

# Louse-borne relapsing fever

## A clinical and an epidemiological study of 389 patients in Asella Hospital, Ethiopia

Giulio Borgnolo, Belayneh Hailu, Alfonso Ciancarelli, Mauro Almaviva, Tisasu Woldemariam \*

*An outbreak of louse-borne relapsing fever, due to the return of soldiers to their original recruitment areas, after the end of thirty years of fighting in northern Ethiopia, was reported in Arsi region, southern Ethiopia. The epidemic spread to different members of the community and eventually the schools. We studied 389 patients affected by the epidemic and who were admitted to Asella Hospital between June 1991 and May 1992. Twenty-seven per cent of the patients were ex-soldiers; 28% were students, who were admitted to the hospital since the schools were opened after the summer vacations. The common clinical features of the disease were fever (99%), headache (92%), hepatosplenomegaly (66%), myalgia (55%), arthralgia (51%), petechial rash (43%), epistaxis (24%) and jaundice (23%). Observed complications were pneumonia (10%), pulmonary edema (6%), myocarditis (3%) and 6 abortions in 15 pregnancies. Patients were treated with low dose penicillin and I.V. fluids. The in-hospital case fatality rate was 3.6%. Jarisch-Herxheimer reaction occurred in 43% of the patients. 1.8% of the patients had relapses after treatment.*

Key words: Louse-borne relapsing fever, *Borrelia recurrentis*, Ethiopia

Louse-borne relapsing fever (LBRF) is an acute febrile illness caused by the spirochaete *Borrelia recurrentis* and transmitted to man by infected body lice.<sup>1</sup> Louse-borne relapsing fever is endemic in the eastern part of Africa. The first recorded epidemic took place in the Sudan in 1926.<sup>2</sup>

An epidemic in North Africa and Europe during World War II caused 50,000 deaths.<sup>3</sup> Kirk in 1939 reported that Sudanese soldiers returning from Abyssinia during World War II brought the disease with them and spread it throughout the country on their way home.<sup>4</sup> In the northern part of Ethiopia 30 years of war ended in May 1991. Borgnolo *et al.*<sup>5</sup> reported an outbreak of LBRF due to the return of soldiers to their original recruitment areas in Arsi region, southern Ethiopia after the end of this war.

The case fatality rate which may reach 40% during an epidemic, is usually 5% or less in antibiotic treated patients<sup>6</sup>; in one recent Sudanese study the mortality rate due to LBRF was 5.5% with treatment.<sup>8</sup>

The reduced mortality rate was achieved by administering low doses of antibiotics that could prevent severe Jarisch Herxheimer (JH) reaction.<sup>6</sup>

The purpose of this study is to describe the spread of the LBRF epidemic from soldiers to the population of Arsi region and the various clinical presentations and bad prognostic factors of the disease.

### PATIENTS AND METHODS

Louse-borne relapsing fever (LBRF) patients were admitted to Asella Hospital between 1 June 1991 and 31 May 1992. Asella Hospital is the tertiary referral centre for Arsi region, southern Ethiopia. Due to an inadequate transportation network, the catchment area of the hospital is restricted to Asella town (32,954 inhabitants) and the surrounding area.<sup>7</sup> During the study period all LBRF suspected patients at the town's health centre were sent to Asella Hospital for admission. Only confirmed cases of relapsing fever were included in the study. A confirmed case was defined as a febrile illness in an individual found to have visible spirochetes in a Wright-stained peripheral blood smear. Name, age, sex, address, occupation, recent travels, contact with similarly ill patients or soldiers, duration of illness, presenting symptoms and drugs taken before hospital admission were carefully recorded. All patients were nursed in a separate ward room which was specially set up for them. Delousing measures were taken for each patient upon admission. Temperature, blood pressure, pulse rate and respiratory rate were recorded hourly for the first few hours or until the patient's condition stabilized. All clinical observations (complications, Jarisch-Herxheimer reaction and outcome) were recorded by the attending physician. In the ward all cases were first hydrated with 1-2 litres of normal saline I.V. and thereafter treated with low dose (400,000 IU) of procaine penicillin I.M. which was repeated 12 hours after the first dose. If the patient's temperature exceeded 40°C, dipyron was given intramuscularly and tepid sponging was instituted.

Serial blood films were done after the first and second dose of procaine penicillin and patients were discharged when the

\* Giulio Borgnolo MD MSc<sup>1</sup>, Belayneh Hailu MD<sup>2</sup>, Alfonso Ciancarelli MD<sup>1</sup>, Mauro Almaviva MD<sup>3</sup>, Tisasu Woldemariam MD<sup>2</sup>

<sup>1</sup> Asella Hospital, Italian Cooperation Team

<sup>2</sup> Asella Hospital, Asella, Arsi, Ethiopia

<sup>3</sup> Istituto per la Cooperazione Universitaria, Rome, Italy

Correspondence to: Dr Giulio Borgnolo, Via Mulin Vecchio 8,

Tarcento (33100 Udine), Italy

blood film had become negative. Health education was given to the attendants and the patients. Discharged patients were advised to return to the hospital if the presenting symptoms recurred.

Analysis of differences between variables was done employing the  $\chi^2$  test (Yates' correction) and Fischer's exact test, as appropriate. Differences between means were tested by the pooled normal test using the Minitab computer program (version 5.1.1 Minitab Inc. State College PA.).

## RESULTS

### Epidemiological data

Three hundred and eighty-nine patients were studied. Their ages ranged from 14 to 70 years with a mean of 25.8 years (SD 10.1); 78% of the patients were in the age group 14–30 years. The male-female ratio was 2.13:1 (265 males and 124 females).

Figure 1 shows the monthly distribution of admissions for LBRF cases during the study period.

One hundred and eight (28.5%) were students, 104 (27.4%) ex-soldiers returned from war front, 70 (18.5%) housewives, 57 (15%) farmers. Of the remaining patients 7 (1.8%) were prisoners and 3 (0.8%) health assistants.

During the first three months of the epidemic, soldiers were admitted to the hospital significantly more often than the students ( $p < 0.005$ ); the number of admitted students increased in the following six months and exceeded the number of soldiers admitted to the hospital in the same period.

Three hundred (77.7%) patients came from Asella town or areas within 25 kilometres from the hospital, 58 (14.6%) came from areas between 25 and 50 kilometres and 31 (8%) from farther.

One hundred and eighteen (47%) of the 250 patients who had a positive contact history with similarly ill patients, had had contacts with sick returned soldiers, 89 (36%) with sick

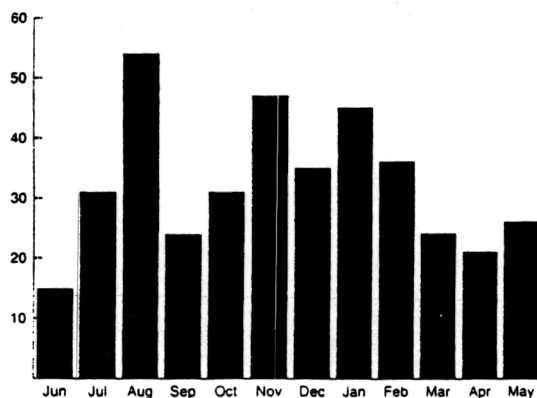


Figure 1 Frequency of LBRF cases by month Asella Hospital medical ward 1991-1992

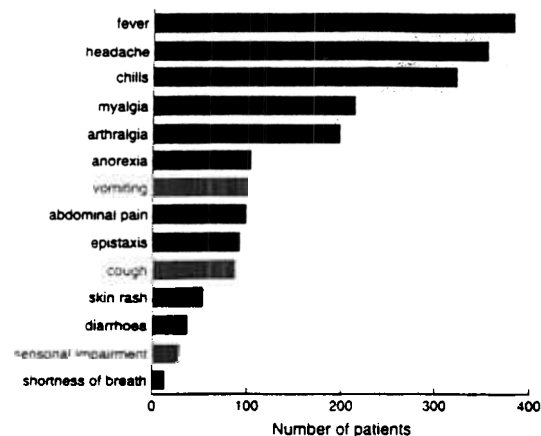


Figure 2 Frequency of clinical symptoms in 389 patients with louse-borne relapsing fever Asella Hospital medical ward 1991-1992

family members and the rest (17%) with neighbours, friends and patients' attendants.

### Clinical symptoms and signs

The average duration of symptoms before hospital admission was 4.72 days (SD 2.8) (range 1–30 days), and was significantly longer in soldiers than in the other categories, mean 5.38 (SD 3.75) vs 4.48 (SD 2.33) ( $p < 0.05$ ).

High grade fever was the commonest presentation and occurred in 99% of our patients. Fever was associated with headache (92%) and chills (83%). Body pains and aches were severe and frequent: half of the patients complained of myalgia (55%), arthralgia (51%), and severe abdominal pain (25%).

Anorexia (27%), vomiting (26%) and cough (22%) occurred with similar frequencies. Epistaxis (24%) was so severe in some patients that blood transfusion was required. Some patients complained of petechial rash (13%) or bleeding from other sites of the body (7%). Sensorial impairment was a presenting symptom in 7.5% of the cases. Diarrhoea (9%) and shortness of breath (3%) were documented in some of the patients (figure 2).

The clinical signs are shown in figure 3. About 90% of the patients were febrile on admission with a mean axillary temperature of 38.4°C (SD 1.04).

Tachycardia was common and was encountered in 46% of the cases.

As for visceral organ enlargement, splenomegaly (69%) and hepatomegaly (64.5%) were the most frequent findings. Skin rash (scattered petechiae to confluent ecchymoses) was present in 47% of the cases and mucosal bleeding (gums, vaginal, conjunctival, nasal, etc.) occurred in 29%. The more severely sick patients were those who had neck rigidity (40%), abdominal guarding (29.5%), jaundice (29%) blurred consciousness (18.5%) and pneumonia (10%).

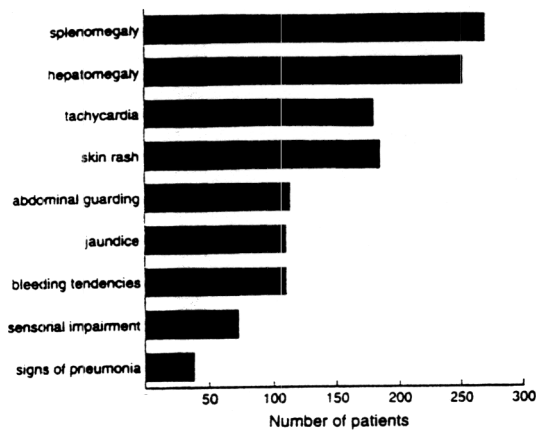


Figure 3 Frequency of clinical signs in 389 patients with louse-borne relapsing fever Asella Hospital medical ward 1991-1992

Associated illness included typhoid fever (4), malaria (3), pulmonary tuberculosis (3), UTI (2), peptic ulcer disease (2), hypertension (1) and diabetes mellitus (1).

Fifteen of the patients were pregnant: 6 (40%) of them aborted in the ward after admission or at presentation to the hospital.

Seven patients (1.8%) had relapses after treatment and were re-admitted.

One hundred and sixty-eight (43%) patients went into Jarisch Herxheimer reaction with different intensity of rigor, discomfort, agitation, hypotension and rise in body temperature after the administration of procaine penicillin.

Pulmonary edema, usually after treatment, occurred in 23 (6%) patients.

Other documented complications include myocarditis (11, (3%)) hepatitis and hepatic coma (18, (5%)) and parotitis (2, (1%)).

Fourteen patients died, resulting in a case fatality rate of 3.6%. Eight of them were soldiers, 2 were prisoners, 2 were housewives and one was a student.

Case fatality rate was found to be significantly higher in soldiers than in students ( $P=0.03$ ).

Deaths appeared to be significantly associated with symptoms such as skin rash ( $P=0.04$ ), blurring of consciousness ( $P=0.0007$ ) and signs and complications such as jaundice ( $P=0.01$ ), or pulmonary edema ( $P=0.004$ ).

## DISCUSSION

The LBRF epidemic started in Asella soon after the return of soldiers to their original recruitment areas at the end of the war. During the first three months of the epidemic ex-soldier patients predominated until preventive measures were started. This resulted in a small decline in the number of admissions. The epidemic then flared up again, spreading to the community, particularly to the student population be-

cause of the re-opening of the schools after the summer vacations.

Out of the total of nine deaths documented, seven were ex-soldiers (57% of total deaths). Case fatality rate among soldiers was significantly higher than in the other patient population, which was due to a delay in the arrival to the hospital, occurrence of associated illnesses in this group (malaria, typhoid, tuberculosis etc.) and higher prevalence of malnutrition.

Louse-borne relapsing fever lies among the differential diagnosis of acute febrile illnesses. It has characteristic signs and symptoms, though it is occasionally difficult to diagnose in the tropics. The presentation of patients varies, depending on the system largely affected. The clinical signs and symptoms documented in this study have large similarities to those described by Bryceson *et al.*<sup>4</sup> and Salih *et al.*<sup>2</sup> The disease is categorized in acute febrile illnesses with a sudden and rising high grade fever, chills, headache and generalized malaise. In our study fever was observed 99% and headache in 90% of the patients, which findings are similar to those of Salih<sup>2</sup>, Robertson<sup>9</sup> and Bryceson.<sup>4</sup> Abdominal pain in the right hypochondrium and epigastrium occurred in 26% while it was a prominent symptom in Salih's Sudanese study.<sup>2</sup>

Jaundice was seen in 28% of our patients, its severity reflected the virulence of the disease. This compares to wide variations from 10% to 70% as reported by Salih<sup>2</sup>, Robertson<sup>9</sup> and Bryceson.<sup>4</sup> As in the studies carried out by Bryceson<sup>4</sup> and Salih<sup>2</sup>, we commonly observed abdominal tenderness with hepatosplenomegaly, which helps differentiate LBRF from other tropical conditions causing hepatosplenomegaly without tenderness.

Neck rigidity, a frequent observation seen elsewhere, was also documented in 40% of our cases. Other described neurological findings, except blurring of consciousness, were very rare in our study.

Bleeding tendency, a common finding in LBRF varies from slight epistaxis to the common skin petechiae. As many as 80% of the patients were found to have this sign in a study done by Dennis *et al.*<sup>10</sup> However, bleeding from other sites has been described, i.e. cerebral<sup>11</sup>, gastrointestinal and visceral.<sup>12</sup> Experience has shown that bleeding in LBRF can adequately be managed by supportive measures alone, but at times it may be difficult to control and occasionally fatal (12). In our series skin petechiae occurred in 43% and mucosal haemorrhages (gums, nasal, conjunctival) in 22% of the cases.

We found 11 cases of myocarditis in our 309 patients: two of them died (18%) but four presented with pulmonary edema as a complication. Of the total 13 pulmonary edema cases in our series, the ones, not due to myocarditis, occurred secondary to large fluids infusion. Judge *et al.*<sup>13</sup> found myocarditis to be common and considered it the commonest cause of death in fatal cases of LBRF.

When LBRF occurs during pregnancy high rates of abortion or stillbirth are the usual outcome (4). Six of our 15 pregnant patients had abortions and stillbirths (40%). All pregnancies below 20 weeks of gestation aborted: there were no stillbirths in pregnant women above 20 weeks of gestation.

Jarisch-Herxheimer reaction occurred in 43% of our patients treated with twelve hours difference two low doses of penicillin. Procaine penicillin (400,000 IU) is effective in LBRF (6) but some authors found high rates of relapses after this treatment (17): penicillin clears the blood more slowly (8-9 hours) and produces less severe reaction than tetracycline (6, 14). Our relapse rate was 1.8% (7 out of 389 patients) using penicillin alone in comparison to 1.2% (2 out of 160 patients) in the Salih *et al.*<sup>8</sup> report using combined tetracycline and procaine penicillin.

Even though we did not have post-mortem examinations, the significant correlation between bleeding tendencies, mental confusion, jaundice and pulmonary edema with poor outcome correspond to the common causes of deaths found by others (severe hepatic damage, lobar pneumonia, subarachnoid haemorrhage) (8).

If untreated LBRF mortality ranges from 30% to 70%, but antimicrobial agents such as penicillin and tetracycline reduces this to 1%-5%. We observed a case fatality rate of 3.6%. This figure is lower than the findings of Salih<sup>2</sup> 5.5%, Granham<sup>15</sup> and Bryceson<sup>4</sup> 3.22%.

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