

PERSISTENCE OF SMALLPOX IN REMOTE UNVACCINATED VILLAGES

P. Imperato<sup>1</sup>, O. Sow<sup>2</sup>, M. LaPointe<sup>3</sup>, D. Vastine<sup>4</sup>, T. Leonard<sup>5</sup>

INTRODUCTION

On October 31, 1968, the Ministry of Health, Upper Volta, was informed of a smallpox epidemic along the Mali-Upper Volta frontier. An investigation of this epidemic revealed that it had occurred in Upper Volta in a small mountain village, Cani, situated along the frontier. A total of 40 cases of smallpox had occurred in Cani between May 1968 and the time of the investigation. The index case in this outbreak came from a village in Mali, Kouna, some 15 kilometres away, atop the same mountain chain.

Smallpox vaccinations were performed in Cani and in several other villages on the Upper Volta side of the frontier on October 11.

On November 6, the Smallpox Measles Programme, (SMP), Upper Volta telegraphed the SMP Mali the results of their field investigations. On the same day, SMP Mali replied and proposed a joint search for smallpox on the Mali side of the frontier by both Malian and Upper Voltan health authorities. Over the next week the details for this joint undertaking were worked out, final plans being made by telephone between Bamako and Ouagadougou on November 11.

PLAN OF ACTION

The mutually agreed upon plan called for: (1) a joint meeting between Upper Voltan and Malian Grandes Endemies authorities and the respective SMP personnel of USAID-NCDC. The town of Tominian, in Mali, was chosen as the meeting place. (2) a joint search on the Malian side of the frontier for smallpox was to be undertaken in the area of Kouna and (3) epidemic control measures were to be implemented on both sides of the frontier.

HISTORICAL CONSIDERATIONS

The village of Kouna lies in the arrondissement of Koula; on March 4, 1968, seven months before the last outbreak a telegram-letter had been received at the Ministry of Health in Bamako from the Commandant de Cercle, Tominian, reporting six cases of smallpox in the village of Koula. Epidemiologic investigations carried out on March 6 and March 25 revealed a total of 12 cases of smallpox in the village of Koula and 28 in the village of Berekani, 12 kilometres to the northwest. While these villages had been vaccinated in November, 1967, by the mass vaccination teams, the investigations revealed that many of the children had avoided being vaccinated. As a result, most of the cases occurred in the pediatric age group.

Two vaccination teams were sent to this area on March 6 in order to control the outbreaks. In Berekani 290 vaccinations were performed and, in Koula, 210 vaccinations.

At the time of the investigation of the Koula outbreak, it was learned that there was a village, Kouna, some 28 kilometres to the north of Koula, where smallpox cases had been seen. This village was at the time inaccessible except on foot and the inhabitants of Kouna had been asked to go for vaccination to an assembly point 10 kilometres away (Lanfera).

<sup>1</sup>Medical Officer Advisor, NCDC/USAID, Bamako, Mali

<sup>2</sup>Chief Medical Officer, Socio-Preventive, Bamako, Mali

<sup>3</sup>Operations Officer Advisor, NCDC/USAID, Bamako, Mali

<sup>4</sup>Medical Officer, Smallpox Eradication Programme, NCDC, Atlanta, Georgia, USA

<sup>5</sup>Operations Officer Advisor, NCDC/USAID, Ouagadougou, Upper Volta

## FRONTIER CO-ORDINATION MEETING AT TOMINIAN

On November 13 the Malian team arrived in the town of Tominian. The Upper Volta team arrived late the same night. Discussions were held that night about the current status of smallpox on both sides of the frontier. It was mutually agreed to travel to Kouna on the following day in order to search for possible smallpox.

### TRIP TO KOUNA

The following morning a meeting was held with the Commandant of the Cercle of Tominian in order to familiarize him with the purpose of the joint search and control mission. It was decided to approach Kouna from the Upper Volta side of the frontier. Both teams crossed over into Upper Volta early that day and spent most of the day searching for an approach to Kouna. The presence of a village with the same name on the Upper Volta side added to the confusion. Conflicting advice was obtained in most villages about how one could get to Kouna. Finally it was learned that Kouna lay 10 kilometres by footpath on the other side of a chain of rocky mountains. That afternoon the village of Cani was visited and one additional case of smallpox was uncovered. The following morning the investigation team comprised of 36 people set off single file across the mountains on foot.

### THE VILLAGE OF KOUNA

The village of Kouna is divided into eight separate units, each separated from the other by a distance of about one-half kilometre. Each of these units of "quartiers" were once separate and autonomous villages which, for the purpose of administration, were grouped together as one unit. The population of these quartiers is as follows:

Kouna Marka	364
Kouna Gadala	205
Kouna Habe	288
Kouna Diabo	168
Kouna Sambo	50
Kouna Tomon	106
Kouna Alabo	73
Kouna Ono	<u>109</u>
TOTAL	1,363

There are two ethnic groups living in Kouna, the Dogon (Habe) and the Marka (Dafing). The former live in the quartiers on the mountain tops, the latter in the valley.

Although Kouna is regarded administratively as a single integrated village, in point of fact, each quartier has a traditional authority system.

### WORK PLAN IN KOUNA

It was agreed that the main aim of this operation was the vaccination of as many people as possible. Because of a lack of porters, only the most essential supplies were trekked into Kouna - vaccine, jet guns, water, medical supplies, etc. The distance and difficulty of the trek required much more time than the actual operation. Because of these factors, the entire operation had to be accomplished in one day. The chief of Kouna Marka had been told the previous day that the teams would be coming. This quartier is in reality the nucleus of the village complex and the most populated.

The expedition first arrived in Kouna Habe, a semi-abandoned settlement on the top of the mountain ridge, and then made the difficult descent, 1,200 feet, into the valley. Vaccinations were given with the jet injector to all the inhabitants present. The chief was asked to bring everyone out, even those with smallpox. The results of

the vaccinations were tabulated, as well as the number of people with smallpox scars or smallpox and vaccination scars. This operation was carried out in Kouna Marka. There was a market that day, held on the mountain top beside Kouna Habe. Fortunately, this market began at noon, at which time the expedition re-ascended the mountain in order to vaccinate it. Five-hundred and seventeen were vaccinated in the village and 24 in the market.

#### THE EPIDEMIC

Sixty-five persons who had had smallpox were observed in Kouna, three of whom were in the desquamation phase, the others being healed (Table 1). No attempt was made to determine the date of onset of each case. The epidemic was said to have begun with a ten year old girl who entered Kouna some time in late 1967 with smallpox. This child had previously traveled through adjacent parts of Mali and Upper Volta. The last case occurred in October 1968. The disease spread to all other quarters, being still present at the time of the investigation in Kouna Gadala.

TABLE 1: CASES OF SMALLPOX IN KOUNA VILLAGE BY AGE AND SEX

Age	Number Examined	Cases of Smallpox			Attack Rate %	Percentage Distribution By Age (this outbreak)	Percentage Distribution by Age (Other Mali outbreaks)
		Male	Female	Total			
0-5 mo.	18	2	0	2	11.0	3.1	2.6
6 mo.-7 yrs.	75	4	0	4	5.0	6.2	34.6
5-14	199	19	11	30	15.0	46.1	55.0
15-44	183	13	14	27	15.0	41.5	7.1
45+	42	1	1	2	5.0	3.1	0.7
TOTAL	517	39	26	65	12.5	100.0	100.0

Overall, 83.7 % of the villagers lacked vaccination scars (Table 2). Of those who had scars, the majority were from scarification vaccinations performed years ago.

TABLE 2: VACCINATION STATUS OF 537 INHABITANTS OF KOUNA VILLAGE

Age	MALE			FEMALE		
	Vaccination Total	Scar Number	Absent Percent	Vaccination Total	Scar Number	Absent Percent
0-5 mo.	29	29	100.0	37	36	97.3
6 mo.-7 yrs.	61	59	96.7	64	60	93.8
5-14	85	61	71.8	46	35	76.1
15-44	82	61	74.4	65	52	80.0
45+	40	32	88.0	28	25	89.2
TOTAL	297	242	81.5	240	208	86.7

The villagers confirmed that the vaccination team had not entered Kouna in 1967. Rather, word had been sent for the villagers to assemble at Lanfera, a village 10 km away.

### ATTACK RATE

Among the 517 people screened in the village, 65 (12.6%) had evidence of smallpox contracted during the present outbreak. Presuming that all or most cases were seen, the attack rate for the village of Kouna as a whole would be 4.8%. However, not all cases were seen nor were the fatal cases taken into account. No estimate of the mortality rate was made since no one could say for certain how many had died during the outbreak.

### AGE DISTRIBUTION OF CASES

The age distribution of cases in this epidemic varies greatly from that observed in previous investigated epidemics in Mali. Of the total, 41.5% of cases occurred in the 15-44 age group compared to 7.1% in other Malian epidemics. Only 6.2% of cases occurred in the 6 months to 4 year age group compared to 34.6% in other epidemics.

Most outbreaks in Mali in 1967-68 occurred in areas where a large percentage of the population above 5 years of age had been vaccinated at one time or another. The highest attack rates, therefore, were seen in the pediatric age groups and smallpox in Mali was characterized, as a consequence, as a disease of unvaccinated children. The vaccination status of Kouna differed from other villages with outbreaks. In this village, remote and inaccessible except by foot, 83.7% of the population was unvaccinated. In no instance was more than 30% of any given age group found to have vaccination scars. The highest percentage of unvaccinated individuals was in the less than five year age group.

Thus, one might expect the outbreak in Kouna to involve all age groups, as, in fact, it did. Although the variation in rates by age might be accounted for by the small numbers involved, one would have expected a higher attack rate in the 6 month to 4 year age group. Possible reasons for the lower rate are (1) parental failure to bring children who had smallpox to the vaccination site; (2) a high mortality rate in this group, (3) a substantial number in this group without visible scars of smallpox.

### DISCUSSION

The outbreak of smallpox in Kouna, its natural history and the manner in which it was handled illustrates most of the issues which are crucial to the chances of successful eradication of smallpox in this part of Africa.

#### (1) Pocket of Susceptibles in Previously Vaccinated Area:

Kouna was, until it was vaccinated on November 15, an isolated susceptible population. This was the result of its geographic inaccessibility. When vaccination was carried out in November 1967 in the cercle of Tominian, in which Kouna lies this village was not vaccinated. For want of a better expression, Kouna was the victim of the use of "Assembly points for Vaccination". From the vaccination scar data, it is obvious that most people in Kouna did not go to the assembly point 10 kilometres away. For this they cannot be condemned. The time (an entire day), effort, and physical stamina required for walking from Kouna to the assembly point at Lanfera and for transporting a family there by foot for the purpose of a vaccination would have been considered too great, even if all of Kouna's inhabitants had been directly threatened by smallpox.

The use of assembly points of this nature in the mass vaccination programme was prohibited during the 1967-68 campaign. This decision was made because extensive experience with smallpox outbreaks in sedentary populations had shown, time and time again, that widely spaced assembly points left susceptible populations among whom smallpox invariably appeared. The fact that the people of Kouna were asked to assemble at Lanfera represented a violation of instructions on the part of the team concerned.

(2) Rate of Transmission

As has been shown many times before, smallpox in Mali is a disease which, while infectious, is not highly contagious. The disease in Kouna showed itself to be a "silent smoulderer". In brief, smallpox smouldered for almost a year in a village of 1,363 people, 83.7% of whom were unvaccinated.

(3) Local Attitudes Toward Smallpox

The Marka in Kouna are Moslem and attributed the epidemic to God. The cases were not isolated and the disease was not viewed by the village as a whole as a great threat. In brief, the slow rate of transmission, the presumed low mortality and the mild nature of the disease (most cases had had mild benign discrete rashes), engendered a casual attitude towards smallpox in Kouna.