intra-familial transmission occurred in three, in one instance there was transmission in the household (compound) and in the other there was transmission in the locality.

Six, possibly seven, of the outbreaks represented imported infections principally from Andrapradesh State. In the remaining six, no source of infection could be found. Of the seven persons who imported infection, the purpose of entry was stated as "seeking employment"

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in two cases, "seeking hospital admission for sickness" in two cases, "to join father" in one case, "return from a business trip" in one case and "came from grandmother's house because of smallpox" in one case.

NOTIFICATION OF PRIMARY CASES AND TRANSMISSION OF INFECTION

Of the 13 primary cases, five were not notified to the Health Department but were hidden at home throughout the course of the disease and these resulted eventually in 12 more cases. Of the five unnotified cases one died and the remaining four completely recovered at home before detection. Primary cases in the remaining eight outbreaks were notified and isolated in the hospital and did not transmit infection to others either in the family or in the locality. Of these eight notified cases, four were isolated before the seventh day of fever and the remaining four between the seventh and tenth day. Table 1 shows the transmission of infection with reference to the notification of primary cases.

SOURCE OF INFECTION AND TRANSMISSION PATTERN

In six of 13 outbreaks infection was definitely traced to areas outside the city and, in one additional instance, infection outside the city was probable. In one instance, infection was acquired in an adjoining district of Madras State; in one instance in Kerala State and in five instances in Andrapradesh State. The source of infection could not be traced in six outbreaks. However, two outbreaks, each constituting single cases, occurred within 200-300 yards of other infected houses, though there was no evidence of either direct or indirect contact.

Four of the seven imported infections did not result in any secondary cases; the remaining three, which were hidden unnotified cases, were responsible for four secondary cases. Even amongst the so-called indigenous outbreaks, four resulted in no secondary cases. Only in two instances was there disease transmission and these again were unnotified cases. These two were responsible for eight further cases.

AGE OF THE PRIMARY CASE AND TRANSMISSION PATTERN

Five of the 13 primary cases were children between six months and two years of age and eight were 14 years of age or older. Of the five children, three were responsible for four subsequent cases - three adults and one child (Table 2). Of the eight adult primary cases, six did not transmit disease while two were responsible for four secondary and four tertiary cases.

Considering the 25 cases as a whole, 10 cases occurred in children, of whom four transmitted infection to seven additional persons; 16 occurred in persons 14 years of age or over but only three transmitted infection to four others.

SEX OF THE PRIMARY CASE AND TRANSMISSION PATTERN

Of the 13 primary cases only two were females, both infants. Among 12 subsequent cases, five were females.

VACCINATION STATUS OF THE PRIMARY CASES

Of the 13 primary cases, five were unvaccinated and eight had been previously vaccinated. Of the five unvaccinated, three transmitted infection to four persons; of the eight previously vaccinated primary cases, only two transmitted infection which resulted in four secondary cases.

Considering all cases as a group, three of 15 previously vaccinated persons transmitted disease to a total of five persons but, among the unvaccinated, four of 10 persons transmitted disease to a total of seven others (Table 3).

CLINICAL TYPE OF THE PRIMARY CASE AND TRANSMISSION PATTERN

Considering the 25 cases as a group, there were two haemorrhagic cases but no subsequent transmission (Table 4); three flat cases of whom two transmitted disease to four others; 17 ordinary cases of whom four transmitted smallpox to seven additional persons; and three modified cases of whom one transmitted disease to one other person.

HOUSING CONDITIONS - NUMBER OF CONTACTS AND INTRA- AND EXTRA-FAMILIAL TRANSMISSION OF INFECTION

Of the 13 index cases, one primary case has no home and no contacts. Four primary cases resided in independent detached houses, two lived in independent huts, one in a tea stall and the other in a masonry bungalow. They had 34 vaccinated and one unvaccinated familial contacts. There was no transmission of infection to these contacts. One case, however, was responsible for two cases in the locality, one in an adjacent house in the same street and the other in a house behind within 50 feet from the infected house.

Four primary cases resided in household complexes with more than one family sharing a common water closet and bath. These four cases had 22 vaccinated and three unvaccinated familial contacts. Of these, one vaccinated and one unvaccinated person developed disease. These four cases also had 61 vaccinated and three unvaccinated extra-familial household contacts but none developed smallpox.

The remaining four cases lived in huts which formed part of a group of huts in a compound. Though the individual families lived in separate huts, they were separated only by a mud wall. All the hut dwellers had a common water closet, bath, well, etc. All 29 familial contacts had been vaccinated: none developed disease. However, of 97 vaccinated and six unvaccinated extra-familial contacts, one vaccinated and three unvaccinated persons developed smallpox.

Considering all cases of smallpox in individual families, there were 125 vaccinated and five unvaccinated familial contacts, of which two among the vaccinated and one in the unvaccinated developed disease, an intra-familial transmission rate of 1.6 per cent. in the vaccinated and 20 per cent. in the unvaccinated (Table 5).

CONCLUSIONS

Considering that the number of cases is very small, conclusions must necessarily be tentative. Clearly dramatic, however, is the fact that despite most intensive surveillance, only 25 cases could be uncovered in a city which annually reported hundreds and thousands of cases during the first six months of every year prior to implementation of the smallpox eradication programme. At least six and probably seven of the 13 outbreaks resulted from infections imported from neighbouring states. Clearly, importation of infection, especially from Andrapradesh State, is an ever-present risk demanding constant vigilance.

In spite of a good public health programme and an awareness of the danger of smallpox on the part of the people of the city of Madras, five of the 13 primary cases were not notified to the Public Health Department in time; all secondary and tertiary cases occurred as a result of spread from these unnotified cases. This should serve as a warning to the public-health staff as well as the public. Burial grounds are a very important source of case detection. Three hidden cases were detected at the burial ground or at home only after death. These led to subsequent detection of eight cases of smallpox. Tracing out the source of infection from a suspicious death is a very important measure in smallpox containment.

Certain observations with respect to transmission patterns which are suggested in these studies support previous, more extensive studies conducted by the author:

1. Children are more likely to transmit infection than adults.

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2. Transmission by unvaccinated cases is more frequent than by vaccinated cases.

3. Transmission by persons living in household complexes and hutting compounds is more frequent than by those living in independent dwellings.

MADRAS CITY OUTBREAK NO. 1

Case 1

Case history: Sridhar, Hindu, Malayalee, 18-year-old male, was admitted for smallpox on 9 February from the platform, Madras Central Station with a history of fever since 5 February. He developed modified discrete smallpox and recovered. Vaccinial status - PV 4 (infancy); RV (five months previous). Occupation - unlicensed porter, Central Station, but became a food-packet vendor, on the station platform, attached to the departmental III Class canteen just five days before the attack.

Housing condition: He has no home. He eats in the canteen and sleeps on the platform.

History of movements: He has not been outside the city during the last year.

Case 2

Case history: Amir, Muslim, Tamilian, 20-year-old male, was admitted for smallpox on 12 February from the pavement, Walltax Road, abutting Central Station, with history of fever since 6 February. He developed ordinary confluent smallpox and recovered. Vaccinial status - PV (infancy) no scar seen; RV not done. Occupation - unlicensed porter, Central Station.

Housing condition: He has no home. He eats in nearby hotel and sleeps on the pavement or station platform.

History of movements: He has not been outside the city in recent months.

Case 3

Case history: Krishnamurthy, Hindu, Tamilian, 40-year-old male, was admitted for smallpox from 5 Marthamman Koil Street, Pulianthope, on 23 February with history of fever since 18 February. He developed ordinary semi-confluent smallpox and died subsequently in the hospital. Vaccinial status - PV 2 (infancy); RV (four years previous). Occupation - unlicensed porter, Madras Central Station.

Housing condition: A thatched hut with only one room. This is one of a group of four huts each separated from the other by a wall.

History of movements: He lived at Pulianthope which is nearly 1-1/2 miles away from the Central Station. He worked at Central Station as an unlicensed porter along with case 2 whom he knew intimately. He had not been out of Madras recently.

EPIDEMIOLOGICAL FINDINGS

Cases 1 and 2 developed smallpox almost simultaneously, on 5 February and 6 February. Case 3 who experienced onset of the disease on 18 February quite possibly contracted infection from case 2 with whom he was in intimate contact.

History revealed that some canteen workers had been admitted for chickenpox at the Infectious Disease Hospital during the previous three to four weeks but all appeared to be valid cases of chickenpox. One such case ended fatally. Although no laboratory studies on this case were performed, the patient lived at Nattupilliar Koil Street, George Town, where several members of his family had chickenpox. The source of infection for these three cases could not immediately be determined.

Annex

Cases 1 and 2 had no familial contacts or even close contacts except case 3 who experienced onset of infection 13 days later. Case 3 had five familial contacts, a wife and four children. None developed the disease, although the youngest child, aged 1-1/2 years, was unvaccinated. He had 10 extra-familial household contacts; all had been vaccinated; none developed smallpox.

Meanwhile five cases of smallpox were reported from Harrington Road, Chetput, which is nearly four miles from the Central Station.

Case 4

Case history: Vijayan, Hindu, TAMILIAN, 3-1/2-year-old boy, was admitted on 21 March from 34A Harrington Road, Chetput, with history of fever since 14 March. He developed flat, confluent type smallpox and died subsequently at the hospital. He had been unvaccinated until the day prior to the onset of disease, 13 March, when he was successfully vaccinated. Occupation of father - coolie.

Housing condition: Single room hut (mud walls with thatched roof), one of a group of 16 huts in the compound of 34A, Harrington Road.

History of movements: Had not been outside Madras recently.

Case 5

Case history: Ayyamma, Hindu, TAMILIAN, three-year-old girl, was admitted for smallpox on 29 March from the same compound as above with history of fever since 16 March. She developed flat, discrete type smallpox and died. Vaccinial status - PV 1 (infancy); RV not done. Mother's occupation - domestic servant.

Housing condition: Thatched hut in the same group of huts but in opposite row from that of case 4.

History of movements: Had not been out of Madras recently.

Case 6

Case history: Rani, Hindu, TAMILIAN, three-year-old girl, was admitted for smallpox from the same compound as the two above, with history of fever since 16 March. She developed ordinary discrete type smallpox and recovered. Vaccinial status - successfully vaccinated (two marks) three days before onset of fever, on 13 March. Father's occupation - coolie.

Housing condition: Thatched hut in the same group of huts, just opposite to that of case 4.

History of movements: Has not been out of Madras recently.

Case 7

Case history: Suseela, Hindu, TAMILIAN, 45-day-old girl, died at home on 12 March. The dead body was seen by the Public Health Staff at the Burial Ground at the time of disposal. The cause of death was recorded as "Eruptive" with Broncho Pneumonia. The body was not sent to the Infectious Disease Hospital for confirmation of diagnosis. According to history, the fever started about 1 March, possibly earlier, and rash developed on the third day of fever. The diagnosis presumably was smallpox. Although this death was not notified to the Health Officer or confirmed by the Infectious Disease Hospital, the people in the locality were vaccinated on 13 March, assuming the cause of death in this case was smallpox. Vaccinial status - unvaccinated. Father's occupation - coolie.

Annex

Housing condition: Hut next to case 6 and between those of cases 6 and 8.

History of movements: No history of having been out of Madras recently.

Case 8

Case history: Natarajan, Hindu, Tamilian, 18-year-old male, was detected and removed to the Infectious Disease Hospital on 21 March. He was a convalescent case with a few scabs remaining on the palms and soles. He is reported to have developed fever about 20 January and was isolated at home without notification to the health authorities. He had experienced ordinary discrete type smallpox. Vaccinal status - PV 3 (infancy); RV not done. Occupation - flower seller at Madras Central Station.

Housing condition: Thatched hut abutting that of case 7.

History of movements: The patient insisted that he had not been out of Madras before he became ill but he was secretive and little information could be elicited. After the attack he was confined to bed only when he was actually sick and at other times he moved about the compound. He also attended his work at the Central Station when he felt well enough. Hence, he was moving about both at home and at work while still actively infectious.

EPIDEMIOLOGICAL SUMMARY

Case 8 was ambulatory while infectious and at least in casual contact with others in his compound, including cases 4, 5 and 6, all children between three and nine years. Considering, however, that case 7, the 45-day-old child, who lived in the hut next to case 8 developed the disease about 1 March, whereas the other three cases developed the disease only after 13 March, it is more likely that case 7 was infected by case 8 and cases 4, 5 and 6 contracted infection from case 7. In this respect, it should be noted that it is common for mothers with their children to visit a sick newborn baby. Additionally, the fever to fever interval between case 7 and the others was 13 to 16 days, the usual period observed by us in our epidemiological studies. If this assumption is correct this primary case (case 8) was responsible for one secondary case and three tertiary cases at the place of residence.

At the Central Station, the flower stall of case 8 is next to the canteen of case 1. He also sells flowers on the platform where cases 1, 2 and 3 also work. Since he became ill about 20 January, it would appear likely that cases 1 and 2 who developed fever on 5 and 6 February, respectively, contracted infection from case 8 just when he was developing rash. As previously noted, case 3 probably contracted infection from case 2 with whom he was in close association.

TRANSMISSION OF INFECTION

The first case, case 8, had seven familial contacts, all previously vaccinated and none developed smallpox. Case 4 had six vaccinated family contacts; case 5, three vaccinated family contacts; case 6, two vaccinated family contacts; and case 7, eight vaccinated family contacts. None had unvaccinated contacts. There was no further transmission in any of these families.

Among the 15 families living in the same compound there were 58 vaccinated and three unvaccinated extra-familial contacts. In this group, one previously vaccinated child and all three unvaccinated children developed smallpox. The previously vaccinated child and two of the three unvaccinated children died.

At work, case 8 was eventually responsible for three further cases, two of whom had no family contacts. The third who had four vaccinated and one unvaccinated family contacts did not further transmit infection.

Annex

MADRAS CITY OUTBREAK NO. 2

Case 1

Case history: Mohamed, Muslim, Malayalee, 28-year-old male, was admitted on 12 February for smallpox from 51/18, Tolgate, Othawadai Street, Ayanavaram, with history of fever since 5 February. He experienced modified discrete type smallpox and recovered. Vaccinial status - PV 2 (infancy); RV not done. Occupation - casual labourer, B & C Mills.

Housing condition: Household complex consisting of seven portions. The infected family has two rooms and all others one room. One of the portions at the time of infection was vacant. Each portion is separated from the other by a brick wall partition; the roof is thatched. All portions open into a common central corridor and all tenants have a common water closet and bath.

History of movements: The patient left Godavari Karai, Karima Nagar District, Ramagundam, Andrapradesh, where he was working as a labourer in a new power house and came straight to Madras Central on 10 January with a break of journey at Vijayawada for a few hours, and immediately proceeded to Ennore, Chingleput District, eight miles from Madras city. He stayed with a friend and came to Madras again on 17 January and stayed at 40A New Farans Road, Perambur Barracks, a tea stall, until 25 January. He then procured a room at the above address at Ayanavaram and shared it with two friends and stayed there until the date of admission.

EPIDEMIOLOGICAL FINDINGS

An intensive search for cases at Ennore, at New Farans Road, as well as at Ayanavaram, revealed no hidden cases or suspicious deaths. However, Ramagundam where the patient had been working until 10 January is reported to have been infected. Although the time lag between the date of departure from Ramagundam, 10 January, and the date of attack, 5 February, viz. 26 days is long, there have been instances in our previous epidemiological studies where "exposure to fever" interval appeared to be as long as 24 days. It is presumed that Ramagundam was the place of infection.

TRANSMISSION OF INFECTION

The patient had two household contacts, both vaccinated adults, and 15 extra-familial household contacts of whom 14 were vaccinated and one unvaccinated (a two-month-old baby) who was vaccinated successfully on the ninth day of exposure. No transmission of infection occurred.

MADRAS CITY OUTBREAK NO. 3

Case 1

Case history: Annamma, Hindu, two-year-old girl, was admitted for smallpox from Hut Muthumariamman Koil Street, Aminjikarai on 14 February with history of fever since 8 February. The child developed ordinary discrete type smallpox and recovered. Vaccinial status - PV (infancy) no scar seen; RV not done. The child has not father at home; her mother works as a casual labourer in construction at the Indian International Trade Fair, Anna Nagar.

Housing condition: Thatched hut with mud walls, unconnected with other huts.

History of movements: The mother denies having been outside the city during the last six months. She came to Madras six months before, seeking employment, from Kolar, Mysore State.

Annex

EPIDEMIOLOGICAL FINDINGS

An intensive search in the locality did not reveal any hidden cases of smallpox or any suspicious deaths. The child is taken by the mother to the construction site daily and brought back at the end of the day. The fair site has attracted thousands of labourers from different parts of the States of Madras, Mysore and Andrapradesh. The construction had been going on for the last six months but there had been no notified cases from these workers. It is reported that the uncle of the child and his children had recently come from Kolar, Mysore State, about 15 days back and were staying in the opposite hut but there was no history of contact with any known case of smallpox at Kolar.

The source of infection of this case could not thus be determined.

TRANSMISSION OF INFECTION

This child has three familial contacts, two vaccinated and the other a child of nine unvaccinated until 14 February, on the seventh day after exposure. There were no extra-familial household contacts. There was no transmission of infection in the family or locality from this case.

MADRAS CITY OUTBREAK NO. 4

Case 1

Case history: Krishnan, Hindu, Andhra, 25-year-old male, was admitted for smallpox on 15 February with a history of fever since 12 February. He was admitted to Government General Hospital for granuloma venereum on 12 February and was transferred to the Infectious Disease Hospital on 15 February. He developed ordinary discrete type smallpox and recovered. Vaccinal status - PV 4 (infancy); RV not done. Occupation - hotel worker.

Housing condition: No home in Madras.

History of movements: The case is a worker in Vijaya Cafe opposite to Clock Tower, Chilakalurpet near Narasaraopet, Guntur District, Andrapradesh State. He left his home by lorry on 4 February for Cuddappah to visit his brother. His brother advised him to go to Madras to consult a physician at General Hospital for his ailment (granuloma venereum). He arrived at Madras by train on 6 February. He was treated as an outpatient for want of a bed in the venereal diseases wards of the General Hospital. He developed fever on 12 February at which time he was admitted to the Infectious Disease Hospital. During his stay in Madras between 6 and 12 February, he stayed on the verandah of General Hospital, eating in nearby hotels.

EPIDEMIOLOGICAL FINDINGS

As he developed fever on the seventh day after his arrival in Madras, and on the ninth day after leaving his home town, the infection was probably acquired in Andrapradesh State. According to the patient, smallpox was prevalent in his home town of Marasaraopet Taluq.

TRANSMISSION OF INFECTION

He has no home or family at Madras and so no familial contacts. There was no known transmission of disease in the indigenous population or in the General Hospital in-patients.

Annex

MADRAS CITY OUTBREAK NO. 5

Case 1

Case history: Raman, Hindu, Malayalee, 25-year-old male, was admitted for smallpox from 26, Adiappa Naicken Street, George Town, on 29 February with history of fever since 26 February. He developed late haemorrhagic type smallpox and died. Vaccinial status - PV 1 (infancy); RV not done. Occupation - hotel worker.

Housing condition: A private lodge with pucca masonry construction with AC roofing. The patient occupied one of 11 rooms, one room was vacant. All rooms open into a common corridor; there is one common water closet and two bathrooms.

History of movements: Had been in Madras continuously for the last year working in a nearby hotel. Originally came from Kerala State.

Case 2

Case history: Balakrishnan, Hindu, Malayalee, 25-year-old male, was detected and admitted for smallpox on 29 February with history of fever since 26 January. He was convalescent with scabs still on the palms and soles. He experienced ordinary discrete type smallpox. Vaccinial status - PV 4 (infancy); RV (one year previously). Occupation - hotel worker.

Housing condition: He occupied the same room as case 1.

History of movements: The patient is a resident of Kerala State but came to Madras from Koderi near Tellichery, Kerala State on 19 January to seek employment. Within seven days after arrival, he developed smallpox.

EPIDEMIOLOGICAL FINDINGS

Case 2 is an imported case from Kerala State. After he became ill, he was dissuaded from going to the Infectious Disease Hospital by his lodge mates. He stayed in his room throughout the course of the disease till the day of removal to the Infectious Disease Hospital by the Public Health staff on 26 February. While he was sick, case 1 attended and nursed him. When case 1 fell ill, he was immediately removed to the hospital. Case 2 was the source of infection for case 1.

TRANSMISSION OF INFECTION

Case 2 had four room mates, three with vaccination scars and one without. The unvaccinated contact did not develop smallpox but one of the vaccinated contacts (case 1) contracted infection and died.

There were 21 others who shared the same water closet and bath. Of these, one had smallpox six years before and one had no marks of vaccination but none contracted the infection.

MADRAS CITY OUTBREAK NO. 6

Case 1

Case history: Rajammal, Hindu, Andhra, 65-year-old female, was admitted for smallpox on 6 March from 4 Lakshmiamma Koil Street, Perambur, with history of fever since 26 February. She developed ordinary semi-confluent type smallpox and died. Vaccinial status - PV (infancy) no scar seen; RV (one year previous). Occupation - nil. One son is employed by the Corporation and another in a bank.

Annex

Housing condition: Terraced pucca masonry building, consisting of a household complex with a central open courtyard with rooms around. It is occupied by three families including the infected one. The infected family has one living room, one hall and a kitchen. All families have a common water closet.

History of movements: The patient had not been out of Madras in recent months.

Case 2

Case history: Harish, Hindu, Andhra, six-month-old boy, was admitted as a recovered case of smallpox on 7 March from the same address with history of fever since 4 February. He developed ordinary semi-confluent type smallpox and recovered. Vaccinial status - unvaccinated. At the time of admission the child was free from infection with no scabs on the body. The case was not notified to the Health Department.

Housing condition: Same as case 1.

History of movements: This child was born at Kakinada East Godavari, Andrapradesh State, and was there till 24 January when he came by train to his father's house.

EPIDEMIOLOGICAL FINDINGS

Case 1 was the grandmother of case 2. Case 2 came from Andrapradesh State and developed fever on the 11th day after arrival in Madras. He was kept at home throughout the course of the disease without notification. The grandmother attended the case and contracted smallpox. Intensive search revealed no other cases in the locality.

TRANSMISSION OF INFECTION

There were nine familial contacts of the primary case, eight vaccinated and one unvaccinated. Only the latter contracted infection. There were 14 extra-familial household contacts all of whom were vaccinated except for a 26-day-old child. None developed the disease.

MADRAS CITY OUTBREAK NO. 7

Case 1

Case history: Srinivasan, Hindu, Andhra, 1-1/2 year-old boy, was admitted for smallpox from 77 Govindappa Naicken Street, George Town on 21 March, with history of fever since 17 March. He developed ordinary confluent type smallpox and died. Vaccinial status - "unvaccinated". Occupation - father is a petty business man.

Housing condition: Pucca masonry building with ground floor and first floor. Besides the infected family, there are three families living on the ground floor and one family on the first floor. The infected family has one living room, one hall and one kitchen.

History of movements: The child was born in Madras. He had been to Ongole, Andrapradesh State, to visit relatives. He stayed there for 18 days and returned to Madras with the rash on 21 March.

EPIDEMIOLOGICAL FINDINGS

The child left for Ongole, Andrapradesh State, on 3 March and developed fever on the 15th day after arrival in Ongole. Intensive search near his Madras residence revealed no hidden cases or suspicious deaths. It was reported that there was infection in Ongole.

Annex

TRANSMISSION OF INFECTION

The child has nine vaccinated and one unvaccinated familial contacts. The latter was vaccinated successfully on 16 March, a day prior to the onset of the primary case. None became ill.

The child has 14 extra-familial vaccinated household contacts; none contracted infection.

MADRAS CITY OUTBREAK NO. 8

Case 1

Case history: Rathnavelu, Hindu, TAMILIAN, 20-year-old male, was admitted for smallpox from 25 Manjakollai Street, Aminjiharai, on 27 March with history of fever since 20 March. He developed ordinary discrete type smallpox and recovered. Vaccinial status PV 4 (infancy); RV 1 (five years previous). Occupation - worker in brick kiln in Reddithope, just outside city limits.

Housing condition: An independent thatched hut with two families residing with a mud wall partition between.

History of movements: Except that he goes for work in Reddithope daily, he has not been outside Madras in recent months.

EPIDEMIOLOGICAL FINDINGS

Search in the locality did not reveal any hidden cases of smallpox or any suspicious deaths. He gave no history of contact. The brick kilns in which he worked obtain labourers from different villages in the adjacent district. The last case of smallpox reported from the locality was noted in outbreak No. 3, a place half a mile away. That case was in a child of a mother who was working in confection at the Indian International Trade Fair. However, there was no history of any direct or indirect contact between this case and the patient.

TRANSMISSION OF INFECTION

This case had nine vaccinated familial contacts and four extra-familial vaccinated contacts. None contracted infection.

MADRAS CITY OUTBREAK NO. 9

Case 1

Case history: Dead body of Arumugham, Hindu, TAMILIAN, six-month-old boy was detected and transferred to the Infectious Disease Hospital on 11 April for confirmation of diagnosis and cause of death. It was confirmed that the child died of flat, confluent type smallpox. The death occurred at 18C Arunachala Gramani Street, Chetput. The child developed fever on 5 April. Vaccinial status - "unvaccinated". Occupation - nil. Brother - petty business.

Housing conditions: Masonry tiled house, a household complex with three additional families residing in the same house. The infected family occupied two rooms.

History of movements: The child was born in Madras and remained in Madras since birth; no history of visitors from outside the city.

Annex

Case 2

Case history: Pushpa, Hindu, 10-year-old girl, developed fever on 16 April and was admitted to the Infectious Disease Hospital on the same day from the same address as case 1. The child developed modified discrete type smallpox and recovered. Vaccinal status - PV 1 (infancy); RV (one year previous); vaccinated successfully on third day of exposure.

Housing condition: Same as case 1.

History of movements: The child had not been out of Madras.

EPIDEMIOLOGICAL FINDINGS

The source of infection for case 2 was case 1. The source of infection for case 1 was not found. Though there were some recovered eruptive fever cases in the locality, none were found to be smallpox. Although this area is only one-eighth of a mile from the infected area described in outbreak No. 1, no history of direct or indirect contact could be established.

TRANSMISSION OF INFECTION

Case 1 had eight vaccinated familial contacts of which one (case 2) developed smallpox. There were six extra familial household contacts, none of whom contracted infection.

MADRAS CITY OUTBREAK NO. 10

Case 1

Case history: Sadanandham, Hindu, Malayalee, 26-year-old male, was admitted for smallpox from No. 2 Taylors Road, Kilpauk on 13 May with history of fever since 7 May. He developed ordinary discrete type smallpox and recovered. Vaccinal status PV 4 (infancy); RV (five years previous). Occupation - hotel cashier.

Housing condition: The case resided at a tea stall which has one big hall and kitchen. All workers sleep in an adjacent old vacant building. After he developed fever he did not go to work but stayed in the vacant building till the day of isolation.

History of movements: He denied having been out of the city during recent months. He has three brothers living elsewhere in the city but it was reported that he was not on good terms with them and rarely visited them.

EPIDEMIOLOGICAL FINDINGS

All the localities where the brothers were living were searched for hidden cases of smallpox but none were found. Similarly the area from which the case was removed also was searched but no hidden cases or suspicious deaths were discovered. The source of infection is not known. There has been no case of smallpox in the locality for more than two years.

TRANSMISSION OF INFECTION

There were 18 contacts, all workers in the hotel, one of these had smallpox about 14 years ago, and all others had been vaccinated. None contracted infection.

Annex

MADRAS CITY OUTBREAK NO. 11

Case 1

Case history: Chandrasekar, Hindu, TAMILIAN, 14-year-old male, was admitted for smallpox on 15 May from 23 Shajudin Sahib Street, Choolaimedu, Kodambakkam, with history of fever since 7 May. He developed ordinary discrete type smallpox and recovered. Vaccinal status - PV 4 (infancy); RV (five months previous). Occupation - carpenter.

Housing condition: Thatched hut with mud walls in a series of huts, six in one row and four in the opposite row. Between the rows there is a cutcha road about 10 feet wide. The series of huts are about 50 feet away from the main road. Each hut in the row is separated from the other by a common mud wall.

History of movements: The case has been staying in Madras continuously. Being a carpenter, he goes to other carpentry shops nearby, especially in the Chetput area.

EPIDEMIOLOGICAL FINDINGS

The source of infection is not definitely known. His residence is about 1/8 to 1/4 miles from the infected locality in outbreak 12 and about one half mile from the locality of outbreak 10 where there were some carpenters. However, there was no history of direct or indirect contact with either.

TRANSMISSION OF INFECTION

This case had five vaccinated familial contacts and 32 extra-familial household contacts, 28 of whom had been vaccinated and one of whom had smallpox in infancy. The remaining three were vaccinated successfully after exposure. One of the unvaccinated contacts, a 22-year-old woman, was living in the hut abutting the infected hut. None developed smallpox.

MADRAS CITY OUTBREAK NO. 12

Case 1

Case history: Swaminathan, Hindu, TAMILIAN, 32-year-old male, was admitted for smallpox on 18 May from 16/4 Wahab Street, Choolaimedu, Kodambakkam with history of fever from 13 May. He developed clinical ordinary discrete type smallpox and recovered. Vaccinal status - PV 1 (infancy); RV not done. Occupation - hotel worker.

Housing condition: Brick walled hut with thatched roof in a group consisting of four huts in one block and six huts in another block. Each block is separated from the other by a small open space. There is a common well and water closet for all the huts. In the first block one hut abuts the infected one; the other two are separated by a small lane.

History of movements: The case had been in Madras for two years, but in this hut for the last one-and-a-half months only. He had been working at a hotel in Choolaimedu High Road, but did not work after the onset of fever.

Case 2

Case history: Ethiraj, Hindu, TAMILIAN, 20-year-old male, was detected dead of smallpox at home, 9 Abdulla Street, Choolaimedu Kodambakkam. The body was removed to Infectious Disease Hospital on 15 May for confirmation of diagnosis. It was confirmed that he died of late haemorrhagic type smallpox. He had developed fever about 9 May. Vaccinal status - PV 3

Annex

(infancy); RV (one year previous). Occupation - student, Pallavaram High School. His brother owns a laundry; soiled clothes are received at the laundry and collected from different houses.

Housing condition: A tiled house with masonry construction consisting of two rooms, one kitchen; in a series of three houses in a row, his was the central portion. In the compound there were six more huts behind this row of houses, separated by a 10 ft passage.

History of movements: The man went to Pallavaram frequently to learn the results of his examinations.

Case 3

Case history: Kalpana, Hindu, TAMILIAN, 1-1/2 year-old girl, was a recovered case of smallpox, still with scabs, detected by Public Health staff, and admitted to Infectious Disease Hospital on 19 May from 18 Wahab Street, Choolaimedu, Kodambakkam. The child had developed ordinary discrete type smallpox with onset of fever on 20 April. Vaccinal status - unvaccinated. Father works at Hyderabad.

Housing condition: Independent masonry house with three rooms, one hall, one kitchen, a store room, flush-out latrine and bath.

History of movements: The child came to Madras by train along with her father and mother on 23 April from Secundrabad, Andrapradesh State with fever and rash. The child remained at home throughout the course of the disease till she was detected and removed to the Infectious Disease Hospital.

EPIDEMIOLOGICAL FINDINGS

The infection was imported from Secundrabad, Andrapradesh State, by case 3 who was brought to Madras in the train with rash. The child's father had also developed smallpox at Secundrabad and recovered. He accompanied the child and left the child at Madras and went to his native home. Case 3 was not notified but was isolated at home at 16 Wahab Street and case 1, living at 18 Wahab Street, became infected, probably from case 3. The house of case 2 abuts the houses of cases 1 and 3 on the back side, in Abdulla Street. Since the brother of case 3 is a laundry owner, it is possible that he might have become infected from linen but there was no positive evidence. This outbreak might have been responsible for outbreak No. 11 since the residence of the case in outbreak No. 11 is about 100 yd away, but there was no evidence of direct or indirect contact.

TRANSMISSION OF INFECTION

Case 3, the primary case, had 10 vaccinated familial contacts in Madras, none of whom developed infection. There were no extra-familial household contacts.

Case 2 had 14 familial contacts, all previously vaccinated, and none developed the disease. Case 2 also had 25 vaccinated and two unvaccinated extra-familial household contacts but none developed disease.

Case 1 had three vaccinated familial contacts; none developed infection. He had 28 vaccinated and one unvaccinated extra-familial household contacts and none developed the disease.

Annex

MADRAS CITY OUTBREAK NO. 13

Case 1

Case history: Kannan, Hindu, Tamilian, 55-year-old male, was admitted for smallpox on 19 June at the Infectious Disease Hospital, having been transferred from the General Hospital out-patient department. He had a history of fever since 12 June. He developed ordinary discrete type smallpox and recovered. Vaccinal status - PV 1 (infancy); RV not done. Occupation - agriculturalist.

Housing condition: Hut with mud walls - independent and detached.

History of movements: The case developed fever and rash in his house at Sivanthangal West Colony, near Mangadu, Poonamalee (15 miles from Madras) and, after staying there for eight days, came to Madras to his sister's house at 49 Bhoopathy Nagar, Egmore, by bus. He requested help from her to obtain hospital admission. Immediately on arrival, his sister took him to General Hospital from where he was transferred to the Infectious Disease Hospital.

EPIDEMIOLOGICAL FINDINGS

The patient, Kannan, is a harijan who normally lives in Sivanthangal, about 15 miles from Madras, outside the limits of Madras Corporation. There was no infection in his house. However, his uncle's son had smallpox in Sivanthangal village East and was isolated at home. The patient visited him during his sickness. Further, his employer in Sivanthangal East had in his family two cases of smallpox, isolated at home, not notified. They were subsequently removed to the Infectious Disease Hospital. There had been a severe outbreak of smallpox in the village as well as in adjacent villages. The epidemic had started in February and all cases had been hidden. A separate epidemiological report on this outbreak is being prepared. However, this case, arbitrarily, was classified under the Madras city outbreaks.

TRANSMISSION OF INFECTION

Since the patient had not stayed even for an hour at the Madras address of his sister, no special epidemiological investigations were done in the vicinity of this address. No secondary cases occurred in any of his contacts.

TABLE 1. NOTIFICATION OF PRIMARY CASE AND TRANSMISSION PATTERN

Notification	Duration of stay at home	Outbreak Number	Number of Secondary Cases	Number of Tertiary Cases
Notified	Less than 7 days	3, 4, 7, 10	0	0
	7-10 days	2, 8, 11, 13	0	0
Not notified		1, 5, 6, 9, 12	8	4
TOTAL		13	8	4

Annex

TABLE 2. AGE OF THE PRIMARY CASE AND TRANSMISSION PATTERN

Outbreak number	Ages of Primary Case (years)	Ages of Secondary Cases (years)	Ages of Tertiary Cases (years)
3	2	-	
6	6/12	65	
7	1-1/2		
9	6/12	10	
12	1-1/2	20, 32	
1	18	3 18 20	3, 3, 1/2 40
2	28	-	
4	25	-	
5	25	25	
8	20	-	
10	26	-	
11	14	-	
13	55	-	
TOTAL 13		8	4

TABLE 3. TRANSMISSION PATTERN BY AGE AND VACCINATION STATUS

Vaccination status	Age	No. of cases	No. which transmitted disease	Total no. of contact cases
Vaccinated	0-4	1	0	0
	5-14	2	0	0
	15+	<u>12</u>	<u>3</u>	<u>5</u>
		15	3	5
Unvaccinated	0-4	8	4	7
	5-14	0	0	0
	15+	<u>2</u>	<u>0</u>	<u>0</u>
		10	4	7

Annex

TABLE 4. TRANSMISSION PATTERN BY SEVERITY OF DISEASE

Disease classification	No. of cases	No. who transmitted disease	No. of cases resulting
Haemorrhagic	2	0	0
Flat	3	2	4
Ordinary	17	4	7
Modified	3	1	1
	25	7	12

TABLE 5. TRANSMISSION PATTERN BY AGE AND VACCINATION STATUS OF INTIMATE HOUSEHOLD CONTACTS

Age of patient	No. of patients	No. of exposures in vaccinated persons	No. of cases	No. of exposures in unvaccinated persons	No. of cases
0-4	9	56	1	3	1
5-14	2	5	0	0	0
15+	14	64	1	2	0
TOTAL	25	125	2	5	1