SUCCESSFUL PLAGUE CONTROL IN NAMIBIA

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Objective. To demonstrate that plague can be successfully controlled.

Design. A descriptive study outlining patterns of plague occurrence in relation to variables such as age group, gender, place and time.

Setting. Two northern districts, namely Engela in Ohangwena region and Onandjokwe in Oshikoto region, an area of 2 000 km^2.

Subjects. All patients who presented to the health facilities with signs and symptoms of plague were considered. Diagnosis was made on the basis of clinical symptomatology and laboratory confirmation.

Outcome measures. A plague control programme was established involving the following components: management capability at the local level, case recognition and management, dusting programme, rodent trapping programme, health education, establishment of plague laboratory, and plague surveillance system.

Results. Following the establishment of the control programme plague cases were reduced from 1 092 to zero within 3 years and deaths from 45 to zero within 2 years. The case fatality rate was reduced from 4.12% to 0% over a 3-year period. No cases have been reported in Namibia for the past 3 years.

Conclusion. The Namibian experience has demonstrated that plague can be controlled through a combination of strategies taking local conditions into consideration.

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Plague is a specific zoonotic infection involving rodents and their fleas. The disease is caused by a small Gram-negative bacillus, *Yersinia pestis*. Plague is transmitted among the natural animal reservoirs, predominantly urban and sylvatic rodents, through vector flea bites or ingestion of contaminated animal tissue by the host. The most important reservoir of plague bacillus are domestic rats. Man becomes an accidental host in

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the natural plague cycle when bitten by an infected rodent flea. During epidemics of pneumonic plague the infection is passed directly from one human to another.

Four plague pandemics have been recorded in history. The first pandemic originated in Egypt in AD 542. The second pandemic started in the 14th century in Asia Minor and Africa and spread to Europe, killing about one-quarter of the latter population. The third pandemic occurred in Europe during the 15th to 18th centuries and the fourth began in China in approximately 1860. Around 1919 plague was notified in Southern Africa and in 1950 it was notified for the first time in Namibia (formerly South West Africa).

Materials and methods

The number of plague cases in the early years of the disease in Namibia has not been properly documented. Hospital records show that the overwhelming clinical form of plague is the bubonic plague, although cases of septicaemic plague have also been recorded. No cases of pneumonic plague have been confirmed. The disease started in the central regions and gradually moved to the northern areas where it became stabilised. It maintained foci in two districts, namely Engela and Onandjokwe in the north-west regions, covering an area of 2 000 km^2. Transmission is mainly through inoculation by infected rodent fleas or through ingestion of infected animal tissue. Mouse meat was considered a delicacy in certain communities in this area, and many people are thought to have been infected in this way.

Results

The number of plague cases recorded from 1983 to 1997 are shown in Table I.

Plague is normally at its height during the dry season. A generous rainfall results in abrupt termination of outbreaks. Seasonal distribution is related to epizootics in the rodent population and is spread when fleas are numerous. However, the peak of the 1991 outbreak coincided with the peak of the rainy season between January and April (Fig. 1).

Most of the laboratory-confirmed cases occurred in the 9 - 10-year age group, followed by the 0 - 9-year age group. Females are more affected than males (Table II), probably because of domestic activities.

Discussion

Plague has been endemic in the two districts, with little annual variation in the number of cases. However the incidence increased dramatically from 169 cases in 1990 to 1 092 in 1991. Reasons for this outbreak are not clear. There was little difference between the 2 years in terms of rainfall, availability of food and environmental sanitation (poor environmental sanitation causes rats to come into closer contact with

Table I. Number of plague cases and deaths from 1983 - 1997

Years	Cases	Confirmed	Deaths	Case fatality rate
1983	247	139	17	6.88
1984	285	65	12	4.21
1985	355	77	16	4.5
1986	371	97	13	3.5
1987	146	10	1	0.68
1988	31	0	0	0
1989	116	0	0	0.00
1990	169	17	10	5.91
1991	1 092	171	45	4.12
1992	458	69	13	2.83
1993	42	0	1	2.38
1994	4	0	0	0
1995	0	0	0	0
1996	0	0	0	0
1997	0	0	0	0
Total	3 316	645	128	3.86

Source: HIS, MOHSS.

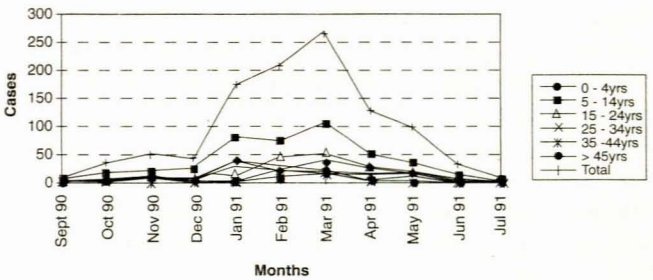

Fig. 1. Monthly plague cases by age group.

households). Diagnosis was mainly on the basis of clinical symptomatology, with comparatively few cases confirmed by laboratory testing in South Africa. The reason for this was that there was no plague laboratory in the country and specimens had to be sent to South Africa, a process that took up to 6 months. This had no clinical relevance to the attending physician or the patient because by the time the result became available the patient had either succumbed to the illness or had recovered and been discharged. This did not encourage doctors to request laboratory confirmation. The case fatality rate has shown a consistent downward trend since 1990.

Response to the outbreak

The plague outbreak caused a public outcry characteristic of the hysterical reaction that plague induces in communities where it strikes. Plague control strategy was developed and a plague control team was established. The latter was headed by the Regional Director who was made responsible for overall supervision, strategic planning, case management, policy-making, logistics and community mobilisation. Other members of the team included a medical officer responsible for proper

Table II. Number of plague cases by age (yrs) and gender

	0 - 4		5 - 14		15 - 24		25 - 34		35 - 44		> 45		Total		
Month/year	F	M	F	M	F	M	F	M	F	M	F	M	F	M	Grand total
Sep 90	0	1	8	1	2	1	0	0	1	0	0	0	11	3	14
Oct 90	4	2	13	6	3	0	0	0	0	0	3	2	23	10	33
Nov 90	3	8	10	13	7	3	0	0	0	0	6	3	26	27	53
Dec 90	4	5	14	11	2	4	0	1	2	1	2	0	24	21	45
Jan 91	27	15	45	41	14	2	3	2	0	0	25	6	114	66	180
Feb 91	16	11	36	40	30	18	7	4	5	18	17	7	111	98	209
Mar 91	19	24	59	53	39	18	12	3	4	15	17	8	150	121	271
Apr 91	16	12	25	27	18	5	4	1	2	1	14	5	79	51	130
May 91	8	14	19	17	15	6	6	1	1	0	12	4	61	42	103
Jun 91	2	1	6	8	4	1	2	0	0	0	5	2	19	12	31
Jul 91	0	1	2	2	1	3	0	0	0	0	0	0	3	6	9
Total	99	94	237	219	135	60	34	12	15	35	101	37	621	457	1 078
Grand total	193		456		195		46		50		138		1 078		

Source: HIS, MOHSS

case management; a health inspector responsible for co-ordination of activities, collection of data, health education, contact tracing and administration of prophylaxis to close contacts; and two environmental health assistants heading a team of 10 dusters each. The team was assisted by a biologist from the University of Namibia and a mammalogist from the State museum of Namibia. The second component of the strategy provided for case recognition and management. Case definition was established and health workers were trained in plague recognition. Drugs to treat plague were supplied to all remote facilities, and the loading dose was administered to patients immediately at the clinic before transferral to the hospital. All suspected cases were subjected to laboratory confirmation.

The third component of the strategy was the dusting programme. Dusting was done using Avi Carbo Dust (5%) and the Rotary Hand Duster Model D-7 around traditional houses where plague cases occurred, as well as around houses in the neighbourhood within a radius of approximately 5 km. Rodent burrows were also dusted. The purpose of the dusting was to kill the rodent fleas; rodents themselves were not targeted. The fourth element of the plague control strategy was the trapping programme undertaken on a monthly basis with the biologist monitoring the quality of trapping. Rodents found in the plague focal area were *Rhabdomys pumilio* (striped mice), *Mastomys* species (multimammate mice) and *Tatera leucogaster*. Identification of rodent fleas was done by the mammalogist. The commonest plague fleas were *Xenopsylla philoxera*, *Xenopsylla versuta* and *Xenopsylla brasiliesis*. The fifth strategic component involved intensive targeted health education. Information on plague was compiled and disseminated widely through the affected community. Methods used included articles in the print media, talks over electronic media, community meetings with health workers, person-to-person talks, and distribution of posters and pamphlets in local languages.

The sixth component involved the establishment of a plague laboratory in Oshakati State Hospital, the regional referral hospital. Previously specimens were sent to South Africa and results could take up to 6 months before they became available. The necessary equipment was purchased and technicians were sent for training in plague diagnosis. The last component of the plague control strategy involved the establishment of a plague surveillance system. This entailed the monitoring of rodent populations and their behaviour. In 1994 a significant increase in the rodent population was noticed in the focal area and dusters were immediately mobilised. The surveillance system is still in place. The control strategy did not make provision for the imposition of quarantine as this was deemed to be ineffective.

CONCLUSION

Plague control in Namibia has been successful, with no cases reported in the past 3 years. Control was achieved by means of a combination of methods. Health education appears to have made a significant impact, as communities have changed their behaviour towards rodents, especially with regard to the eating of mice. Programmes for plague control need to be adapted to local conditions.

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