

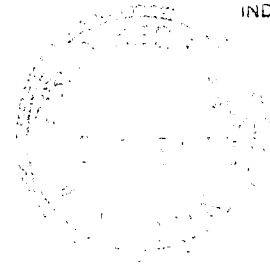


PERSISTENCE OF FACIAL SCARS OF SMALLPOX  
IN WEST AFRICAN POPULATIONS

INDEXED

by

Stanley O. Foster, M.D.,  
Smallpox Eradication Program  
Center for Disease Control



INTRODUCTION

Surveys of the prevalence of facial scars of smallpox have been used in a number of areas in the smallpox eradication programme to estimate the actual incidence of smallpox and to estimate reporting efficiency. The method was first employed in Indonesia by Keja, and has been used in West Africa by Foege and Henderson. The method requires the examination of the youngest age-groups (e.g. children 0-4), in a cluster survey of the population to determine the prevalence of facial scars of smallpox. For an individual to be considered as positive, at least five characteristic, round, depressed facial scars, one or more mm in diameter, must be present. By correcting for the observed rate of smallpox mortality in the age-group examined and for loss of smallpox scars over time, it is possible to estimate the incidence of smallpox within the sampled population. Smallpox incidence in the entire population can then be determined by correcting for the age distribution of cases. By comparing this estimated figure with the number of officially reported smallpox cases, an estimate of reporting efficiency is obtained.

West African surveys have utilized correction factors for mortality and age distribution of cases based on collected data from West Africa. However, the correction factor for loss of smallpox scars over time, 25 per cent., was based on data collected by Mack in Pakistan. In order to determine if this rate applied to the retention of residual scars in West Africans, a survey was undertaken during the spring of 1971 to determine the frequency of residual smallpox scars in previously identified cases of smallpox.

METHOD

Previously investigated smallpox epidemics in which a detailed line listing of cases had been prepared, were visited one to four years following the outbreak. Identified subjects were examined for facial scars of smallpox and the results were recorded on a standard form.

RESULTS

Of 259 individuals identified for follow-up, 20 had died of smallpox and seven had died of other causes. Of the remaining 232, 153 (66 per cent.) from nine outbreaks in three countries were located and examined. In all, 104 individuals (68 per cent.) had five or more residual scars of smallpox (Table 1).

The number of residual facial scars by age-group are presented in Table 2 and age specific rates in Table 3. The proportion with residual scars is directly related to age with low rates in the young age-groups and higher rates in adults (correlation coefficient of 0.84). The correlation coefficient between the frequency of residual smallpox scars and the interval between the outbreak and follow-up was low (+0.64). This suggests that within the time intervals in this study, there was a comparatively low rate of loss of facial scars.

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The inter-epidemic variation in scar retention appears to be primarily related to the age distribution of cases. By correcting the age specific rates in the individual outbreaks (Table 4) to a standard population, much of the inter-epidemic variation is removed (Table 5).

CONCLUSION

The frequency with which smallpox scars are retained in West Africa is directly related to age, varying from a low of 30 per cent for children under five to 90 per cent. in adults.

Appendix 1 and 2 are examples of the method by which smallpox prevalence may be estimated using data collected by Henderson and Leadley. In rural and urban areas, the completeness of reporting of smallpox cases before the campaign began was calculated to be 1.3 per cent. (rural areas) and 8.1 per cent. (urban areas).

TABLE 1. RESIDUAL FACIAL SCARS IN SMALLPOX CASES IN WEST AFRICA

Country	No. of months after outbreak when patients examined	No. of cases	No. examined	No. with scars*	%
Mali	45	34	19	14	74
Niger	40	60	43	39	90
Nigeria					
Oyo	32	19	13	5	38
Ilesha	18	11	5	2	40
Abeokuto	38	10	6	6	100
Jolumbu	23	12	12	4	33
Yamalto	25	10	9	6	67
Gerere	38	42	26	15	58
Amayo	16	61	20	13	65
		259	153	104	68

\* Scarred - five or more concentric depressed facial scars measuring one or more mm in diameter.

TABLE 2. NUMBER OF FACIAL SCARS\* IN  
134 WEST AFRICANS, BY AGE-GROUP

Age at time of infection	No. scars	Number of facial scars				Total
		1-4	5-10	11-25	25	
0-4	6	6	1	1	3	17
5-9	16	8	4	4	10	42
10-14	0	1	2	6	14	23
15-19	3	1	2	6	8	20
20-24	1	0	3	2	9	15
25+	1	1	1	2	12	17
TOTAL	27	17	13	21	56	134

\* Facial scar - round depressed scar one or more mm in diameter.

TABLE 3. RESIDUAL FACIAL SCARS OF  
SMALLPOX BY AGE-GROUP

Age	Examined	Number with scars	%
0-4	17	5	29.4
5-9	42	18	42.8
10-14	23	22	95.6
15-19	20	16	80.0
20-24	15	14	93.5
25+	17	15	88.3
TOTAL	134	90	67.1

TABLE 4. RESIDUAL SMALLPOX FACIAL SCARS BY AREA

Area	Age										Total		%
	0-4		5-9		10-14		15-24		25+		Ex	S	
	Ex	S	Ex	S	Ex	S	Ex	S	Ex	S			
Niger	1	0	4	3	10	10	21	20	7	6	43	39	90.7
Nigeria													
Kwara	6	4	9	4	3	3	2	2	0	0	20	13	65.0
North East	4	0	7	2	1	1	4	3	5	4	21	10	52.6
North West	3	0	9	5	5	4	6	3	3	3	26	15	57.7
West	3	1	13	4	4	4	2	2	2	2	24	13	54.2
TOTAL	17	5	42	18	23	22	35	30	17	15	134	90	67.2

Ex = No. examined  
S = No. with scars

TABLE 5. AGE CORRECTED RESIDUAL SMALLPOX FACIAL SCAR RATES BY AREA

Area	Age					Total	% with scars
	0-4	5-9	10-14	15-24	25+		
Total examined	17	42	23	35	17	134	
Niger	0.0	31.5	23.0	33.3	14.6	102.4	76.4
Nigeria							
Kwara	11.3	18.6	23.0	35.0	0.0	87.9	65.6
North East	0.0	12.0	23.0	26.2	13.6	74.8	55.8
North West	0.0	23.3	18.4	17.5	17.0	76.2	56.9
West	5.7	12.9	23.0	35.0	17.0	93.6	69.8
TOTAL All outbreaks	5	18	22	30	15	90	67.2

APPENDIX 1

ESTIMATED EFFICIENCY OF SMALLPOX REPORTING  
SOKOTO AND KATSINA PROVINCES, NIGERIA (RURAL AREA)

Population - 6 900 000 persons

Population 0-4 - 18.7 per cent.

Population 0-4 - 18.7 per cent. x 6 900 000 persons = 1 290 000 persons

Observed frequency of smallpox scars ( $\frac{4}{305}$ ) - 1.29 per cent.

Estimated number of 0-4 year-old children with facial scars - 1.29 per cent. x 1 290 000 -  
16 641 persons

Proportion of 0-4 year-old children who retain scars for at least one to four years -  
29.4 per cent.

Estimated number of 0-4 year-old children who had smallpox and survived -  $\frac{16\ 900}{29.4\%} = 56\ 602$

Smallpox case-fatality rate in 0-4 year-old children - 15 per cent.

Estimated total cases of smallpox which occurred in the 0-4 year-old age-group studied -  
 $\frac{57\ 500}{85\%} = 66\ 590$  cases

Percentage of smallpox cases which normally occur in the 0-4 year-old age-group - 20 per cent.

Estimated total of smallpox cases during the last five years among all age-groups  $\frac{66\ 590}{20\%} =$   
332 950

Number of smallpox cases reported during last five years - 4185

Reporting efficiency -  $\frac{4185}{332\ 950} = 1.3$  per cent.

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APPENDIX 2

ESTIMATED EFFICIENCY OF SMALLPOX REPORTING KANO (URBAN AREA)

Population - 50 000

Population 0-14 - 44.6 per cent.

Population 0-14 - 44.6 per cent. x 500 000 = 223 000 persons

Observed frequency of smallpox scars in 0-14 year-old age-group - 3.7 per cent.

Estimated number of 0-14 year-old children with facial scars - 3.7 per cent. x 223 000 =  
8250 persons

Proportion of 0-14 year-old children who retain scars for at least one to four years -  
55 per cent.

Estimated number of 0-14 year-old children who had smallpox and survived -  $\frac{8250}{55\%} = 15\ 000$

Smallpox case-fatality rate in 0-14 year-old children - 13 per cent.

Estimated total cases of smallpox which occurred in the 0-14 year-old age-group studied -  
 $\frac{15\ 000}{87\%} = 17\ 250$  cases

Percentage of smallpox cases which normally occur in the under 15 age-group - 50 per cent.

Estimated total of smallpox cases during the last 15 years -  $\frac{17\ 250}{50\%} = 34\ 500$

Reported number of smallpox cases during last 15 years - 2805

Reporting efficiency -  $\frac{2805}{34\ 500} = 8.1$  per cent.