

OBSERVATIONS DURING SPECIAL INVESTIGATIONS IN RAJASTHAN

by

Dr Mahendra Singh¹

Introduction

Rajasthan, which has accounted this year for 29 per cent of the smallpox cases in India, is bounded on the south and north by two highly endemic states - Gujarat (21 per cent of India's smallpox cases) and Haryana (15 per cent); on the east by Uttar Pradesh and Madhya Pradesh and on the west, by Pakistan.

The successful implementation of the programme has been complicated by a scattered population, frequent drought and famine conditions with resulting large scale migration, superstition leading to resistance to vaccination, unapproachability of certain areas during monsoons and difficult desert terrain.

Since the start of the programme, there has been a "zigzag" type of incidence in Rajasthan but the case rate per 100 000 population has always been above five (Table 1).

¹ Deputy Assistant Director General of Health Services (Smallpox Eradication), Nirman Bhavan, New Delhi

TABLE 1
CASES PER 100 000 POPULATION, 1963-1970

Year	Rajasthan		India	
	No. of Cases	Cases per 100 000	No. of Cases	Cases per 100 000
1963	3 370	15.6	83 423	17.9
1964	1 994	8.9	40 265	8.4
1965	1 683	7.3	33 402	6.8
1966	1 695	7.4	32 616	6.5
1967	4 506	18.7	84 902	16.6
1968	1 923	7.7	35 179	6.7
1969	1 439	5.6	18 981	3.5
1970	*(3 200)	12.5	*(12 000)	2.2

* Projected incidence in 1970

While India in 1970 is recording the lowest incidence of smallpox in its history, nearly the opposite is true of Rajasthan. Of four Indian smallpox patients, one is from Rajasthan. Through June, 2 404 cases were reported as against 962 cases in 1969 during the same period. In 1970, most cases were reported from 9 of 26 districts, as has been true in previous years. Two of these 9 districts were visited to study the implementation of the programme.

Principal Observations

State level

A Deputy Director is in charge of the programme, assisted by a full time Assistant Director. Despite full-time concern for the programme, further efforts in supervision are required as illustrated by the fact that all vaccinators checked in the field were still working with the rotary lancet despite previous instruction for immediate adoption of use of the bifurcated needles. Primary vaccination targets had been fixed for all workers but implementation has not been satisfactory.

TABLE 2
VACCINATIONS - 1967-1970 - RAJASTHAN STATE

Year	Primary Vaccinations	% of Population	Re-vaccinations	% of Population
1967	915 000	3.5	2 303 000	9.4
1968	1 265 000	4.9	1 893 000	7.4
1969	1 037 000	4.0	1 587 000	6.2
1970 (June)	721 000	2.8	1 156 000	4.5

To vaccinate newborns only, the number of primary vaccinations that would need to be performed would be equal to at least 4 per cent of the population, but in none of the years noted are the figures substantially above those for primary vaccinations for the entire population (Table 2). Further, if the take rates obtained in primary vaccinations in this state (80-90 per cent) are considered, the absolute numbers are further reduced by 10 to 20 per cent.

District level - Alwar District

Alwar District, (population 1 300 000) is mainly rural and is surrounded by highly endemic districts. The district has 14 blocks, (population of 80 000 to 100 000), 439 Panchayats and 1 924 villages. The population is mostly agriculturist. There is no large industry or construction work.

The programme is hampered by the fact that one-sixth of the area is flooded during monsoons. Additionally, Muslims constitute about 40 per cent of the population, sizeable numbers of whom are resistant to vaccination.

The Principal Medical and Health Officer has delegated his authority for public health activities, including NSEP, to the District Health Officer who is assisted by a health educator and two full-time para-medical assistants, each responsible for the implementation of NSEP in 7 blocks. There is also a mobile squad of 5 vaccinators, utilized for routine vaccination work in Alwar City.

Properly stored freeze-dried smallpox vaccine is utilized exclusively. Refrigeration, however, is a problem. There are 8 refrigerators in the district: 2 at Headquarters (1 out of order); 6 at Primary Health Centres (5 out of order).

The disease is firmly entrenched and explosive outbreaks have occurred in 1967 and 1970. After 1967, efforts had been made to intensify the primary vaccination campaign. The decline in the number of revaccinations, particularly in 1970 when the highest incidence was reported, indicates that containment efforts must be incomplete (Table 3).

TABLE 3

VACCINATIONS - 1966-1970 - ALWAR DISTRICT

Year	Primary Vaccinations		Revaccinations		Cases	Cases per 100 000
	No. (000)	% of Population	No. (000)	% of Population		
1966	50	3.8	164	12.6	64	4.9
1967	42	3.2	78	6.0	171	13.0
1968	70	5.3	74	5.6	62	4.7
1969	76	5.8	67	5.2	45	3.4
1970 (June)	67	5.1	68	5.2	301	22.8

The Panchayat Secretary, who is responsible for immediate reporting of smallpox cases to the primary health centre, rarely performs this function. Cases are mostly reported by malaria workers, vaccinators, Gram Sewaks, Patwaris and Block Development Officers.

On receipt of reported cases by the Primary Health Centre, the vaccination supervisor visits the affected village and takes "necessary control measures" without further supervision. Epidemiological investigations, tracing of the source of infection, cross notification and containment measures are ineffective. Follow up visits are rare.

During July 1970, five outbreaks of smallpox were reported to the District Health Officer, respectively 46, 10, 10, 52 and 29 days after the onset of the first case. During August 1970, there were not only marked delays in reporting but further delays in initiating action. After a delay of over 3 months, the occurrence of cases in one village was brought to the notice of the District Health Authority on 4 August. No action had yet been taken on 21 August.

After completion of the investigation, the vaccination supervisor reports the number of cases and deaths. This is transmitted by post in a weekly consolidated statement to the District Health Authority who forwards the weekly report to the State Statistics Section and to the State NSEP. There is no cross-notification in case of importations.

Subsequently, monthly reports which include additional cases discovered are sent only to the state NSEP which transmits this data to the national NSEP. The State Health Authorities consider the NSEP data as the most accurate. The State Statistics Section also sends a report weekly to the National Statistics Office and, after 3 weeks, another "final report".

Block level - Govind Garh Primary Health Centre (Alwar District)

Population, 100 000; number of villages, 178. The Chief Medical Officer is assisted by a full-time Vaccination Supervisor and four vaccinators. Apart from the vaccinators, other health staff are supposed to perform vaccinations according to set targets. Vaccination and smallpox incidence data pertaining to the years before 1969 were not available. Four different sets of incidence data were available for 1970 and the data were completely different from those recorded at the District Headquarters.

Various places were visited from where the latest reports of smallpox cases were received.

Thekda-Ka-Bans village: (population, 229; 37 households). In addition to 13 cases known to the Primary Health Centre, 17 cases were discovered on investigation, including 2 acutely ill cases. The age, sex and vaccination status of the cases is shown in Table 4.

TABLE 4

CASES BY AGE, SEX, VACCINATION STATUS - THEKDA-KA-BANS

Age (years)	Males	Females	Total	Vaccinated	Unvaccinated	Unknown
< 1	3	2	5	0	3	2
1 - 4	8	3	11	0	7	4
5 - 14	6	7	13	0	13	0
15+	0	1	1	0	1	0
Total	17	13	30	0	24	6

All cases occurred among the unvaccinated and 29 of the 30 cases were among those less than 15 years of age.

The outbreak had been notified at the Primary Health Centre level on 4 August. Containment efforts were undertaken by the Vaccination Supervisor on 5 and 6 August. He performed 50 primary vaccinations and 26 revaccinations and detected 13 cases. Another visit was made on 12 August, during which he performed 4 more primary vaccinations.

A house-to-house visit was undertaken. In the village lived a total of 229 persons of whom 176 (77 per cent) were contacted during the survey. Of those contacted, 21 (12 per cent) were still unprotected and 79 (45 per cent) had not been vaccinated in the course of the containment measures.

Out of 37 households, 12 households (nearly one-third) were affected. Four of these, with 13 cases, were situated in a semi-circular fashion with their doors opening to a common compound. A fifth house, with 3 cases, had common walls with these. Three households, with 2 cases each, formed a second cluster. A third cluster consisted of 4 houses with a total of 8 cases.

A summary of the findings in these three clusters is shown in Table 5.

TABLE 5

CASE AND IMMUNITY STATUS OF RESIDENTS - THEKA-KA-BANS

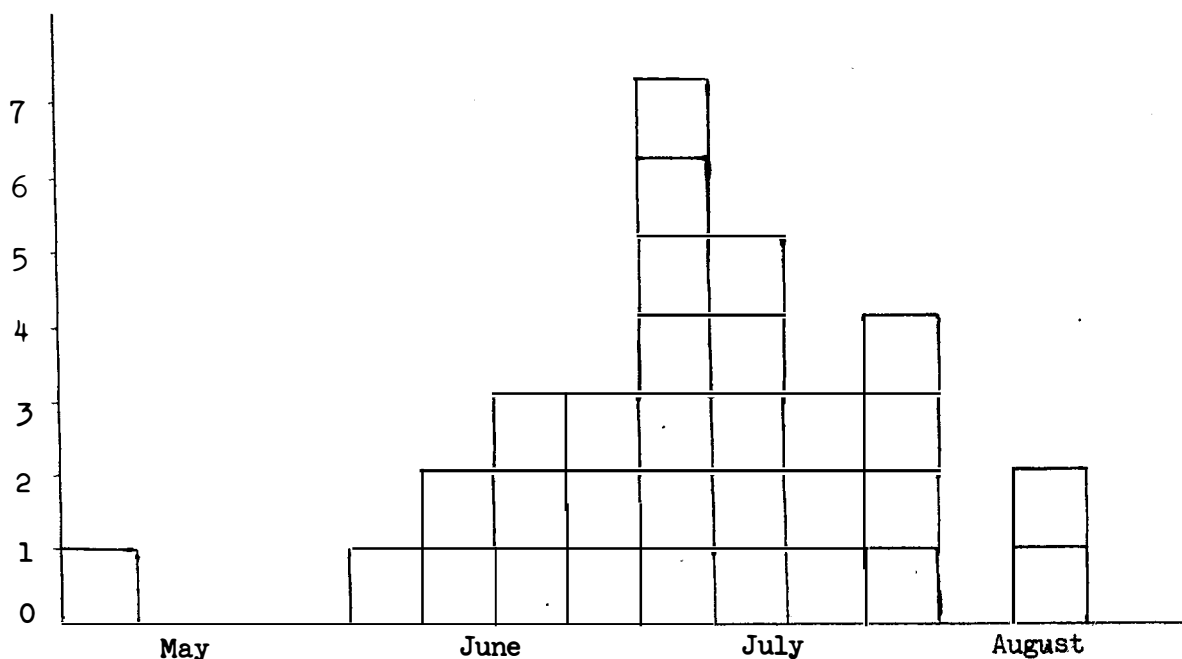
Cluster	Persons Enumerated	Persons Contacted	No. of Persons with Scars	No. of Persons with Pockmarks	Unprotected	No. of Cases
I	32	31 (97%)	13 (42%)	2	0	16
II	15	13 (87%)	5 (38%)	2	0	6
III	37	19 (51%)	10 (53%)	0	3	8*
Total	84	63 (75%)	28 (44%)	4	3	30 (48%)

* includes 2 deaths and 2 acutely ill cases

Of 84 persons living in the three Clusters, 63 were contacted. Of these, 28 had vaccination scars, 4 had pock marks, 3 were unprotected and the remaining 30 had smallpox.

The peak of the outbreak occurred in the first week of July as shown in Figure 1.

FIGURE 1
CASES BY WEEK - THEKDA-KA-BANS



The first case experienced onset of fever in the first week of May. The 7 year old child had frequently visited the main marketing town, Mauzpur, about 1 mile from the village. The case which occurred in the first week of June was the younger brother of the first case.

At the beginning of the outbreak at least 105 of the 229 persons in the village were unprotected but despite overcrowding and a most unsatisfactory vaccination status, only 30 persons were infected in over 3 months. This indicates the very slow but steady transmission of infection. However, smallpox transmission in Clusters I and II was eventually so complete that out of 44 persons contacted, 22 had either vaccination scars or pock marks while the remaining 22 unvaccinated persons had contracted smallpox. In Cluster III, active transmission was still going on.

To trace the source of infection for the first case in the village, the investigations were continued in Mauzpur Town (population 5 000).

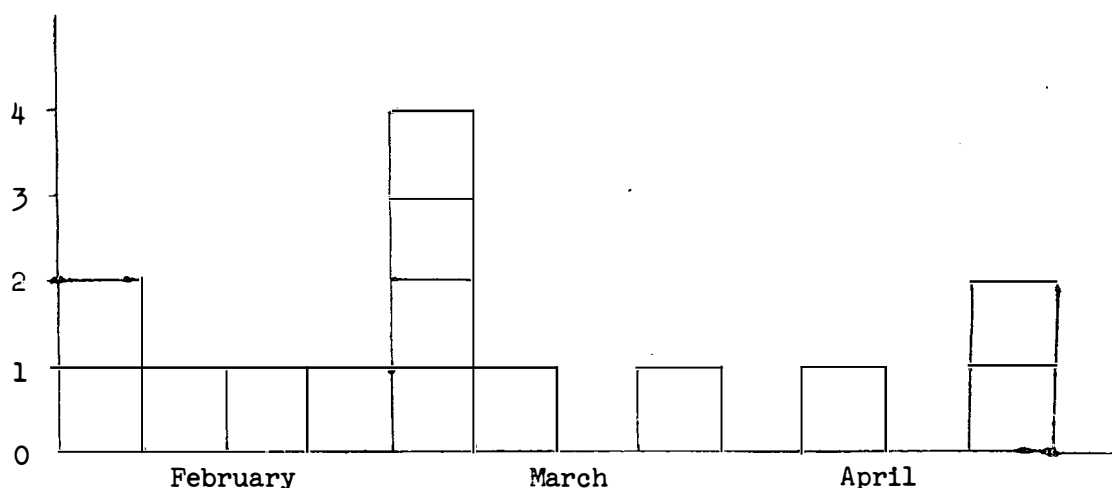
Mauzpur Town: The Primary Health Centre data indicated that there had been four cases, and that the first case, an unvaccinated 3 year old boy, had experienced smallpox in the last week of March. Investigation revealed that in his compound, 3 children (2 years of age and twins 3 months of age) most probably had died of smallpox in April. In a compound 50 metres away, three children (2, 2 and 1 year

of age respectively) had suffered from smallpox. One child had become ill in the first week of February four or five days after reaching Mauzpur from Imlali village where smallpox cases were reported to be occurring. The other two children suffered from smallpox later in February. Seven other cases, including three deaths, were discovered in three other compounds.

In this brief investigation, 14 cases (all unvaccinated; 7 deaths) were detected and only 4 of these were recorded by the Primary Health Centre. This outbreak was notified to the Primary Health Centre on 16 March about 1-1/2 months after onset of the first case (Fig. 2).

FIGURE 2

OCURRENCE OF CASES BY WEEK - MAUZPUR



As a containment action, 350 primary vaccinations and 28 revaccinations had been performed. There were no follow-up visits and the last case, according to Primary Health Centre records, occurred in the first week of March. No attempts were made to find additional cases. The infection remained smouldering in Mauzpur and this subsequently was responsible for the outbreak in Thekda-ka-Bans.

Malawali Village: The villagers in Thekda-ka-Bans had reported that cases of smallpox were occurring in a nearby village, Malawali (population 800) which has sectors X, Y and Z. Sector X has 7 compounds with 2 to 5 houses in each compound and six separate houses lying adjacent to each other. In all, there are 29 households with 158 persons all of whom belong to the Bhilai Community. This is a low socio-economic group, resistant to vaccination, who wander over a wide area in search of a livelihood. Sector Y is 50 metres distant and consists of 246 persons, residing in 35 households. Sector Z, consisting of 46 households and 320 persons, is about 50 metres from Sector X. A house-to-house visit was

undertaken in all sectors and it was determined that at least 9 per cent of the persons were unprotected. The disease was found to be localized to Sector X, the Bhilai Community (Table 6).

TABLE 6
CASES AND IMMUNITY STATUS OF RESIDENTS - MALAWALI VILLAGE

Sector	No. of Households	No. of Persons	No. Contacted	No. with Vaccination Scars	No. with Pockmarks	No. Unprotected	No. of Smallpox Cases
X	29	158	85	55	12	6	12
Y	35	246	91	53	25	13	0
Z	46	320	164	123	28	13	0
Total	110	724	340	231	65	32	12

In Sector X, 85 of 158 persons were contacted, of whom 55 (65 per cent) had scars of vaccination and 12 (14 per cent) had pock marks. Of 55 protected persons, 16 had just recently been vaccinated by rotary lancet and the wounds were secondarily infected. Six persons, mostly children, were still unprotected; 12 cases of smallpox were detected. All cases were less than 15 years of age and 11 of the 12 were among girls (Table 7). There was no information about this outbreak at the Primary Health Centre. The area vaccinator had visited this village on 11 and 22 August but had not reported these cases.

TABLE 7
SMALLPOX CASES BY AGE, SEX, VACCINATION STATUS - MALAWALI VILLAGE

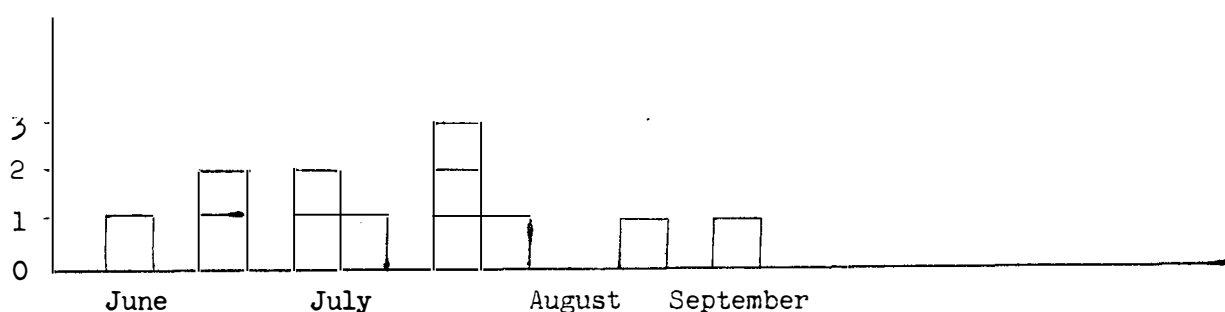
Age (years)	Male	Female	Total	Vaccinated	Unvaccinated	Unknown
< 1	1	0	1	0	1	0
1 - 4	0	5	5	0	3	2
5 - 14	0	6	6	0	5	1
15+	0	0	0	0	0	0
Total	1	11	12	0	9	3

The first case in this outbreak occurred in an unvaccinated 8 year old girl who became ill on 10 June, 2 days after her arrival from Intka village where the child had gone with her mother to stay with her maternal uncle. In Intka, her uncle's daughter and son, aged 3 and 6 years respectively, both unvaccinated, were confirmed to have had smallpox in late May.

In Intka village, there were 412 persons in 62 households. Out of 244 persons contacted, there were eight cases of smallpox and 45 persons who were unprotected. The outbreak in Intka had smouldered unnoticed since the last week of March. There was a strong indication that the infection had crept into Intka from Ramgarh, a nearby village known to have been affected during February and March. Limited time prevented further tracing of the chain of transmission.

FIGURE 3

OCCURRENCE OF CASES BY WEEK - MALAWALI VILLAGE



The outbreak in Malawali was particularly interesting as the disease remained localized among the Bhilai community despite a similar vaccination status in Sectors Y and Z, thus demonstrating again that intimate contact is necessary for transmission. The spread of the disease was extremely slow (Figure 3). During 73 days, smallpox affected only 12 children in Sector X, in spite of the fact that 16 of the 59 persons contacted were unprotected. Thus, even in an area with a poor vaccination status, the transmission of smallpox was found to be unbelievably slow.

District level - Nagaur District

This district (population 1 200 000) is surrounded by other endemic districts and has been declared as famine-affected since 1968. One-fourth of the population in the rural areas moves out of this district from February onwards and returns in August/September. Most move to nearby states to earn their livelihood as labourers while about 5 per cent go to other districts of Rajasthan. The majority are illiterate and resistance to vaccination is quite pronounced. About 15 per cent to 20 per cent of the population is Muslim and some have relatives in West Pakistan whom they often visit.

The District Medical and Health Officer has delegated his authority for NSEP to the District Health Officer, who is also responsible for other public health activities. He is assisted by a full-time health educator, 2 para-medical assistants, and a sanitary inspector who apart from other public health activities, supervises the work of 5 vaccinator posts, 2 of which are filled.

The progress of vaccination and the trend of smallpox incidence is reflected in Table 8.

TABLE 8

VACCINATIONS - 1967-1970 - NAGOUR DISTRICT

Year	Primary Vaccinations (000)	% of Population	Revaccinations (000)	% of Population	Cases	Cases per 100 000
1967	39	3.2	96	8.0	132	11.0
1968	62	5.1	110	9.0	50	4.1
1969	27	2.2	76	6.0	56	4.6
1970 (June)	34	2.8	98	8.0	273	22.7

In 1969, the primary vaccination performance was at its lowest comprising 2.2 per cent of the population, which is only half the expected number of new births. Only 6 per cent of the total population was revaccinated, indicating that containment action was very limited.

On receiving information about the occurrence of cases, the block level supervisor investigates and carries out whatever containment action he thinks is best without guidance from supervisors. Follow-up visits are rare. If the supervisor confirms an outbreak of smallpox, he fills out an investigation report and the Medical Officer in charge of the Primary Health Centre sends it to the district level by ordinary post, followed by a monthly incidence report. Supplementary information is said to be transmitted to the state level. From the district level, no information, however, is sent to the state statistics office.

Data were available for 269 of 273 cases reported up to June 1970: 37 (14 per cent) were under 1 year; 74 (28 per cent) were 1 to 4 years; 141 (52 per cent) were 5 to 14 years and 17 (6 per cent) were over 15 years. Only 39 cases (14 per cent) had occurred in towns while the remaining cases were from rural areas. All 11 Primary Health Centres had reported cases.

Block level - Maulasar Primary Health Centre

Maulasar has a population of 130 000 living in 153 villages. The MOC, Primary Health Centre, is assisted by a sanitary inspector who is responsible for all public health activities, including the NSEP. There are 3 vaccinators responsible for rural areas and one vaccinator for Didwana, the only town in the block. Smallpox incidence and vaccination data maintained by the Primary Health Centre were different from those seen at the district level. The take rate in primary vaccinations was only 84 per cent. Virtually no information was available regarding the vaccination status of the 27 cases recorded.

The most recent cases had been reported on 28 July from Supka village (population 800) - 12 cases and 2 deaths. The first case occurred on 24 April but the outbreak was not reported until 98 days later. As a containment effort, 88 primary vaccinations and 188 revaccinations had been performed.

A house-to-house visit was undertaken in the village and an additional 13 cases were discovered. In the course of the house-to-house visits, 13 per cent of those examined were found to be unprotected (Table 9).

TABLE 9

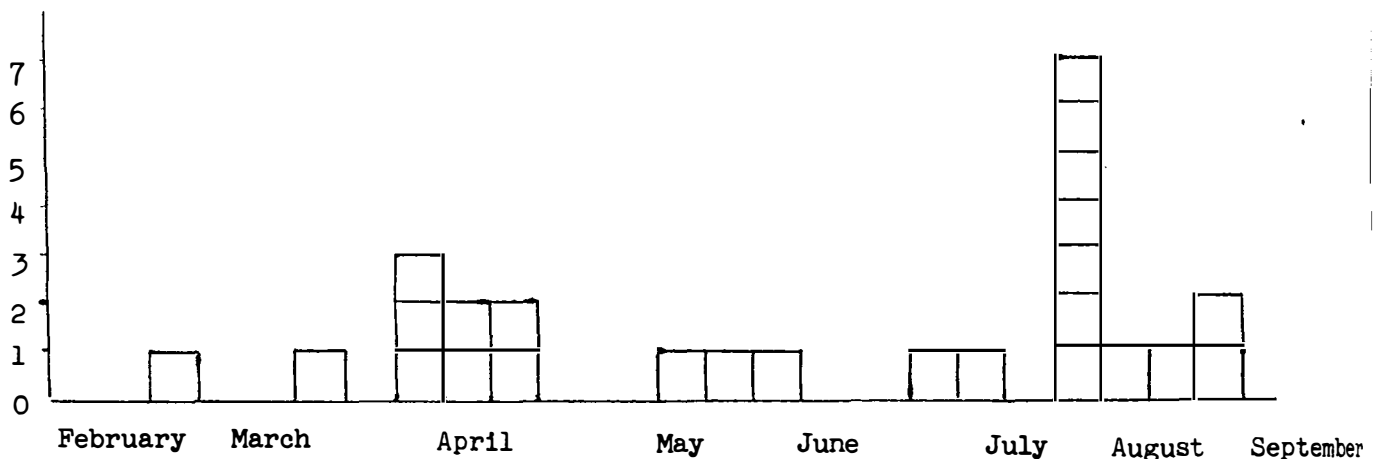
SMALLPOX CASES BY AGE, SEX, VACCINATION STATUS - SUPKA VILLAGE

Age	Male	Female	Total	Vaccinated	Un- vaccinated	Unknown
< 1	4	1	5	0	1	4
1 - 4	3	5	8	0	4	4
5 - 14	7	4	11	0	10	1
15+	1	0	1	0	0	1
Total	15	10	25	0	15	10*

* includes 6 deaths

FIGURE 4

CASES BY WEEK - SUPKA VILLAGE



The first case occurred in a 4-year-old unvaccinated girl in the last week of February (Fig. 4). During the first week of February, a family from a migrant population, the Kanjars, camped in the village. Amongst them a girl was reported to have been suffering from severe smallpox. After 6 weeks they moved to an unknown destination. This Kanjars family entertained with tricks, music and songs which facilitated their close contact with the village children. The incidence reached a peak in late July, when 7 cases occurred. At this time, the disease was reported to the Block Development Officer, who reported to the Primary Health Centre on 1 August, 5 months after the occurrence of the first case.

The Supervisor and vaccinator performed 88 primary vaccinations (11 per cent of the population) and 188 revaccinations and detected 12 cases and 2 deaths. No follow-up visits were made. Active transmission of the disease continued.

In this village, 81 per cent of the population had either been vaccinated or had evidence of having suffered from smallpox but active transmission was continuing, confirming again that there is no fixed percentage of vaccination coverage after which transmission of smallpox will not occur. Clearly, early reporting and prompt institution of effective containment measures, is the only way to arrest the transmission of the disease.

Points for improvement of the programme

The most critical need is to develop the surveillance component of the programme.

a) The report of smallpox cases is delayed and cases of smallpox are not reported to the Primary Health Centre even when they come to the notice of health staff. Containment efforts are half-hearted and without guidance.

All peripheral workers of both public health staff and other government departments should be asked as a matter of routine to enquire during their visits to the villages about any case of "fever with rash" and it should be immediately reported to the Primary Health Centre.

b) The MOC, Primary Health Centre, along with the vaccination supervisor should himself visit the affected areas:

- to diagnose the disease;
- to complete the epidemiological investigations and to trace the source of infection as far back as possible and to discover additional cases;
- to direct the containment action and to arrange the proper care of patients;
- a house-to-house visit should be undertaken beginning from the affected house and all possible efforts should be made to contact and vaccinate the entire population of the village without regard to a previous history of vaccination. In the face of an outbreak, no contra-indication to vaccination exists;
- the vaccination supervisor should stay in the affected area until the above is accomplished;
- there should be weekly follow-up visits for 6 weeks after the occurrence of the last case.

c) The MOC, Primary Health Centre, should immediately inform, by the quickest means possible, the District Health Officer of the details of the investigation. The District Health Officer, with the supervisors and the "flying squad", should visit the affected areas for close supervision and intensification of containment efforts.

d) District level supervisors, particularly, should seek the source of infection and the chain of transmission, so that a "hunt" can be organized and containment measures initiated at all foci of infection.

e) Cross notification should immediately be effected to the concerned health authority in other districts of the state and a copy of the same should be given to the state programme officer.

f) In case the importation has been traced to another state, a copy of "cross notification" should also be sent to the programme officer at the Central level.

Since, at present, health officers have no uniform procedure for reporting of cases of smallpox to the state and central level, it is urgent that a detailed circular be issued from the state level to all District Health Officers educating them about the correct procedure of reporting.

Special efforts are required also in regard to vaccination.

a) Though top priority has to be accorded to primary vaccination, particularly in those under 15 years of age, revaccinations ARE NOT TO BE NEGLECTED. All efforts should be made to achieve the annual set target of 20 per cent of the total population in revaccination.

b) Supervisors should ensure that the multiple puncture technique is utilized by all vaccinators.

c) Problem areas and populations should be identified and special programmes instituted.

d) Tour programmes of the vaccination staff including the supervisors should be planned well in advance and copies of the programme should be sent to all concerned.