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RECURRENCE OF SMALLPOX IN NIGERIA 1970

(Prepared from data submitted by the Ministry of Health, Nigeria)

by

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Introduction

On March 21, 1970, an unvaccinated 14 year-old girl was admitted to the infectious disease hospital in Kaduna, Nigeria with classical smallpox in the pustular stage. What made this unusual was the fact that smallpox had not been recorded in West and Central Africa for five months. Clearly, this constituted an importation of the disease or smallpox had continued undetected for five months in a country which generally has a good smallpox surveillance system.

Background

In early 1967, vaccination programmes began as part of a regional effort in 20 West and Central African countries to eradicate smallpox within a five-year period. The area involved has a population of approximately 120 million people. The 20 countries reported an average of 10 149 cases of smallpox a year from 1962 to 1967. Pock mark surveys have indicated that less than 10% of smallpox cases were in fact reported, therefore, it is estimated that at least 100 000 cases of smallpox occurred each year in the West and Central African area. Between January 1967 and December 1969, 100 million persons were vaccinated against smallpox and reported cases of smallpox ceased in October 1969.

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Nigeria, a country of 55 to 60 million people, reported an average of 3 622 cases of smallpox each year from 1960 to 1967. Again, scar surveys indicate the actual number was at least 36 000 cases per year. By the end of 1969, Nigeria had vaccinated 50 million persons and no smallpox cases had been reported since October 1969. During late 1969 and early 1970, approximately 10 suspected cases of smallpox were investigated each month by Nigerian health officials, but the suspected cases were always found to be something other than smallpox.

The Outbreak

Investigation of the case admitted to the infectious disease hospital revealed the patient had travelled from Amayo to Kaduna one week prior to the onset of symptoms (Fig. 1). This information was forwarded to Kwara State, the administrative unit in charge of Amayo. An investigation team was sent to Amayo where they discovered a widespread smallpox epidemic. What had gone wrong to permit an epidemic despite a mass vaccination campaign?

The mass vaccination attack phase in Kwara State extended over 8 months from November 1968 to June 1969. Many problems were encountered which resulted in some of the lowest vaccination coverages reported in the entire country. Coverage rates of 50% or less were recorded. Vaccination teams concentrated on larger villages which resulted in extremely low coverage rates in small villages and isolated hamlets. Amayo village, the site of the epidemic, was a vaccination site but only 500 people were vaccinated out of a population of 1 400 persons. A repeat vaccination effort resulted in less than 100 additional vaccinations. At the time of the outbreak, the immunity level in Amayo town was less than 50% and even lower in surrounding hamlets. This poor vaccination coverage set the stage for a continuing smallpox problem.

In early 1969 smallpox was recorded in Nigeria but at much reduced levels as compared to previous years. In February 1969, smallpox was reported from Idofian a few miles from Amayo. In March, cases were reported from nearby Faloku and from Omupo. Transmission evidently continued at a low level during the rainy season (April to October) despite the lack of reports. During October an unvaccinated 6 year-old male travelled from Fufu village to Amayo where he developed smallpox. He in turn infected three other unvaccinated persons, two from his compound and one from an adjacent compound.

The outbreak continued at a very low level (Fig. 2) until the first week in February 1970 (week 15 of the outbreak) when an increase in cases began, soon to average more than one new case a day. In February and March, adjacent villages and hamlets also became involved yet no cases were reported to the Ministry of Health.

Four patients travelled from the Amayo area during the incubation period. Three of the four returned to Amayo before developing symptoms or during the first day of rash. The fourth travelled to Kaduna, as noted earlier, to bring the outbreak finally to the attention of health authorities 22 weeks after it started. Only one case occurred in Amayo more than one week after control measures were instituted. A total of 61 known cases were recorded in Amayo.

What were some of the characteristics of this outbreak? First, the overall immunity level in infected compounds was only 50% (Table 1). Note the very low immunity levels in children under the age of 15. As might be expected in this situation, the epidemic was a pediatric problem (Table 2), with 65% of cases in the 5 to 14 age group.

Another finding of note was the high attack rate in the age group 5 to 14 even when correcting for the differing immunity levels by age group. In Table 3, attack rates per 100 susceptibles are given by age groups. Only one of 54 susceptible adults over the age of 30 developed smallpox even when living in a compound harboring a smallpox patient. This finding, that smallpox transmission was easier in younger age groups was supported by the fact that in 21 instances smallpox was introduced to a compound but did not spread. The average number of susceptibles under age 30 in these 21 compounds was 2.1 persons. In 13 compounds where spread did take place the average number of susceptibles under age 30 was 4.6 persons.

Investigation of the Amayo outbreak led health authorities in Nigeria to find 3 additional outbreaks believed to have their origins in the outbreak which persisted in the Amayo area. Nine cases were reported in Ilorin, two in Lagos and three in Shagamu (Fig. 1).

Control efforts involved both mass vaccination activities as well as efforts to find and vaccinate susceptibles on a compound-by-compound basis. Experiences clearly indicate that a careful search for susceptibles in the immediate area involved is essential for proper investigation and effective control. No cases of smallpox have been detected in Nigeria since May 1970.

Implications

First, a mass vaccination campaign is not sufficient in itself to eradicate smallpox.

Second, the absence of reports should not be interpreted to mean the absence of disease. The combination of poor coverage during the vaccination campaign and known smallpox in early 1969, should have raised suspicions regarding the possibility of smallpox in the area.

Third, if assessments are to be worthwhile they must result in corrective action. In this case repeated efforts including house-to-house campaigns were indicated in early 1969.

Fourth, increased emphasis on surveillance should take place when an area is believed free of smallpox. Transmission at low levels and in remote areas has been repeatedly observed. A high index of suspicion is required to find these foci before they become larger epidemics.

Perhaps most important is the fact that the value of an investigation cannot be overestimated. A single case of smallpox in this instance led to the discovery of four outbreaks with a total of 75 cases of smallpox.

TABLE 1

ESTIMATED PRE-EPIDEMIC SMALLPOX IMMUNITY IN "INFECTED" COMPOUNDS
AMAYO, NIGERIA - SEPTEMBER 1969

Age Group	Number	Number Immunes	% Immune
< 1	15	3	20.0
1-4	40	14	35.0
5-14	65	12	18.4
15-29	50	36	72.0
30+	140	86	61.4
Total	310	151	51.3

TABLE 2

AGE SEX DISTRIBUTION OF 61 SMALLPOX CASES
AMAYO, NIGERIA - 1969-1970

Age	Males	Females	Total
< 1	2	1	3
1-4	6	5	11
5-14	22	18	40
15-29	4	2	6
30+	1	0	1
Total	35	26	61

TABLE 3

AGE SPECIFIC ATTACK RATE PER 100 SUSCEPTIBLES IN INFECTED COMPOUNDS
AMAYO, NIGERIA - 1969-1970

Age Group	Number Susceptible	Number Infected	Attack Rate per 100 Susceptibles
<1	12	3	25.0
1-4	26	11	42.3
5-14	53	40	75.5
15-29	14	6	42.9
30+	54	1	1.9
Total	159	61	38.4

FIG. 1

DIAGRAM OF CITIES INVOLVED IN THE SMALLPOX EPIDEMIC
OCTOBER 1969 – APRIL 1970, AMAYO, NIGERIA

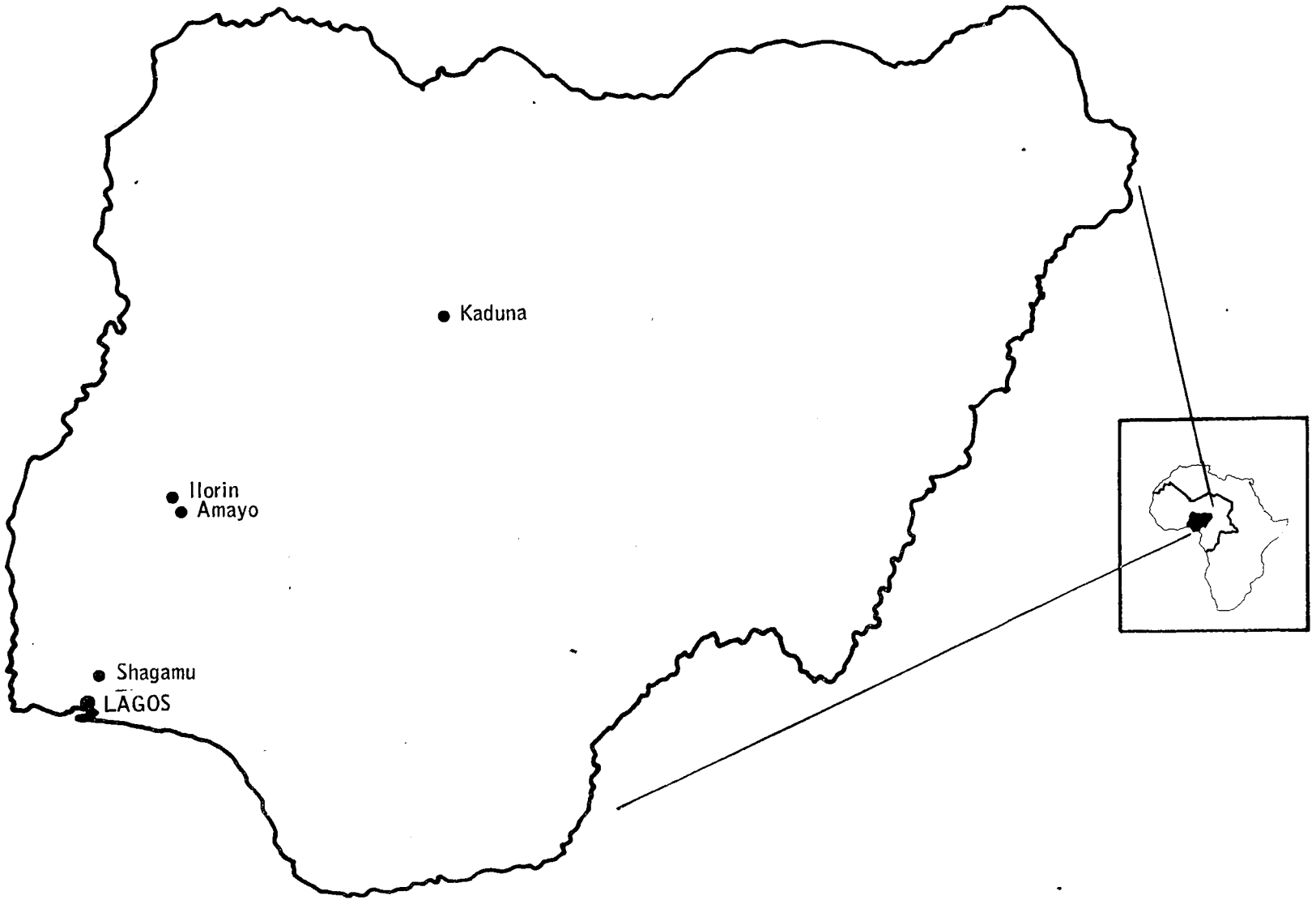
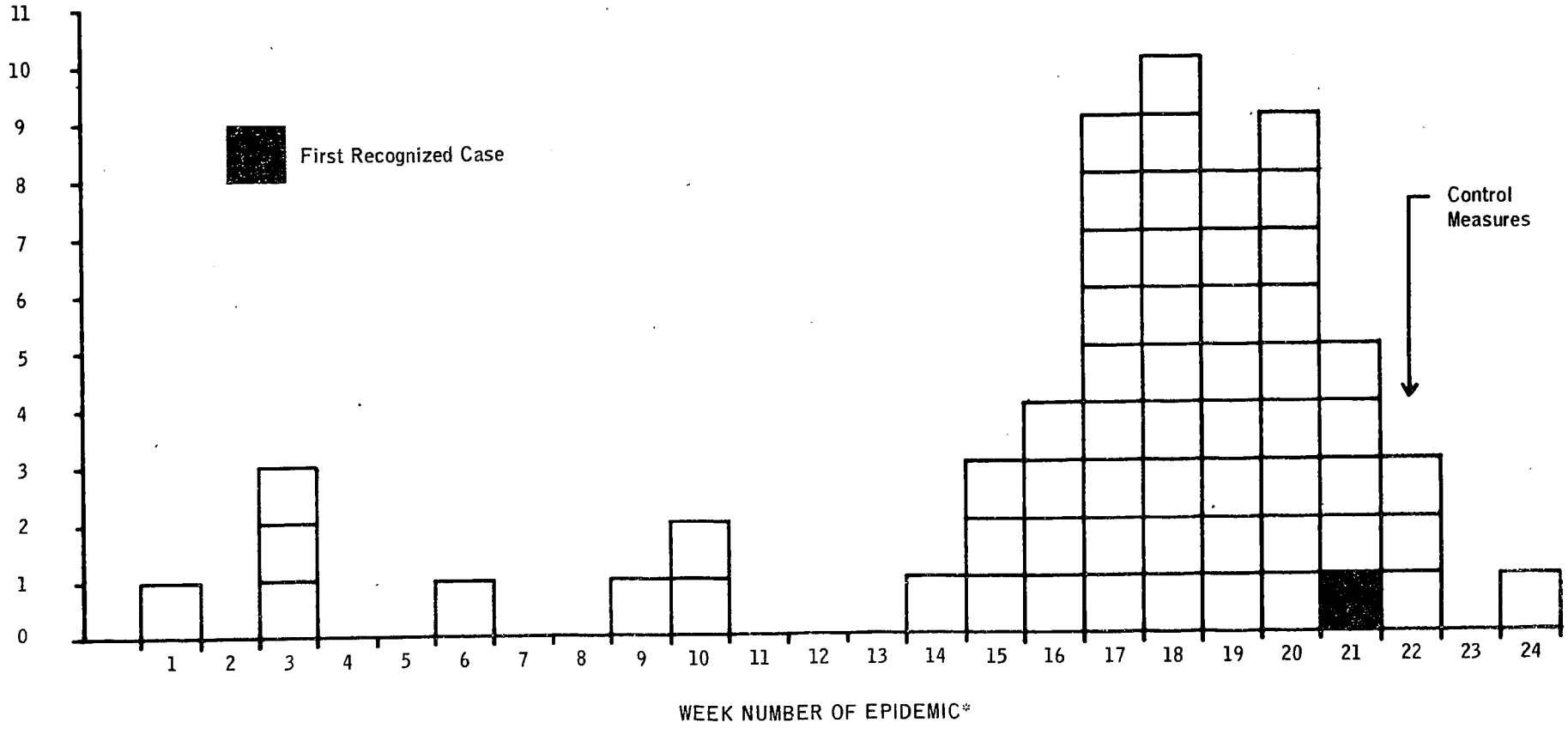


FIG. 2

EPIDEMIC OF SMALLPOX, AMAYO, NIGERIA
OCTOBER 1969 – APRIL 1970



*First week of epidemic was October 26–November 1.