



TRAINING SEMINAR ON SMALLPOX ERADICATION

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SMALLPOX ERADICATION PROJECT PUNJAB 1972  
SOME ASPECTS OF SMALLPOX ERADICATION IN LAHORE



Dr G. D. Souleimanov<sup>1</sup>

The paper deals with the problem of smallpox eradication in Lahore City as, in the course of time, its importance to the success of the overall provincial campaign has increased significantly. The importance of large urban areas in the spread of communicable diseases has long been known. In Punjab Province considerable data have been obtained which emphasize the role of an urban reservoir of infection in Lahore in sustaining endemic smallpox in the country.

Smallpox History of Lahore

Lahore is the historical, cultural, administrative and industrial centre of Punjab and the second largest city in the country (population 2 000 000). The district of Lahore, according to the census of 1961, is one of the most densely populated - 1 119 persons per square mile. Approximately half the residents live in slum and semi-slum type areas, situated mainly along the city perimeter, although clusters of such dwellings can be found everywhere. As the only suitable land route to India (only ten miles distant) passes through Lahore, the occurrence of smallpox in the city has international implications.

As in other cities of Pakistan, all matters concerning public health are in the hands of the Municipal Corporation.

The territory is divided on the basis of population into 34 vaccination sectors, in which 75 vaccinators are employed. Numerically, this force is sufficient to cover the total population in a year. During the past 20 years, more than 900 000 have been vaccinated and 8 000 000 re-vaccinated. Most of their working time is spent in vaccination centres; time is devoted to house-to-house visits and case detection. Not surprisingly, the city has never been free from smallpox (Table I).

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<sup>1</sup> WHO Epidemiologist, Punjab

As evidence of the quality of reporting, it may be seen from Table I that the number of hospitalized cases during 1961-65 was equal to or higher than the number of cases reported by the Municipal Medical Officer. Changes occurred during the period 1966-71 as the number admitted to the hospital was less than the number of cases reported. The inception of the provincial eradication campaign in 1968 undoubtedly facilitated this change although it is noted that even during this latter period most cases were reported as a result of hospitalization at the Infectious Diseases Hospital.

Through two sources, an estimate may be made about the actual prevalence of smallpox in the city in the past:

1) In 1970 epidemiologists from the Medical Research Centre, Maryland University branch in Lahore, carried out an evaluation of immunity level in city areas inhabited mostly by low-income groups. Using advanced techniques of sampling, they demonstrated that 4.7% of the population in the city had experienced smallpox at some time in the past. This implies the occurrence each year of between 3 000 and 4 000 cases.

2) A second estimate may be obtained based on data obtained this year. As a result of an active search for cases throughout the city, a reasonably accurate count of cases was obtained. In all, 314 cases were discovered of which 285 had onsets this year. During this period, 63 cases (approximately one-fifth of the total) were admitted to the Infectious Diseases Hospital. If we assume that approximately this proportion of cases was admitted during past years, the projected incidence each year would be between 100 and 500 cases.

While these figures represent only crude approximations, nevertheless it is apparent that smallpox has been a major problem in Lahore.

#### Structure of Surveillance Network

From the very beginning of the Smallpox Eradication Project, there were problems implementing the plan due to the independence of the Local Bodies authorities from the Ministry of Health services. This led to overlapping and duplication of effort, discrepancies in reporting and confusion. In Lahore, this was a particular problem in consequence of which a surveillance mechanism was not established in the City. However, analysis of epidemiological patterns indicated clearly that it was necessary to solve the problems of Lahore City if smallpox were to be eliminated from the province as a whole. Thus, this year our efforts have been principally directed toward the creation of a unified surveillance network within the municipal limits. Agreement was reached with the Municipal Corporation and the scheme was implemented in May - reported cases increased sharply (Table II).

The structure of the surveillance service is represented in Table III. Staff from the provincial office and from Lahore Corporation have been deployed. The provincial office deputed one Assistant Sanitary Inspector, and five Assistant Superintendents of Vaccination have been delegated from Lahore Municipal Corporation. These six ASVs who constitute the surveillance team were specially trained in the methods of detection of suspected cases, selection of informers among the residents, completion of records, etc.

Areas of the city inhabited by the predominantly low income groups of the population have been divided into four sectors - each for one ASV, who has been provided a motorcycle.

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Two of the ASVs have been assigned the job of investigation of hospitalized cases, strengthening active case search and for supervisory purposes.

For containment operations, a group of 10 vaccinators with a landrover has been provided by the Corporation and is stationed at the provincial office.

### Reporting

Thirty-four vaccination centres were designated as primary reporting cells. However, there was a strong feeling that a large gap existed between the reporting unit and potential sources of information. Therefore, the activity of the vaccination centres was reorganized in such a manner that only one vaccinator was required at the office and the rest of the staff has been fully deployed for early detection of cases and selective vaccination of the unprotected.

Vaccination centres have been provided with a code number and positive or negative reports are communicated on a fixed day of the week by telephone to the central office.

At present, this surveillance organization (Table III) comprising provincial and corporation staff, provides a triplefold coverage of the slum areas of the City.

### Pattern of Smallpox Transmission in 1972

In all, 314 cases were investigated during the first nine months of the current year. This is one quarter of the province's incidence. There were 52 distinct outbreaks in 15 major affected localities. As shown in Figure 1, these affected places extend all over the city perimeter, i.e. on slum outskirts.

It was possible to observe two types of transmission from one area to another:

- 1) Transmission over short distances, i.e. to adjoining quarters, and
- 2) Transmission over long distances, i.e. across the City.

Of the 314 cases, 193 (61.5%) occurred as a result of transmission over short distances. Long distance transmission was less common. For example, a large outbreak of 27 cases in Model Town was caused by an importation from Bilal Gunj across the city, and in Shadra, by an importation from Kumharpura. The epidemic started in Bilal Gunj in 1971 on the north-western end of the city, was gradually transmitted to the northern parts and ultimately was stopped on the eastern side, completing almost a semi-circle around the City.

We feel that the failure to stop transmission effectively is mainly due to incomplete containment operations. Even the coverage of the family contacts has not been sufficient (Table IV).

The source of infection has been traced in 33 outbreaks or 63.5% of the total. As shown in Table V the size of outbreaks ranged from one, of which there were 11 outbreaks, up to 49 cases. Outbreaks comprising less than 10 cases represent 88.5% of all outbreaks.

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One large outbreak of 49 cases was detected in Kumharpura, a slum area, where the immunity level was low because virtually no vaccination of new-borns had been done for at least four years. Thirty-six (69.2%) of the outbreaks had a duration of less than two months, but these accounted for only 43.9% of the cases.

As shown in Table VI, 47.1% of the cases were discovered within two weeks after the onset of disease and 71.7% within one month. In brief, the efficiency of case detection was reasonably satisfactory.

The results achieved by this scheme of active case detection are shown in Figure 2. After February, the reported incidence increased steadily, but the combined effect of containment and the seasonal decline in incidence have led to a nil incidence for the last two months.

Another indicator of the quality of the surveillance activities is the fact that 93.0% of cases were detected by the teams - only 22 of the 314 cases were reported by the Lahore Municipal Corporation.

#### Importations

In general, importations into the City have not contributed significantly to the epidemic wave this year. Four importations have occurred to date; one from Gujranwala District, two from Sukkur District (Sind Province), and one from Peshawer District (N.W.F.P.). These importations have been tracked down promptly and effectively contained. Only seven cases occurred as a result of the importations.

The traffic in the opposite direction has been much more extensive and has emerged as an important factor in sustaining endemicity in Punjab Province. During the past six months, 11 districts constituting the northern and central zones of the Province have reported 127 cases, of which 22 were due to importations from Lahore City. Within the last three months this proportion changed considerably: 37% of all cases originated from the City.

#### Role of Hospital Cross-Infection

The Infectious Diseases Hospital in Lahore has no isolation facilities. Small-pox and chickenpox wards have a common corridor and patients and visitors intermingle freely. Not surprisingly, at least one outbreak of 3 cases caused by cross-infection has come to our notice. A more sizeable outbreak of 6 cases originated in the General Hospital as described in a separate paper.

Keeping in mind the potentially growing role of the hospital in an area with reduced endemicity, it was recommended to minimize admissions and to routinely vaccinate every person hospitalized. The Infectious Diseases Hospital has now been put under constant control.

#### Summary and Discussion

Three years have passed since the mass vaccination campaign in Lahore City, when about 2 million persons were vaccinated within a three month period. Nevertheless, active virus transmission has not yet been stopped and 314 cases occurred during the first nine months of the current year - the highest recorded figure in two decades.

Analysis of available documents and present trends, however, indicates clearly that there was gross under-reporting in the past with perhaps not more than 10% of cases having been notified.

This example is one more confirmation of the fact that without a comprehensive surveillance mechanism in a rapidly urbanized zone, any eradication campaign is doomed to failure.

A surveillance system was organized in March 1972 and the Lahore Corporation's sanitary staff has participated since May. Active case search resulted in a sharp rise in incidence with a peak in June.

With a considerably reduced endemicity in the rural parts of the Province, the role of a major urban reservoir as an exporter of cases has been marked - 37% of cases reported from 11 central and northern districts of the Province for the last three months had their source in Lahore.

Vigorous surveillance activity combined with containment operations produced a major decline in the epidemic curve, a decline which may partly be attributed to seasonal variation. The onset of the last case in Lahore was on 10 August.

The principal task now is to sustain the operation of a durable, vigilant surveillance network until eradication is completed throughout the country.

TABLE I  
SMALLPOX INCIDENCE REPORTS FROM LAHORE MUNICIPAL CORPORATION (LMC)  
AND THE INFECTIOUS DISEASES HOSPITAL, LAHORE  
1952 - 72

Year	No. of cases (LMC)	No. of cases (ID)	Deaths (ID Hospital)
1952	90	*	*
1953	103	*	*
1954	16	*	*
1955	111	*	*
1956	12	*	*
1957	16	*	*
1958	191	*	*
1959	71	*	*
1960	56	*	*
1961	69	106	22
1962	64	105	31
1963	12	12	5
1964	18	40	12
1965	10	32	4
1966	98	62	16
1967	133	92	15
1968	6	15	2
1969	58	22	1
1970	89	66	10
1971	149	93	12
1972	314	63	12

\* Data not available

TABLE II

SMALLPOX CASES BY WEEK WITHIN LMC AREA

JANUARY - AUGUST 1972

Month	January					February					March					Total
	1	2	3	4	5	6	7	8	9	10	10	11	12	13		
Week No	1	2	3	4	5	6	7	8	9	10	10	11	12	13		
Cases	4	9	5	10	12	6	9	7	10	12	6	8	9	8	109	
Month	April					May					June					Total
Week No	14	15	16	17	18	19	20	21	22	23	23	24	25	26		
Cases	5	17	1	2	16	7	16	14	6	15	7	29	19	8	155	
Month	July					August					September					Total
Week No	27	28	29	30	31	32	33	34	35	36	36	37	38	39		
Cases	13	1	1	3	1	1	-	-	-	-	-	-	-	-	20	
Month	October					November					December					Total
Week No	40	41	42	43	44	45	46	47	48	49	49	50	51	52		
Cases															284	

Grand Total: 314

Cases for 1971

Jul	Aug	Sep	Oct	Nov	Dec	Total
18	5	1	1	2	3	30

TABLE III

STRUCTURE OF THE  
SURVEILLANCE SERVICE IN LAHORE M.C.

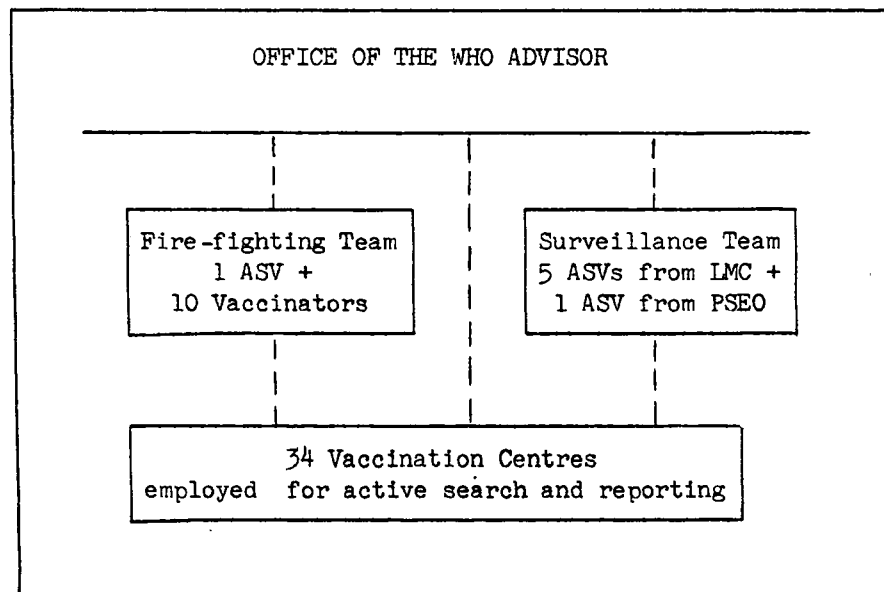




TABLE IV

ATTACK RATE AMONG PROTECTED  
AND  
UNPROTECTED CONTACTS

UNVACCINATED CONTACTS				VACCINATED CONTACTS			TOTAL		
Age	No.	No. of cases	Percent	No.	No. of cases	Percent	Contacts	No. of cases	Attack rate (%)
0-1	36	15	41.7	11	3	27.3	47	18	38.3
1-4	111	74	66.7	79	3	3.8	190	77	40.5
5-14	78	58	74.4	258	14	5.4	336	72	21.4
15 +	30	12	40.0	414	10	2.4	444	22	5.0
Total	255	159	62.4	762	30	3.9	1 017	189	18.6

TABLE V

DISTRIBUTION OF OUTBREAKS BY SIZE AND DURATION

Number of cases	Number of outbreaks	Percentage of total	Duration of outbreak (months)	Number of outbreaks (cases in brackets)	Percentage of total
1-5	32	61.5	1	19 (33)	36.5(10.5)
6-10	14	26.9	1-2	17 (105)	32.7(33.4)
11-19	2	3.8	2-3	8 (54)	15.4(17.2)
20-49	4	7.8	3-4	4 (76)	7.7(24.3)
50+	-	-	4-5	4 (46)	7.7(14.6)
Total	52			52 (314)	

TABLE VI

TIME GAP BETWEEN THE ONSET OF CASES AND DETECTION

D a y s						W e e k s		
I	II	III	IV	V	VI	I	II	III
14	7	14	12	14	8	38	41	35

M o n t h s								Total cases
I	II	III	IV	V	VI	VII	VIII	
42	42	19	5	-	1	4	18	314

FIGURE 1  
LAHORE CITY, SMALLPOX TRANSMISSION  
1972

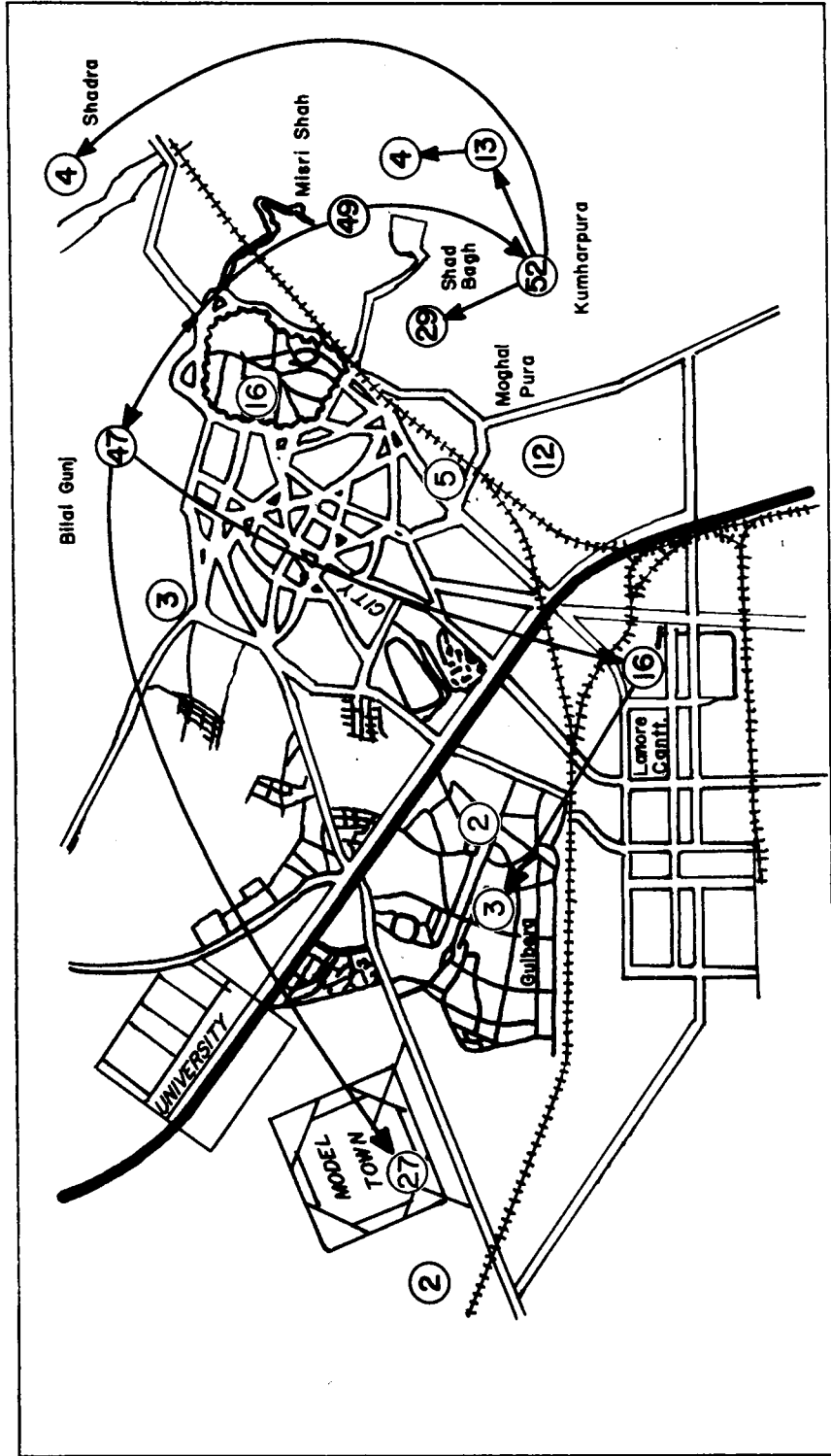


FIGURE 2  
LAHORE CITY, SMALLPOX INCIDENCE 1972

— Date of Report  
— Date of Onset

