Epidemic of louse-borne relapsing fever in Ethiopia

[Public Health]

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Summarytoctoc

During summer 1991 an outbreak of louse-borne relapsing fever occurred simultaneously in two transit camps established for prisoners of war being returned from Eritrea at the end of the Ethiopian civil war.

Only antibiotic treatment was given at the Bahr Dar camp where the frequency of cases increased for 20 days.Vector control by delousing in addition to antibiotics was given at Mekele camp where the frequency of cases fell over a similar period. This difference was significant

(p<0.001). Furthermore, there was a significant correlation between the decreasing proportion of camp inhabitants that had not been deloused at Mekele camp each day and the numbers of patients with fever (r=0.89, p<0.001).

Taken together, these results confirm that effective control of an epidemic of louse-borne relapsing fever is dependent on efficient vector control in addition to antibiotic treatment.

Introductiontoctoc

After the end of the civil war in Ethiopia in May 1991, 300 000-500 000 Ethiopian soldiers were in refugee camps in Eritrea. The responsibility for their repatriation was allocated to the International Committee of Red Cross. Transit camps were built between Eritrea and Addis Ababa Figure 1. This area is endemic for louse-borne relapsing fever (LBRF), caused by the spirochete Borrelia recurrentis. Out of the yearly reported 4000-6000 cases worldwide, (probably an underestimate), the majority are recorded in Ethiopia.

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Figure 1. Location of camps: Bahr Dar and Mekele

The vector is the human body louse (Pediculus humanus humanus; also, although less important, the head louse, Pediculus humanis capitis). Transmission is through crushing the louse into a skin break, such as a louse bite. Incubation period is 2-10 days, usually 4-8. Untreated, mortality ranges from 10-73%; treated, from 2-12% [1]. The range reflects differences in spirochetal virulence, living conditions, and nutritional status. Death usually occurs during the first febrile episode.

Patients and methodstoctoc

Transit campstoctoc

The largest transit camps were in Bahr Dar and Mekele. In Mekele a tent camp was erected 1 km outside the city. In Bahr Dar an abandoned army camp a few km outside the city was supplied with extra tents. The soldiers were from 16-25 years of age. Population during the period of observation was estimated at 30 000 in Bahr Dar and 18 628 in Mekele. Population density in both camps was similar; after August 1 the maximum verified in Mekele was nearly two soldiers for each m2.

In Bahr Dar and Mekele, health services were an out-patient department with four satellite clinics, and a field hospital. At August 1, the medical staff at Mekele was 1 physician, 2 expatriate nurses, 18 Ethiopian nurses, and 15 Ethiopian health assistants. In Bahr Dar the staff

was 1 expatriate and 2 Ethiopian physicians, and the same number of other healthworkers as at Mekele.

Epidemic onset

Due to delays in repatriation, the number of soldiers in the camps increased during July and there were heavy rainstorms. There was no running water for washing and all drinking water came in bottles from Addis Ababa. The risk of communicable disease outbreaks became obvious. 5 soldiers who died during transport from Mekele to Addis Ababa in July probably died of LBRF and were incubating the disease whilst at the camp. In Mekele, on 2 days in early August, 600 soldiers suffering from fever and dysentery were found in their tents. The situation at Bahr Dar deteriorated at the same time.

Methods of control

Bahr Dar-Screening blood smears were made on July 30 and antibiotic treatment for LBRF (tetracycline 500 mg orally) was the only control measure as no facilities existed for delousing. Weekly recordings of the situation were made, and on August 20 a second LBRF screening was done.

Mekele-On most days from July 31 until Sept 2, blood smears were taken from as many febrile patients as possible and examined by the National Malaria Control Program of the Ministry of Health. It was not possible to test all patients with fever because of their number and the weather conditions. From July 20 to August 5 treatment was inconsistent as some patients were also treated for malaria. After August 5 all patients with pyrexia were treated for LBRF. The antibiotic and the dose given varied according to symptoms, supplies, and side effects (first, oral tetracycline 500 mg and from August 5, intramuscular penicillin). Only the most seriously-affected patients could be admitted to the field hospital. The other patients had to return to their tents after antiobiotic treatment.

The delousing programme at Mekele began on August 11. Measures were taken to prevent soldiers mingling with the local population and the repatriation of non-deloused soldiers was forbidden. Delousing was by shaving the head and pubic hair, a 15-minute shower with soap, and all clothes were boiled for 30 min. Blankets were burned and new clean blankets distributed together with extra food rations. The right hand of the deloused soldier and one blanket corner were marked with gentian violet. Personal belongings were collected and treated with DDT separately. Because malathion was unavailable and permethrin did not arrive in time, DDT was used to spray the inside of tents and hospital. 12 days after beginning the delousing programme, it was possible to resume repatriation.

Results

Bahr Dar

On July 30, the estimated number of soldiers with fever was 250, and of 60 blood smears, 23 were positive for LBRF (38%) and 25 for malaria (42%). On August 20 the LBRF-positive ratio

had increased to 67% (34 of 51). The number of fever cases had remained constant or slightly higher.

Mekeletoctoc

During the epidemic, the number of out-patient attendances ranged from 289-422. From August 1 to August 5, 90% were treated as having LBRF and after August 5, all were treated. Lice infestation (body and head lice) was universal and louse density high.

From July 31 to September 2, 1437 blood smears were made from feverish patients of which 657 were verified as LBRF on microscopy Figure 2. The maximum LBRF patients in one day was 136 Figure 3, middle). Not more than 267 LBRF cases could be admitted to the field hospital, whereas altogether 3638 fever patients were treated from August 3 to Sept 9. Only four cases of malaria were recorded in the 1437 blood smears.

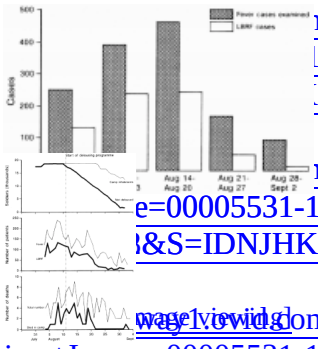

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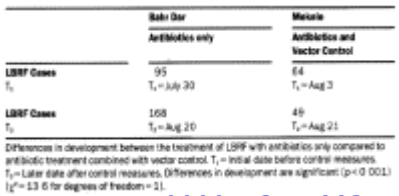
Figure 2. LBRF and fever diagnoses

Figure 3. Epidemic in Mekele August 31 to September 6. Camp inhabitants deloused (top), number of fever cases and LBRF (middle), and death (bottom)

From August 11, the number of soldiers deloused daily ranged from 490-1215 Figure 3, top). The correlation between the proportion of camp inhabitants not yet deloused and numbers of patients with fever and LBRF is statistically significant (0.89, $p<0.001$; 0.88, $p<0.001$ respectively).

150 soldiers died during the observation period, 106 of them in the field hospital and 44 in the camp. No LBRF patient treated in the hospital died. For the deaths in the camp the causes of death could not be verified. No deaths occurred during repatriation transport after the LBRF programme was started. Despite the limited recordings in Bahr Dar camp, the difference in development of the epidemic between the two camps is significant ($p<0.001$) Table I.



	Bahr Dar	Mekele
	Antibiotics only	Antibiotics and Vector Control
LBRF Cases	95	64
T_0	T_0 = July 30	T_0 = Aug 3
LBRF Cases	168	49
T_1	T_1 = Aug 20	T_1 = Aug 21

Differences in development between the treatment of LBRF with antibiotics only compared to antibiotic treatment combined with vector control. T_0 = Initial date before control measures. T_1 = Later date after control measures. Differences in development are significant ($p < 0.001$) ($\chi^2 = 13.6$ for degrees of freedom = 1).

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Table I. Course of epidemics

Discussion[toctoc]

Epidemics of louse-borne relapsing fever have occurred throughout large parts of Africa and south-eastern Europe this century. Since 1948, however, there have been no large epidemics, but small ones still occur if local outbreaks are not treated adequately. There are a variety of recommended treatments [2,3,4,5,6] .Tetracycline in a single oral 500 mg dose and penicillin as a single injection of 1 000 000 IU have proven curative. Relapses are more frequent after penicillin treatment [6]. Neither in Mekele nor in Bahr Dar could antibiotic treatment alone contain the epidemic. However, the significant correlation between non-deloused soldiers and new LBRF cases, combined with the significant difference in epidemic development between the two camps, confirms vector control is necessary to control LBRF epidemics.

Myocarditis with cardial arrythmias, cerebral haemorrhage and hepatic failure are the most common causes of death in LBRF. At Mekele, most deaths were due to tuberculosis, dysentery, and malnutrition. LBRF mortality ratio was difficult to calculate under these circumstances, although 106 who died in the hospital can be excluded. The 44 camp deaths would include untreated LBRF, but LBRF is unlikely to have been the only cause. We registered only one death due to Jarisch-Herxheimer Reaction. This patient might have survived if he had been in hospital.

If the camp could have been completely isolated, the epidemic might, even without treatment, have declined eventually, but probably with a considerable mortality as a consequence of the harsh living conditions and low nutritional status. With antibiotic treatment only, the mortality and morbidity could have been reduced, but a further spread of the infected lice could not have been prevented. Mass drug administration without vector control is likely to only mask the epidemics.

Due to the urgency of the situation and with the uncertainty of differentiating between head and body lice we included head shaving in the delousing procedure. In our experience, DDT proved to be effective; despite reports of lice resistant to DDT in some areas.

Conclusion[toctoc]

We conclude that antibiotic treatment alone is insufficient to stop an epidemic outbreak of LBRF, without systematic vector control. Further, our report underlines the importance of health surveillance systems to detect epidemic outbreaks early and shows how it may be possible with limited resources to control epidemics. For control of vector-borne diseases, DDT must be considered an acceptable option, despite the problem of vector resistance.

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