

THE INCREASING BURDEN OF INFECTIOUS DISEASES ON HOSPITAL SERVICES AT ST. MARY'S HOSPITAL LACOR, GULU, UGANDA

SANDRO ACCORSI, MASSIMO FABIANI, MATTHEW LUKWIYA, PAUL AWIL ONEK, PIETRO DI MATTEI, AND SILVIA DECLICH FOR THE ITALIAN-UGANDAN AIDS COOPERATION PROGRAM*

Laboratory of Epidemiology and Biostatistics, Istituto Superiore di Sanità, Rome, Italy; St. Mary's Hospital Lacor, Gulu, Uganda; District Health Services, Gulu District, Ministry of Health, Gulu, Uganda; I Division of Infectious Diseases, Luigi Sacco Hospital, Milan, Italy

Abstract. To evaluate the impact of infectious diseases on hospital services in Northern Uganda, a retrospective analysis of discharge records concerning 70,304 inpatients admitted to the Lacor Hospital (Gulu, Uganda) during the period 1992–1997 was performed. Children less than five years old represented 46.5% of the admissions, and the burden of infectious diseases on pediatric admissions increased over time, especially due to malaria and measles. Infectious diseases accounted for 7 of the 10 leading causes of admission. The most frequent cause was malaria (21.8% of total). The second leading infectious disease resulting in admission was respiratory tuberculosis (6.2%); given the long hospital stay, this is the most important disease in terms of hospital bed days (24.6%). Infectious diseases have represented a progressively heavy burden on hospital services, mostly due to pediatric admissions. Respiratory tuberculosis and malaria represent nearly one-third of the overall burden in terms of hospital bed days.

Hospital discharge records are an especially important source of data because they are readily available. They can provide important information on the hospital's performance and on the health status of the population, serving as an essential tool for decision making, an early warning signal for impending problems, and for identifying those structural and process features of hospital organization that affect health outcome.^{1,2}

The present study, based on data routinely collected at Lacor Hospital (Gulu District in northern Uganda), was designed to evaluate the impact of infectious diseases on hospital services and the trends in these diseases over a period of 6 years, during which the area was involved in a civil war. The study was carried out in the context of the project "Global Support to the National Plan for HIV/AIDS Control in Uganda", which is based at Lacor Hospital and co-funded by the Italian Ministry of Foreign Affairs and the Istituto Superiore di Sanità (the National Health Institute of Italy), which is also responsible for implementing the Project. In this project, health service research, disease control, and applied epidemiology are integrated with public health interventions and clinical care. In particular, health service research focuses on evaluating the impact of preventive and curative interventions and the implementation of cost-effective health services.

METHODS

Study site. The study was reviewed and approved by the Ethical Committee of St. Mary's Hospital Lacor, which pro-

vided a computerized database containing hospital records without any personal identifiers for a retrospective analysis. St Mary's Hospital Lacor (better known as Lacor Hospital) is a teaching hospital located in northern Uganda, 6 km from the town of Gulu, on the road to Sudan. Gulu, which is located 340 km north of Kampala, the capital of Uganda, is the administrative center of the Gulu District. The district covers 11,734 km² and has an estimated population of more than 400,000 (Gulu District Medical Office, unpublished data). Only 10% of the total population is used and 75% of the households survive on subsistence farming.³

Although Uganda has been experiencing sustained economic growth in recent years, northern Uganda has benefited only very minimally from this growth, as a result of the prevailing insecurity related to the ongoing civil war. In 1993, before the latest spate of civil strife (1996–1997), the average income per household in northern Uganda was 37 US\$ per month, whereas it was 52 US\$ for the entire country. Furthermore, 49% of the households live in one room, compared with 35% nationwide.^{3,4}

Lacor Hospital has 446 beds and is divided into four wards (i.e., general medicine, surgery, pediatrics, and obstetrics-gynecology). The hospital also offers a full range of diagnostic and curative services, including ultrasound and endoscopy, radiotherapy, physiotherapy, and dental care and oral surgery (performed in the hospital's dental clinic); there are four operating theatres and both a serology and a histology laboratory. The hospital also has a busy outpatient department (approximately 120,000 consultations annually), a community health department, and three peripheral health centers. Lacor is a recognized center for medical interns from the Universities of Kampala and Mbarara. The hospital also has a nursing school and schools for laboratory technicians and nurse anesthetists. It has more than 300 staff members, including 14 medical officers, 9 medical interns, 4 clinical officers, 3 physiotherapists, 3 laboratory technicians, 3 anesthetic officers, and 94 qualified nurses and midwives.

Data analysis. The study is based on data routinely collected from hospital discharge records; the data analyzed in this study refer to the 70,304 inpatients admitted during the

* The Italian-Ugandan AIDS cooperation program: D. Greco, M. G. Dente, P. Tancredi, A. Ranghiasi (Laboratory of Epidemiology, Istituto Superiore di Sanità, Rome); P. Corti, B. Corrado, A. Onyut, J. Ouma, A. Hasman (St. Mary's Hospital Lacor, Gulu); B. Biryahwabo (Ugandan Virus Research Institute, Entebbe); T. Rosolen (Project Laboratory Co-ordinator, Gulu); B. Ensoli, S. Buttò (Laboratory of Virology Istituto Superiore di Sanità, Rome); M. Clerici, A. Zagliani, M. Biasin (Chair of Immunology, University of Milan); G. Rizzardini, F. Milazzo, S. Piconi (I Division of Infectious Diseases, Sacco Hospital, Milan); P. Ferrante, M. Saresella (Chair of Virology, University of Milan, Don Gnocchi Foundation); A. Aloï (Directorate General for Development Co-operation, Ministry of Foreign Affairs, Rome); A. Cosulich (Italian Embassy, Kampala).

TABLE 1
Distribution of admissions by age (Lacor Hospital 1992–1997)

Age class (years)	No. admissions	%	Cumulative %
0	15,295	21.8	21.8
1–4	17,397	24.7	46.5
5–9	2,827	4.0	50.5
10–14	1,788	2.5	53.1
15–19	4,325	6.2	59.2
20–24	6,064	8.6	67.8
25–29	6,354	9.0	76.9
30–34	5,039	7.2	84.0
35–39	2,976	4.2	88.3
40–44	2,099	3.0	91.3
45–49	1,617	2.3	93.6
50–54	1,488	2.1	95.7
55–59	842	1.2	96.9
60–64	948	1.3	98.2
65–69	544	0.8	99.0
≥70	701	1.0	100.0
Total	70,304	100.0	–

period 1992–1997. The diagnoses at discharge are coded according to the reporting system of the Ugandan Ministry of Health, which is based on the International Classification of Diseases,⁵ and are entered into a computerized database. No changes were made in hospital admission policy during the considered period, whereas bed capacity increased from 356 beds in 1992 to 446 beds at the beginning of 1993, afterwards remaining stable.

Concerning indicators for estimating the impact of different diseases on the hospital-based care system, we took into account that the use of hospital inpatient services varies according to three major features: frequency of admissions due to the condition; duration of the service provided (expressed in days of hospital stay); and intensity of the service (expressed as the proportion of total charges represented by laboratory, radiology and ancillary services). The percentage of hospital bed days (related to both frequency of admission and duration of stay) can be considered a good indicator of the relative burden of the different diseases on hospital services.

RESULTS

In the period 1992–1997, 70,304 patients were admitted to Lacor Hospital. The cumulative percentage of admissions by age (Table 1) shows a steep increase during the first years of life. Children 0–4 years of age account for almost half of the admissions in Lacor Hospital (46.5%), yet they represent only 16.3% of the entire population of Gulu.³ More than half (50.5%) of the individuals admitted were children less than 10 years old, resulting in a median age of 8 years for all patients admitted. This steep increase of admissions in childhood age is followed by a slow upward trend until the age of 20. Afterwards, the admissions increase again in the young adult age group (20–34 years), as a result of an increase in admissions due to obstetrical conditions, human immunodeficiency virus (HIV)–related diseases, and war-related injuries. After 40 years of age, a very slow upward trend is observed, indicating few admissions in the older age groups.

TABLE 2
Distribution of admissions, bed days, and ALOS for the leading causes of admission (Lacor Hospital 1992–1997)*

Cause	No. of admissions	%	No. of bed days	%	ALOS (days)
Malaria	15,305	21.8	70,924	7.0	4.6
Delivery	4,655	6.6	19,939	2.0	4.3
Respiratory tuberculosis	4,352	6.2	249,628	24.6	57.4
Malnutrition	3,470	4.9	57,748	5.7	16.6
Pneumonia	3,270	4.7	26,891	2.7	8.2
Measles	2,669	3.8	21,294	2.1	8.0
Diarrhea	2,126	3.0	13,841	1.4	6.5
Meningitis	2,110	3.0	14,859	1.5	7.0
Trauma (injuries, wounds)	1,762	2.5	39,109	3.9	22.2
Septicemia	1,406	2.0	9,347	0.9	6.6
AIDS	1,353	1.9	26,903	2.7	19.9
Other	27,826	39.6	463,862	45.5	16.7
Total	70,304	100.0	1,014,345	100.0	14.4

* ALOS = average length of stay; AIDS = acquired immunodeficiency syndrome.

The pediatrics ward has undergone a marked increase in the number of admissions, reaching 8,483 in 1997 (compared with 3,487 in 1990). The relative burden of infectious diseases on pediatric admissions has increased over time; this increase is largely attributable to malaria and measles (Figure 1). Childhood diseases are among the leading causes of hospital admissions in Lacor Hospital and the mean age of inpatients for 5 of the 10 leading causes of admission is less than 10 years: malaria (4.4 years), malnutrition (1.9 years), pneumonia (8.6 years), measles (2.0 years), and septicemia (less than 1 year).

The increase in preventable and/or treatable infectious diseases in childhood is strongly related to the war and to the consequent famine, social disruption, and impossibility of carrying out health activities, such as immunization, in the peripheral health facilities and villages, a situation common to many African countries.⁶

The number of admissions to the medical ward, although fluctuating, has shown an upward trend (from 1,922 in 1990 to 3,165 in 1997); the relative burden of infectious diseases (not considering the high peak in 1992 due to a meningitis epidemic) has also fluctuated, yet without the strong increase over time observed in the pediatrics ward (Figure 2).

When considering all wards, infectious diseases accounted for 7 of the 10 leading causes of admissions during the period 1992–1997 (malaria, respiratory tuberculosis, pneumonia, measles, diarrhea, meningitis, and septicemia). The other three causes of admission were an obstetrical condition (delivery), a nutrition-related condition (malnutrition, including kwashiorkor and marasmus), and trauma (including war-related injuries and wounds). Acquired immunodeficiency syndrome was only the 11th leading cause of admission (Table 2).

Malaria is the most frequent cause of admission in Lacor Hospital (15,305 admissions during the period 1992–1997, 21.8% of the total), although, due to its low average length of stay (ALOS) (4.6 days), this disease accounts for only 7.0% of the total hospital bed days (Table 2).

Respiratory tuberculosis, the second most frequent infectious disease in Lacor Hospital, was the cause of 4,352 ad-

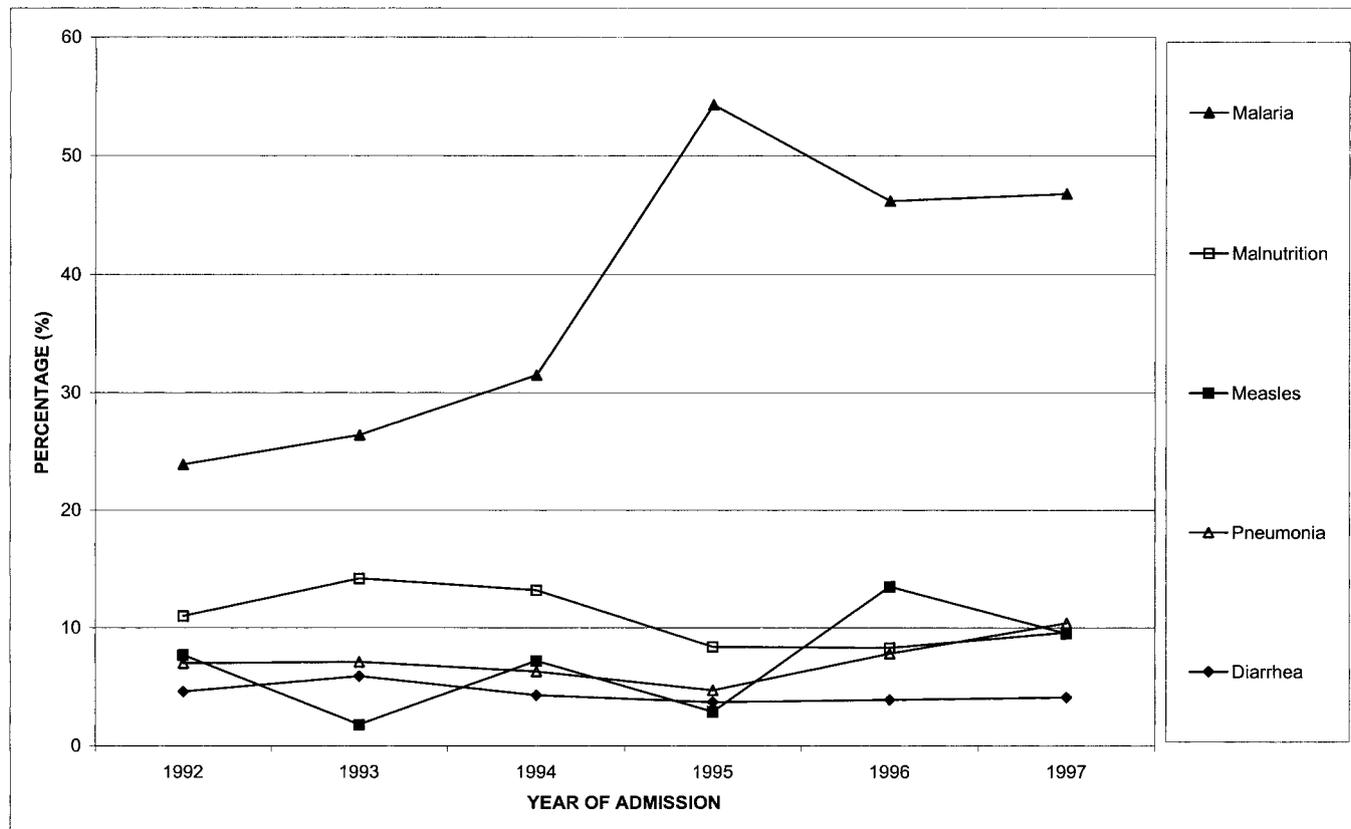


FIGURE 1. Trend of admissions in the pediatric ward for the five leading causes of admission at Lacor Hospital in Gulu, Uganda, 1992–1997.

missions during the period 1992–1997 (6.2% of the total number of admissions). However, it accounts for the longest ALOS (57.4 days versus 14.4 days for all conditions) and for the largest percentage of hospital bed days (24.6%) (Table 2).

The case fatality rate (the ratio of deaths to cases) was 8.6% for respiratory tuberculosis and 4.7% for malaria, meaning that nearly 1 of every 10 tuberculosis patients and nearly 1 of every 20 malaria inpatients die during their hospital stay. In fact, malaria and respiratory tuberculosis also have an important impact in terms of mortality, accounting for 11.3% and 5.9%, respectively, of the total number of deaths (proportional mortality rate) among inpatients in Lacor Hospital in the period 1992–1997 (Table 3).

These two infectious diseases, however, have a different impact on the population. Respiratory tuberculosis was the first cause of admission and the second cause of hospital deaths among adults admitted to the medical ward (Table 4), whereas malaria was the first cause of admission and the second cause of hospital mortality among children admitted to the pediatrics ward (Table 5), but only the ninth cause among adults.

DISCUSSION

Hospital discharge data are often readily available at a low cost and are useful for planning and evaluating hospital services and for epidemiologic purposes. However, these data

also have certain limitations, since they are collected and compiled by different health officers, many of whom are already overworked and few of whom are trained in data management or involved in the analysis of their own data. Consequently, the quality of the data and the standardization of the diagnostic procedures are not always assured; thus the comparability of morbidity and mortality statistics among wards and over time may sometimes be difficult.

Using the percentage of hospital bed days (related to both frequency of admission and duration of stay) as proxy of a condition's relative burden on hospital services, childhood diseases as a whole account for more than one-fourth of the total burden. The high percentage of admissions to the pediatrics ward (55.7% of the total number of admissions in 1997) and the number of children admitted to other wards (such as the surgical ward), despite the shorter ALOS related to childhood diseases (8.5 days versus 14.4 days for all conditions, all wards included), explain the high burden of childhood diseases on hospital services. Moreover, it must be taken into account that only children with severe or complicated childhood diseases are hospitalized; for example, in the case of malnutrition, only children with life-threatening forms requiring intensive care are admitted to Lacor Hospital.

The most important diseases in terms of burden on hospital services are respiratory tuberculosis and malaria, which accounted for almost one-third of the hospital bed days in Lacor Hospital during the period 1992–1997. Respiratory tuberculosis is a frequent cause of admission to Lacor Hos-

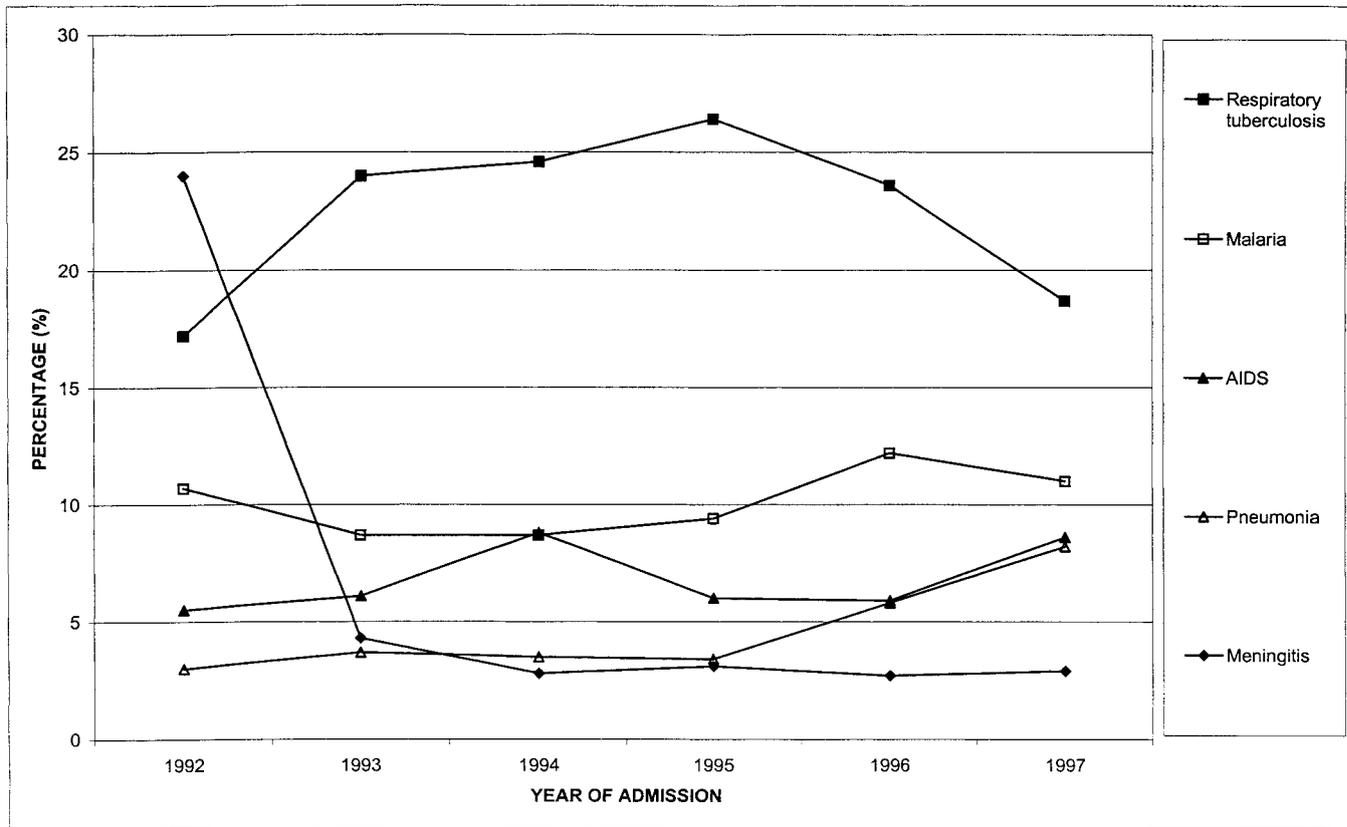


FIGURE 2. Trend of admissions in the medical ward for the five leading causes of admission at Lacor Hospital in Gulu, Uganda, 1992–1997. AIDS = acquired immunodeficiency syndrome.

pital and patients with this disease have the longest ALOS, accounting for about one-fourth of the total number of hospital bed days. Moreover, tuberculosis patients require labor-intensive care and use a high volume of laboratory, radiology, and ancillary services. In other words, the burden of respiratory tuberculosis in terms of use of hospital services is much higher than its burden in terms of number of admissions. Given the lack of systematic screening for HIV among tuberculosis patients during the considered period, it is not possible to distinguish between HIV-positive and HIV-negative tuberculosis patients in terms of admissions or bed

occupancy in the medical ward. However, HIV surveys carried out in 1994 and 1997 showed a greater than 50% HIV prevalence among tuberculosis patients,^{7,8} highlighting that the heavy burden of respiratory tuberculosis may in part be due to coinfection with HIV. The implementation of a directly observed short-course therapy strategy and other community-based support services for tuberculosis patients, planned for the beginning of 1999 in Gulu District and Lacor Hospital, could result in a shift from inpatient to outpatient care.

With regard to malaria, a three-fold increase in the number of admissions was observed during the period 1992–1997, largely due to the steep increase in the pediatric ward, leading to the overall upward trend of admissions to the Lacor

TABLE 3

Distribution of hospital deaths by cause in order of frequency (Lacor Hospital 1992–1997)*

Cause	No. of deaths	PMR (%)
Malnutrition	821	12.9
Malaria	717	11.3
Meningitis	437	6.9
AIDS	431	6.8
Pneumonia	430	6.8
Measles	416	6.6
Diarrhea	387	6.1
Respiratory tuberculosis	373	5.9
Other anemia	218	3.4
Septicemia	213	3.4
Other	1,900	29.9
Total	6,343	100.0

* PMR = proportional mortality rate; AIDS = acquired immunodeficiency syndrome.

TABLE 4

Distribution of admissions and hospital deaths in the medical ward for the five leading causes of admission (Lacor Hospital 1992–1997)*

Cause	No. of admissions	%	No. of deaths	PMR (%)
Respiratory tuberculosis	3,548	22.1	259	14.9
Malaria	1,619	10.1	39	2.2
Meningitis	1,165	7.3	199	11.4
AIDS	1,095	6.8	352	20.2
Pneumonia	734	4.6	68	3.9
Other	7,867	49.1	822	47.4
Total	16,028	100.0	1,739	100.0

* PMR = proportional mortality rate; AIDS = acquired immunodeficiency syndrome.

TABLE 5

Distribution of admissions and hospital deaths in the pediatrics ward for the five leading causes of admission (Lacor Hospital 1992–1997)*

Cause	No. of admissions	%	No. of deaths	PMR (%)
Malaria	13,185	40.0	677	16.8
Malnutrition	3,413	10.4	813	20.1
Measles	2,583	7.8	409	10.1
Pneumonia	2,478	7.5	356	8.8
Diarrhea	1,415	4.3	303	7.5
Other	9,867	30.0	1,478	36.7
Total	32,941	100.0	4,036	100.0

* PMR = proportional mortality rate.

Hospital (from 8,729 in 1990 to 15,377 in 1997). Although malaria is the most frequent cause of admission to Lacor Hospital, patients with this disease have a low ALOS, constituting only 7.0% of the total hospital bed days, less than one-third of those related to respiratory tuberculosis.

The case of tuberculosis illustrates the relationship between prevention and care, which should be seen as inter-related and integrated in the health care system. Diagnosis, treatment, and follow-up of tuberculosis patients are the cornerstones of tuberculosis control programs. From a public health point of view, the best way to prevent tuberculosis is to provide effective treatment to contagious pulmonary tuberculosis patients to interrupt the chain of transmission.⁹

The integration of preventive and curative care by, among other activities, implementing health education programs and improving the accessibility of health facilities and the availability of effective treatment, is also crucial for controlling other infectious diseases, such as malaria. In this context, hospital services play an essential role. Health care systems should ensure the prompt treatment of malaria cases and, if necessary, the admission of severe cases to the hospital, especially in epidemic conditions and instances of increasing drug resistance.

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Authors' addresses: Sandro Accorsi and Matthew Lukwiya, St. Mary's Lacor Hospital, PO Box 180, Gulu, Uganda. Massimo Fabiani and Silvia Declich, Istituto Superiore di Sanità, Laboratorio di Epidemiologia e Biostatistica, Viale Regina Elena, 299, 00161 Rome, Italy. Paul Awil Onek, District Medical Office, PO Box 60, Gulu, Uganda. Pietro di Mattei, Ospedale Luigi Sacco, 1a Divisione di Malattie Infettive Via GB Grassi, 74, 20157 Milan, Italy.

Reprint requests: Silvia Declich, Laboratorio di Epidemiologia e Biostatistica, Istituto Superiore di Sanità, Viale Regina Elena, 299, 00161 Rome, Italy.

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