



INTER-REGIONAL SEMINAR ON SURVEILLANCE  
AND ASSESSMENT IN SMALLPOX ERADICATION

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OBSERVATIONS DURING SPECIAL INVESTIGATIONS IN RAJASTHAN

by

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1.0 Introduction

Rajasthan, which has accounted this year for 29% of the smallpox cases in India, is bounded on the south and north by two highly endemic states - Gujarat (21% of India's smallpox cases) and Haryana (15%) on the east by Uttar Pradesh, (8%) and Madhya Pradesh (8%); while on the west, it has common borders with Pakistan.

The successful implementation of the programme has been complicated by:

1. Scattered population - (average density of population 153 persons/sq. mile);
2. Frequent drought and famine conditions necessitating large scale migration of the population to other states and districts;
3. Superstitious beliefs of the people leading to palpable resistance to vaccination and hiding of smallpox cases;
4. Unapproachability of certain areas during monsoons;
5. Difficult terrain (desert).

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

TABLE 1

Cases per 100 000 population, 1963-1970

Year	Rajasthan		India	
	No. of cases	Cases/100 000	No. of cases	Cases/100 000
1963	3 370	15.6	83 423	17.9
1964	1 994	8.9	40 256	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	*2 404	12.5	*8 395	
(June)	** (3 200)		** (12 000)	**2.2

\* Provisional

\*\* 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:

TABLE 2

District	1970 (up to June)
Sikkar	529
Jaipur	262
Alwar	240
Ganganagar	232
Nagaur	206
Chittorgarh	113
Churu	99
Sirohi	93
Kotah	92

Two districts, Alwar and Nagaur, were visited to study the implementation of the National Smallpox Eradication Programme (NSEP) and to appraise the smallpox situation.

## 2.0 Principal observations

### 2.1 State level

A Deputy Director is in charge of the programme and he is assisted by a full time Assistant Director for the implementation of the NSEP. The Assistant Director is stated to be frequently on tour to supervise the conduct of the programme. He issues instructions for remedial action but how forcefully he follows up the implementation of the instructions is uncertain. For example, instructions had been issued for immediate adoption of the multiple puncture vaccination technique and it was reported to have been adopted uniformly in all districts. However, all vaccinators checked in the field were still working with the rotary lancet.

Primary vaccination targets had been fixed as follows for the vaccination staff and other health workers:

TABLE 3

Vaccinator	Primary vaccinations per month
Para Medical Assistant	50
Health Educator	50
Sanitary Inspector	50
Lady Health Visitor	25
Auxiliary Health Worker	30
Auxiliary Nurse Midwife	25
Vaccinator	200

The target for primary vaccinations for a vaccinator seemed reasonable. In 25 000 population, 1 000 new births (40 per 1 000) and an estimated backlog of 1 500 primary vaccinations (60 per 100) would be expected. The workload for a year is 2 500 primary vaccinations or 200 per month. Variations in the targets, however, were reported by staff at district and primary health centre levels. Instructions were also issued to supervisory staff to check whether the vaccination staff was achieving the goals and if not, to make certain cuts in their travelling allowance. The instructions, regrettably were rarely read and more rarely followed.

The following table indicates vaccinations performed from 1967 up to June 1970.

TABLE 4

Year	Primary vaccinations	% of the population	Re-vaccinations	% of the population
1967	915 000	3.5	2 303 000	9.4
1968	1 265 000	4.9	1 813 000	7.4
1969	1 037 000	4.0	1 587 000	6.2
1970 (June)	721 000	2.8	1 156 000	4.5

Only during 1968 were more than 4% primary vaccinations performed. The revaccination coverage has gradually declined from 9.4% in 1967 to 4.5% in 1970. Further, if the low success rate obtained in primary vaccinations in this state (80-90%) is considered, the absolute numbers are further reduced by 10 to 20%.

## 2.2 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 Gram Panchayats and 1 924 villages. The population is mostly fixed, 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% of the population, sizeable numbers of whom are illiterate and resistant to vaccination.

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

Properly stored freeze-dried smallpox vaccine is exclusively utilized. The vaccine is despatched by rail and delivered in 4 days, although often not picked up by the staff for 8 days. There are 8 refrigerators in the district: 2 at Headquarters (1 out of order); 6 at Primary Health Centres (5 out of order). There are 9 sets of public address equipment, supplied in 1965, which are not utilized.

The disease is firmly entrenched in this district; explosive outbreaks 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 the incompleteness of containment efforts.

TABLE 5

Year	Primary vaccinations		Revaccinations		Cases	Cases/ 100 000
	No. (000)	% of the population	No. (000)	% of the population		
1964	46	3.5	85	6.5	N.A.	N.A.
1965	92	7.0	195	15.0	N.A.	N.A.
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 half hearted and ineffective, with the result that the infection smoulders on. Follow up visits are rare and ineffective.

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 when we visited on 21 August.

After completion of the investigation, the vaccination supervisor returns to the Primary Health Centre and 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 Health Directorate, Statistics Section and to the State Programme Officer, NSEP. No information is sent in case of importations despite specific instructions to state authorities "to inform the Director General of Health Services telegraphically about the area affected and the number of smallpox cases and deaths" by post.

Subsequently, monthly reports which include additional cases are sent only to the State NSEP Officer, who transmits this data to the NSEP at the Directorate General of Health Services. The State Health Authorities consider the NSEP Officer's data as the latest and most accurate. The Statistics section of the State Directorate also sends a report weekly to the Director General of Health Services (CBHI). After 3 weeks, another "final report" is said to be sent to the Director General of Health Services (CBHI).

### 2.3 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. There is a separate Sanitary Inspector at the Primary Health Centre, whose target is to perform 50 primary vaccinations per month. Apart from the vaccinators, other health staff, such as the Lady Health Visitors, Auxiliary Health Worker, Auxiliary Nurse Midwife, etc., are supposed to perform vaccinations according to set targets. Vaccination and smallpox incidence data pertaining to the years before 1969 were not available. Data which were available were not compiled properly and even totals were found to be incorrect. The inspection rates for primary vaccinations were very poor, 18.8% (1969) and 21.5% (1970). The take rate in primary vaccinees was also poor, 90% (1969) and 91.5% (1970). Vaccination technique was faulty; sterilization was rarely practised; family registers have not been maintained since 1965; there was no proper arrangement for the storage of the vaccine. 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: (a compact village with a population of 229 and 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 was as follows:

TABLE 6

Age (years)	Males	Females	Total	Vaccinated	Unvac- cinated	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 - 29	0	1	1	0	1	0
30 +	0	0	0	0	0	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%) were contacted during the survey. Of those contacted, 21 (12%) were still unprotected and 79 (45%) 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 (3, 2, 2 and 1 cases respectively) with a total of 8 cases.

A summary of the findings in these three clusters is shown below:

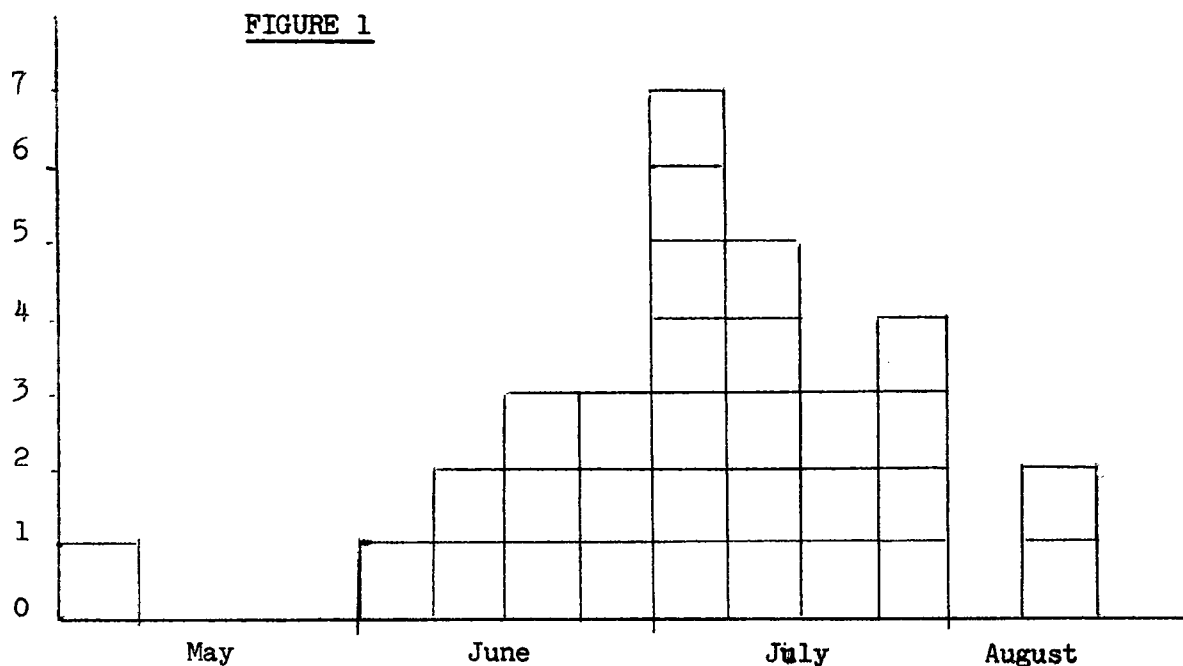
TABLE 7

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. In Cluster III, there were 8 smallpox cases, including 2 deaths and 2 acutely ill patients. The ineffectiveness of the containment action is obvious.

The peak of the outbreak occurred in the first week of July as shown in the epidemic curve below:





The date of the notification at the Primary Health Centre level was 4 August after a delay of over 3 months.

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. Their father denied a history of movement for this case. Presumably, there may have been a missed case(s) in May.

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. Smallpox transmission in Clusters I and II was 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. Here, intensified containment action, i.e. to vaccinate all known contacts, was particularly important.

At the beginning of the outbreak at least 105 of the 229 persons were unprotected indicating that the area vaccinator had not visited this village for many years as one would not expect more than 11 new births in a year. Under such circumstances, vaccinators and supervisors deserve separation from duty.

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 only four cases, and 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, one, 2 years of age and twins 3 months of age, most probably had died of smallpox. The dates of onset were estimated to have been in the first half of April for one child and at the end of April for the twins.

In a compound 50 metres away, three children aged 2, 2 and 1 year, respectively, had suffered from smallpox. One of these cases was known to the Primary Health Centre. 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 in the third and fourth weeks of February.

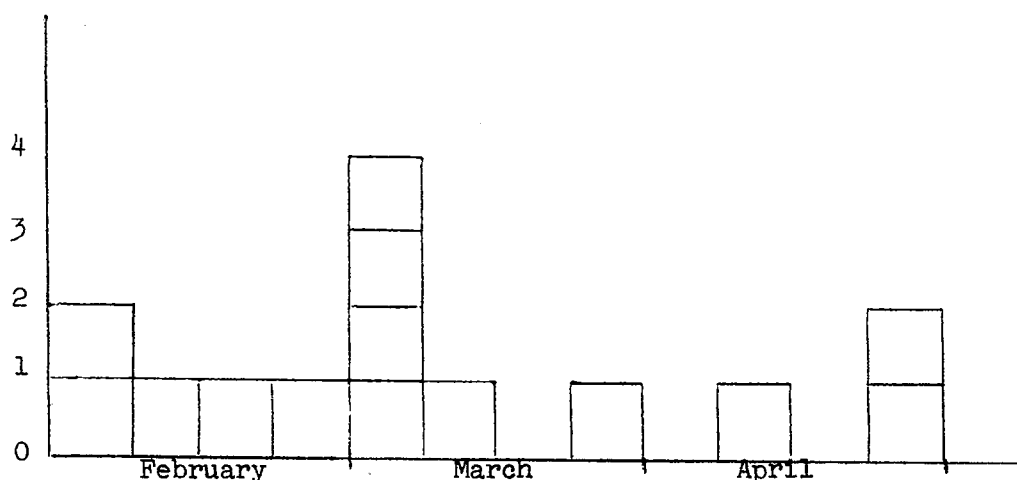
In the third compound, one unvaccinated 2-year-old girl had suffered from smallpox in the first week of March. An additional 2 unvaccinated children, aged 3 years and 6 months, experienced smallpox in the third week of February.

In a fourth compound, one 3-year-old girl had experienced smallpox in the first week of March. In a nearby house, an unvaccinated 2-year-old girl had died from smallpox in the 2nd week of March. In another nearby house, two girls 1 and 2 years old, were reported to have died from smallpox in the second week of March.

In this brief investigation, 14 cases all of whom were unvaccinated, (including 7 deaths), were detected, only 4 of which 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.

FIGURE 2

Occurrence of cases by week - Mauzpur



The source of infection for the first case was traced to Imlali. The source of infection for the other case which occurred in the first week of February was not clear.

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 containment action was far from satisfactory and the infection remained smouldering in Mauzpur. This smouldering infection was responsible for the outbreak in Thekda-ka-Bans.

Khora Village: On a hurried house-to-house visit to Khora village, 1-1/2 miles from Thekda-ka-Bans, no smallpox case was detected. However, 16 children were found unprotected. These were vaccinated on the spot.

Malawali Village: The villagers in Thekda-ka-Bans reported that cases of smallpox were occurring in a nearby village, Malawali (population 800). Malawali has 3 distinct 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 separated from Sector X by 50 metres of village road. The population of this sector is 246 persons, residing in 35 households. Sector Z, consisting of 46 households and 320 persons, is on a higher slope about 50 metres from Sector X.

A house-to-house visit was undertaken in all sectors and it was determined that the disease was localized to Sector X, the Bhilai Community.

TABLE 8

Sector	No. of house-holds	No. of persons	No. con-tacted	No. with vaccin-ation scar	No. with pock-marks	No. unpro-ected	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%) had scars of vaccination and 12 (14%) had pock marks. Of 55 protected persons, 16 had just recently been vaccinated by rotary lancet and the "wounds" were secondarily infected. Presumably, these were successful "takes". Six persons, mostly children, were still unprotected; 12 cases of smallpox were detected. There was no information about this outbreak at the Primary Health Centre. The area vaccinator had visited this village on 11 and 22 August (one day prior to my visit) but had not reported the occurrence of these cases.

A house-to-house visit in all the sectors indicated that at least 9% of the persons were unprotected. They were vaccinated on the spot.

The age, sex and vaccination status of the cases was as follows:

TABLE 9

Age (years)	Male	Female	Total	Vaccinated	Un-vaccinated	Unknown
0 - 1	1	0	1	0	1	0
1 - 4	0	5	5	0	3	2
5 - 14	0	6	6	0	5	1
15 - 29	0	0	0	0	0	0
30 +	0	0	0	0	0	0
Total	1	11	12	0	9	3

All cases were less than 15 years of age and 11 of the 12 cases occurred among girls.

#### Source of infection

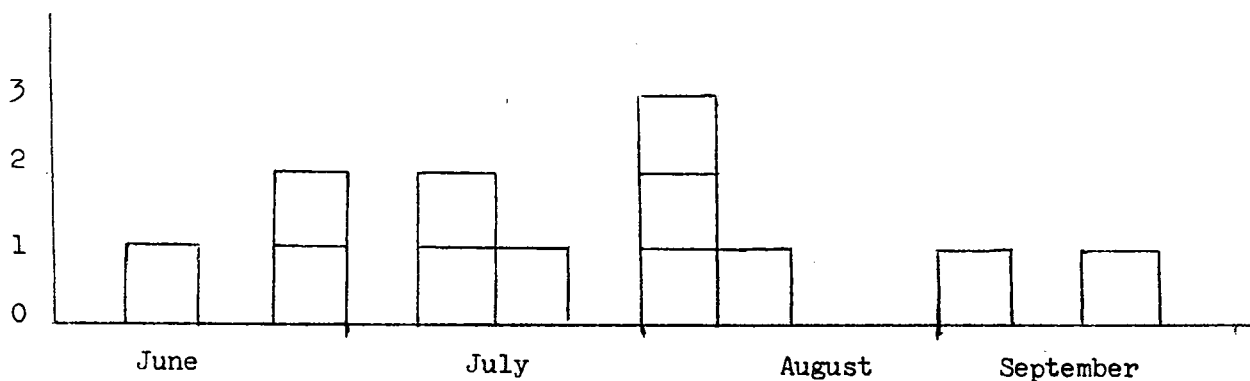
The first case in this outbreak occurred in an unvaccinated 8-year-old girl who became ill on 10 June, 2 days after her arrival from Intka village where the child had gone with her mother to stay with her maternal uncle. In Intka, her uncle's daughter and son, aged 3 and 6 years respectively, both unvaccinated, 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 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 the writer from pursuing further the chain of transmission; however, the Health Officer promised to continue the search.

#### Transmission of infection

The epidemic curve is shown below:

FIGURE 3



In one household, a 3-year-old unvaccinated girl with typical chickenpox was found. The centripetal, pleomorphic, superficial rash along with the bright looks of the playing child were so characteristic of chickenpox that the opportunity was taken to demonstrate the difference between the 2 diseases to the doctors and other staff. The patient was vaccinated by the writer and the vaccination had a beautiful "take". The unvaccinated sister of this chickenpox patient, aged 8 years, was in the early scabbing stage of smallpox.

The outbreak in Malawali was particularly interesting as the disease remained localized in Sector X, among the Bhilai community. Despite a similar vaccination status in Sectors Y and Z of the same village, these sectors remained free from smallpox, demonstrating that intimate contact is necessary for transmission. The delay in reporting was notable. The disease was detected and

notified by the writer on 23 August when 10 cases had already occurred. The date of onset of the first case was 2-1/2 months before. The area vaccinator, even after learning of this outbreak on 10 August, did not report it to the Primary Health Centre.

The spread of the disease was extremely slow. In 73 days, unchallenged, smallpox affected only 12 children in Sector X, in spite of the fact that 16 of the 59 persons contacted were unprotected and 10 had smallpox. Thus, even in an area with a poor vaccination status, the transmission of smallpox was found to be unbelievably slow.

It is noted that chickenpox and smallpox cases do occur together among siblings under the same roof. Since smallpox cases are well known to occur after an attack of chickenpox, it is always necessary to vaccinate all persons, including those suffering from chickenpox.

#### 2.4 District level - Nagaur District (population 1 200 000)

This district 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% go to other districts of Rajasthan. The majority are illiterate and resistance to vaccination is quite pronounced. About 15 to 20% of the population is Muslim and some have relatives in West Pakistan whom they often visit.

In charge of all Medical and Public Health activities is the District Medical and Health Officer. For NSEP, he has delegated his authority to the District Health Officer, who is also responsible for other public health activities (excluding TB, Family Planning and Malaria). The present Health Officer had taken over only within the preceding few months. To assist there is a full-time Health Educator and 2 Para Medical Assistants. In addition, there is a Sanitary Inspector, who apart from other public health activities, supervises the work of 5 posts of vaccinators (2 of which are filled). On detailed checking, the full-time district supervisory staff appeared to contribute little to the NSEP. They did not prepare advance tour programmes or daily diaries of work. The District Health Officer had not yet settled because he feared another transfer and knew next to nothing about the activities of his staff.

The progress of vaccination and the trend of smallpox incidence is reflected in the following table:

TABLE 10

Year	P.V.s (000)	% of the population	R.V.s (000)	% of the 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, 2.2% of the population, which means that even primary vaccinations totalled only half the expected number of new births.

In 1969, 6% of the total population was revaccinated, which is also very low, particularly for this endemic district, indicating that containment action was limited.

Instructions from the State Directorate regarding targets for primary vaccinations had no doubt reached this district but nobody was aware of these targets, let alone making attempts to achieve these goals.

The Panchayat Secretary who is officially responsible for the reporting of cases rarely performs this function. As usual, cases are mostly notified by health staff, malaria workers, vaccinators and Block Development Officers.

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 report of incidence. Supplementary information is said to be transmitted to the State level. From the district level, no information is sent to the Directorate General of Health Services (CBHI Section).

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

## 2.5 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 the Public Health activities, including the NSEP but excluding malaria. There are 3 vaccinators responsible for rural areas and one vaccinator for Didwana, the only town in the block.

State-level targets for primary vaccinations had been fixed for all categories of staff but, unfortunately, no-one reviewed progress. Vaccine is still administered by rotary lancet; family registers have not been maintained since 1965.

Smallpox incidence and vaccination data maintained by the Primary Health Centre were different from those seen at the District level. The inspection rate and the take rate in primary vaccinations were very low, 63% and 84% respectively. Virtually no information was available regarding the vaccination status of the 27 cases recorded.

### Most recently reported cases:

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, the Primary Health Centre staff had performed 88 primary vaccinations and 188 revaccinations.

### Supka Village:

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% of those examined were found to be unprotected. The age, sex and vaccination status of the cases were as follows:

TABLE 11

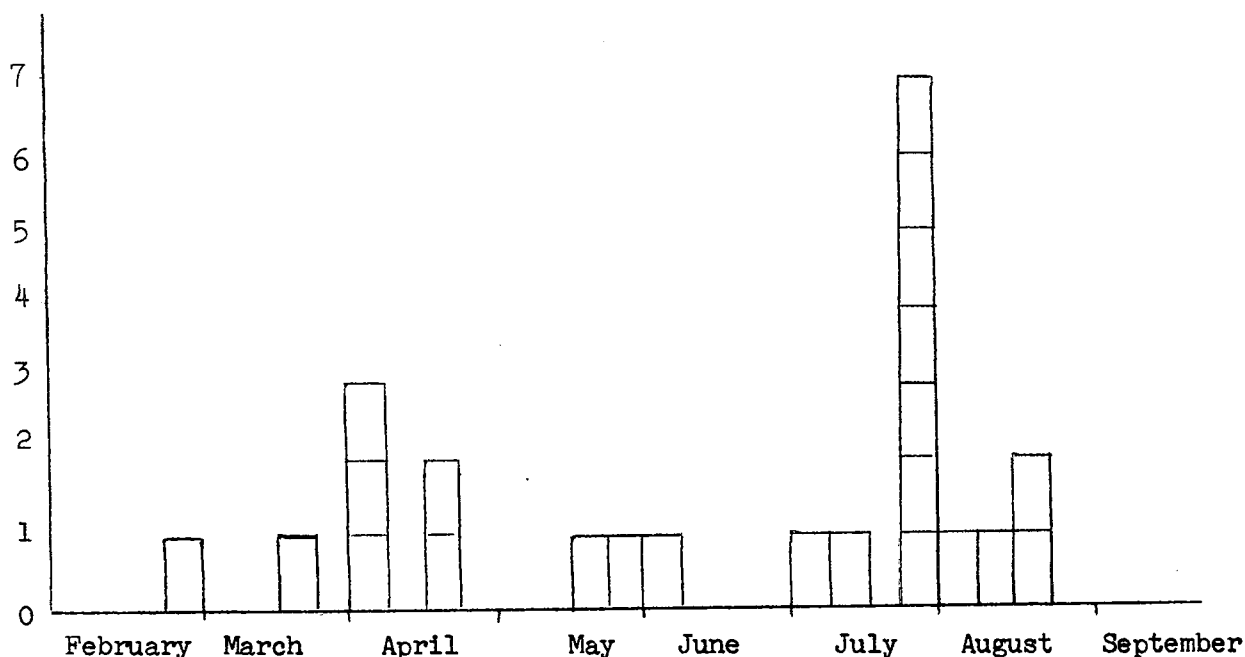
Age	Male	Female	Total	Vaccinated	Un-vaccinated	Unknown
0 - 1	4	1	5	0	1	4
1 - 4	3	5	8	0	4	4
5 - 14	7	4	11	0	10	1
15 - 29	1	0	1	0	0	1
29 +	0	0	0	0	0	0
Total	15	10	25	0	15	10*

\* includes 6 deaths

All but one of the cases was under 15 years of age; none were found to have been vaccinated.

The chronological order of the occurrence of the cases is given below:

FIGURE 4



The first case occurred in a 4-year-old unvaccinated girl in the last week of February. 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 doctor on 1 August, 5 months after the occurrence of the first case.

The Supervisor and vaccinator performed 88 primary vaccinations (11% of the population) and 188 revaccinations and detected 12 cases and 2 deaths. No follow-up visits were made. Active transmission of the disease was continuing at the time of our visit - two cases in the pustular stage were seen.

Of interest is the fact that in this village, where 81% of the population had either been vaccinated at least once or had evidence of having suffered from smallpox, active transmission was continuing. This indicates that there is no fixed percentage of vaccination coverage after which transmission of smallpox will not occur. In other studies, in fact, we have found active transmission with 97% certified vaccination coverage. Since it is difficult to contact and vaccinate every person to achieve 100% vaccination coverage, the significance of



surveillance, early reporting and prompt institution of effective containment measures, is the only way to arrest the transmission of the disease.

Containment action means prompt epidemiological investigation to trace the source of infection - to unearth the additional cases to establish the chain of transmission - prompt cross notification followed by mass vaccination around each foci of infection as extensive as required by the epidemic situation. This has to be followed by a weekly visit for at least 6 weeks from the data of the reporting of the last case.

### 3.0 Points for improvement of the programme

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

a) The report of smallpox cases is delayed beyond imagination. 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 from superiors.

All the 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 contraindication 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.

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

3.3 Apart from limited supervision from the state level, supervision does not exist at the district and block levels, in spite of the fact that a full contingent of staff is in position. Concurrent field assessment by Block level supervisors are urgently necessary. The Primary Health Centre doctor should insist on seeing the results of assessments of all vaccinators.

3.4 Regarding the vaccination component:

- 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% of the total population in revaccination. At the end of the day, the remaining quantity of vaccine should be utilized for a blanket coverage of those in the age group 15-45 years.
- b) Supervisors should ensure that the multiple puncture technique is utilized by all vaccinators. At present, the technique has not been understood by the vaccination staff for the simple reason that it has not been explained and demonstrated.
- c) It is urgently necessary that the problem areas or populations be recognized. Repeated attempts with special programmes should be instituted to deal with such areas or populations.
- 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. The tour diaries of the supervisors should be brief and must indicate the work done in the field.
- e) In-service training of the staff including the Medical Officers at the Block and District levels seems to be an urgent need in Rajasthan. Immediate steps should be taken to impart necessary training to the staff as per the syllabus already prepared by the Directorate General of Health Services.