ORIGINAL ARTICLE

RELAPSING FEVER IN HOSSANA, ETHIOPIA: A CLINICAL AND EPIDEMIOLOGICAL STUDY

Tewdros Eguale[1*], MD, Getahun Abate[2], MD, PhD, Fekadu Balcha[2], MSc.

ABSTRACT

Background: *Louse borne relapsing fever (LBRF) is endemic in Ethiopia. This study was conducted in Hossana Hospital where relapsing fever admissions comprised 27 % of total admissions. The study was conducted to evaluate factors which affect severity of illness and outcome of treatment, and to assess disease related knowledge of patients (or relatives).*
Methods: *One hundred six patients were included in the study. A pre-tested questionnaire was administered by the attending physician. Giemsa stain of blood film, from each patient, was done and borrelia index (BI) was calculated by counting the number of spirochetes against 300 white blood cells. All patients were treated with a stat dose of procaine penicillin followed by tetracycline or chloramphenicol.*
Results: *Our result showed male preponderance. The average family size of the patients was 7. In 41 % (32/78) of cases two or more family members were diagnosed to have RF previously. Twelve patients came from a prison and sixteen patients were homeless who passed one or more nights in a cheap motel in town. Only 17% (16/97) of patients know that the disease is louse borne and only these patients know the importance of personal hygiene in the control of LBRF. Fever, headache, myalgia and arthralgia were most common presenting symptoms. Jarisch-Herxheimer reaction was detected in 76% (80/106) of patients and the reaction was severe in 7 (6.6 %) patients. There was a positive correlation between Jarisch-Herxheimer (JH) reaction and borrelia index (r = 1). However, the BI had a weak negative correlation with other severe manifestations such as epistaxis and hepatosplenomegaly. The case fatality rate was 1.9 %. The remaining 98.1% patients became free of spirochetes after completing treatment.*
Conclusion: *The result of evaluation of RF related knowledge of patients and/or relatives showed that health education should be given due emphasis as part of a control strategy. Routine surveillance of high risk sites (i.e., prisons, hotels) is important in regions where RF is endemic.*

Key words: *Relapsing fever, louse, Hossana, Jarisch-Herxheimer, Borrelia recurrentis, borrelia index*

[1]Hossana Hospital, Hossana; Ethiopia
[2]Institute of Pathobiology, Addis Ababa University, P.O. Box: 1176, Addis Ababa; Ethiopia
*Corresponding author

INTRODUCTION

Relapsing fever (RF) is an acute febrile illness caused by Borrelia spirochetes. Among twenty-seven Borrelia species, fifteen are known to be associated with RF (1). *Borrelia recurrentis* is the only etiologic agent of louse-borne (LB) RF and humans are the only known reservoirs (1).

The clinical manifestations and severity of RF may vary with age (2, 3, 4). In all age groups, antibiotic therapy has reduced mortality. The case fatality rate of RF may exceed 30 % in non-treated patients but can be well below 5% in properly treated patients (5).

The treatment for RF is commonly followed by a Jarisch-Herxheimer (JH) reaction. JH reaction is potentially fatal and is associated with a massive release of tumor necrosis factor (6). The incidence of JH reaction which is the hallmark of post-treatment complications of RF varies based on the type of antibiotics used (7, 8, 9). Tetracycline induces a JH reaction more often than penicillin (9). Penicillin induces a JH reaction that peaks late and is associated with a higher rate of relapse (7, 8). Therefore, it is generally agreed that LBRF can be safely treated with low dose penicillin followed by tetracycline (9, 10).

LBRF is endemic in Ethiopia. RF has been reported from different regions of the country (4, 11, 12). This investigation was done with the following objectives: i) to assess the problem RF, including disease-related knowledge of patients, under a setting of a rural hospital, ii) to study the clinical manifestations and complications, iii) to evaluate the association between the number of spirochetes in the blood and the severity of RF.

PATIENTS AND METHODS

Patients:-One hundred six patients diagnosed as cases of relapsing fever at Hossana hospital between November 12, 1997 and September 3, 1998 were included. Hossana hospital is located 230 kms south of Addis Ababa. A pre-tested questionnaire was administered by the attending physician to collect information on disease-related factors. Delousing measure was taken for all admitted patients.

Spirochete load

Thick blood film was prepared for each patient and stained with 3% Giemsa for 30 minutes. The slides were examined under 100 X objective using oil immersion objective. Borrelia index (BI) was calculated by counting the number of spirochetes against 300 white blood cells (WBC) as in the examination of slides for malaria (13). A BI of "+" indicated 1 to 10 spirochetes against 300 WBC, "++" BI indicated 10 to 100 spirochetes or 1 to 10 clumps, "+++" BI indicated 100 to 1000 spirochetes or 10 to 100 clumps, and a BI of "++++" indicated more than 1000 spirochetes or more than 100 clumps against 300 WBC. Blood films were cross-checked and Spirochete density were determined by an experienced technician.

Manifestations and Treatment outcome: Jaundice, epistaxis, peticheal rash, hepatosplenomegaly, still birth, and coma were considered as severe manifestations. All patients were admitted to the hospital and treated with low dose procaine penicillin (i.e., 200,000 to 400,000 IU i.m. stat) followed by tetracycline (250 mg q.i.d. for three days) or chloramphenicol (12 mg p.o., q.i.d. for small children) (10). Treatment outcome was evaluated by a repeat blood film 24 hrs after penicillin administration and immediately after the completion of treatment. Vital signs were recorded once before initiation and hourly (for four hours) after initiation of treatment. The Jarisch-Herxheimer (JH) reaction was defined as a change in the general condition of the

patients (i.e., experiencing an initial phase of fever and rigor followed by a phase with sweating) and blood pressure in 4 hrs after the initiation of treatment. JH reaction was considered severe when the systolic blood pressure was below 70 mm Hg or when the drop in diastolic blood pressure was greater than 10 mm Hg from the baseline reading.

Statistical analysis

Correlation coefficient was calculated using Spearman Rank Order correlation.

RESULTS

Table 1 shows the age and sex distribution. The average family size of patients included in this study was 7. This did not include thirteen prisoners who lived in a cell with one hundred twenty cellmates and seventeen homeless patients in this study. In 32/78 (41%), two or more family members were previously diagnosed to have relapsing fever. Table 2 shows the distribution of patients by occupation. The majority (82%) of patients were either farmers, students or daily laborers.

Table 1: Age and sex distribution of LBRF patients (n =106)

	Age (years)							
Sex	<10	10-20	21-30	31-40	41-50	51-60	>60	Total
Male	6	40	28	4	1	1	1	81
Female	5	11	6	1	-	2	-	25
Total	11	51	34	5	1	3	1	106

Table 2: Occupation of LBRF patients (n=79)

Occupation	Number of patients (%)
Farmer	23 (29)
Student	21 (26.6)
Daily laborer	21 (26.6)
Housewife	4 (5)
Civil Servant	2 (2.5)
Others (driver assistant, cook, merchant, house maid)	5 (6.3)

Thirteen patients who were prisoners, fifteen under age and two unemployed patients were not included in the above table.

The knowledge of patients on the transmission and control of relapsing fever is important in planning a control strategy. Patients more than 10 years old were all interviewed. Parents were interviewed for ten patients under 10 years of age. Only 16/97 (16.5%) know that the disease is louse borne and only these patients know that personal hygiene is important in the control of the spread of the disease in the family or in the community (Table 3). Proper health education was given to patients and relatives.

Fever, headache, myalgia, and arthralgia were the most common presenting symptoms. Table 4 shows the different presenting clinical signs and symptoms. All patients had fever and the average duration of fever was 3.9 ± 0.7 days (mean ± SE). Epistaxis and petechial rash were seen in 32/106 (30%) and 8/106 (7.6%) patients, respectively. Seventy one (67%) patients had either hepatomegaly or hepatosplenomegaly (i.e. eight had only hepatomegaly, one had only splenomegaly, sixty two had hepatosplenomegaly). In eleven patients a repeat blood film, a day after the first dose of penicillin, was positive.

These patients received a second dose of penicillin. All these eleven patients had mild JH reaction when treatment was initiated but the reaction did not get worse on the second dose of penicillin .

Table 3: Knowledge of patients towards LBRF (n = 97)

Knowledge of patients	Yes n (%)	No n (%)
Knows that the disease could be transmitted by lice	17 (17.5)	80 (82.5)
Knows that personal hygiene is important	17 (17.5)	80 (82.5)
Knows that the disease is treatable	21 (21.7)	76 (79.4)

Table 4: Clinical signs and symptoms of LBRF (n = 106)

Signs and symptoms	No. of patients (%)
Fever	106 (100)
Head ache	101 (95.3)
Myalgia	98 (92.5)
Arthralgia	98 (92.5)
Epistaxis	32 (30.2)
Tachycardia	104 (98)
Hepatosplenomegaly	71 (67)
Peticheal rash	8 (7.6)
Jaundice	1 (0.9)
Others*	3 (2.8)

Others*: include pneumonia, still-birth, unconsciousness

Of the total patients, two (1.9%) had a BI of +, 14 (13%) had ++, 42 (39.6) had +++, and 48 had (45.3%) had ++++. There was a weak negative correlation between BI and severe manifestations such as epistaxis (r = - 0.2) and hepatosplenomegaly (r = - 0.4).

JH reaction was seen in 80/106 (75.5%) of patients. There was a positive correlation between JH reaction and BI (correlation coefficient = 1). The reaction was severe in 7(6.6%) patients and all these patients with severe reaction had a BI of +++. The case fatality rate was 1.9% (2/106). The two expired patients had had severe JH reaction. The remaining patients became free of spirochetes after completing treatment.

DISCUSSION

In a year preceding this study, there were 420 cases of RF admitted to Hossana Hospital comprising of 27% of the total admissions and the mortality rate was 3.6%. Compared to the previous year, the mortality rate (1.9 %) obtained in our study is low. This could be because of increasing awareness of the public in seeking medical care early during the illness.

Crowding and unhygienic condition increase the risk of transmission of LBRF. In this study the crowding index was not measured but 18/106 (17 %) patients were from a prison or had spent a night in a cheap motel in town. The control of RF, like the

control of many other tropical diseases, is multifaceted. It includes delousing measures, health education on personal hygiene and case management. It has been shown in previous studies that delousing measures significantly contribute to the control of LBRF (11). This should be done by increasing the level of awareness of the population at risk, through health education. It is surprising that only 17% of our patients know that the disease is transmitted by lice. Similarly, only few of our patients know that personal hygiene is important for the control of LBRF. These findings indicate that health education should be given appropriate consideration in the routine clinical practice to control the spread of disease in the community.

Our study shows male preponderance. A similar finding was reported previously (12, 14). This could partly be because males are more outgoing than females and therefore, more exposed to infestation by infected lice.

The presenting signs and symptoms in our patients were no different from previous reports on Ethiopian patients (4) except that severe complications such as bleeding tendency and jaundice were less common in our group of patients. It has been previously reported that the BI is related with severe manifestations of RF (15). However, in our study, the severity of clinical manifestations was not related to BI. Nevertheless, there was a positive correlation between JH reaction and BI. Moreover, severe JH reaction was seen only on patients with very high BI and the two fatalities were recorded among patients with severe JH reaction.

In conclusion, LBRF is endemic in Hossana, Ethiopia. BI obtained from variable spirochete density could be one indicator of JH reaction. The control of diseases like LBRF could benefit from an adjunct health education in clinical setting.

REFERENCES

1. Schwan TG, Burgdorfer W, Rosa PA, Borrelia. In: Murray PR, Baron EJ, Pfaller MA, Tenover FC, Yolken RH, eds. Manual of Clinical Microbiology. Washington DC, ASM Press, 1995: 626-35.
2. Mekasha A. Louse-borne relapsing fever in children. *J Trop Med Hyg* 1992; 95: 206-9.
3. Borgnollo G, Denku B, Chiabrera F, Hailu B. Louse-borne relapsing fever in Ethiopian children: a clinical study. *Ann Trop Paediatr* 1993; 13: 165-71.
4. Bergnollo G, Hailu B, Ciancarelli A, Almaviva M, Woldemariam T. Louse-borne relapsing fever. A clinical and an epidemiological study of 389 patients in Assela Hospital, Ethiopia. *Trop Geogr Med* 1993; 45:66-69
5. Gebrehiwot T, Fiseha A. Tetracycline versus penicillin in the treatment of louse-borne relapsing fever. *Ethiop Med J* 1992; 30: 175-81.
6. Warrel DA, Perine PL, Krause DW, Bing DH, Mac Dougal SJ. Pathophysiology and immunology of the Jarisch-Herxheimer-like reaction in louse-borne relapsing fever: comparison of tetracycline and slow-release penicillin. *J Infect Dis* 1983; 147: 898-909.
7. Seboxa T; Rahlenbeck SI. Treatment of loue-borne relapsing fever with low dose penicillin or tetracycline: a clinical trial. *Scand J Infect Dis* 1995; 27:29-31.
8. Salih SY, Mustafa D. Louse-borne relapsing fever: II. Combined penicillin and tetracycline therapy in 160 Sudanese patients. Tans R Soc Trop Med Hyg 1977; 71:49-51.

9. Suddnes KO, and Haimanot AT. Epidemic of louse-borne relapsing fever in Ethiopia. *Lancet* 1993; 342: 1213-15.
10. Mekasha A, Meharie S. Outbreak in lause borne relapsing fever in Jimma, southwestern Ethiopia. *East Afr Med J* 1996; 73:54-88.
11. Cheesbrough M. Medical laboratory manual for tropical countries. Vol. I. ELBS edition. 1987.
12. Almaviva M, Hailu B, Bornolo G, Chiabrera F, Tolesse G, Gebre B. Louse-borne relapsing fever epidemic in Arssi region, Ethiopia: a six months survey. *Trans R Soc Trop Med Hyg* 1993; 87:153.
13. Melkert PWJ. Prognostic value of the borrelia- index in relapsing fever, East Afr Med J 1987; 64: 284-86.