

Prevalence of serum antibodies against bloodborne and sexually transmitted agents in selected groups in Somalia

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SUMMARY

Somalia has suffered from a civil war during the last 10 years. In this period the use of whole blood has increased at least twofold in Mogadishu, Somalia compared with pre-war. Screening possibilities are limited. Recent data concerning the prevalence of infections with blood-borne and sexually transmitted agents are not available from this country. To investigate the spread of human immunodeficiency virus (HIV-1/2) and other blood-borne or sexually transmitted agents we tested a total of 256 serum samples collected in the summer of 1995 from blood donors, hospitalized children and adults in Mogadishu. The hepatitis B surface antigen (HbsAg) carrier rate was 19·1%, 5·6% and 21·3% among blood donors, hospitalized children and hospitalized adults, respectively. However, no children under 2 years of age were HbsAg positive. The overall presence of antibodies against hepatitis C virus (HCV) was 2·4% (6/256). In blood donors this was 0·6% (1/157). In none of the samples tested, antibodies against HIV 1 and 2 or human T-cell lymphotropic viruses (HTLV I and II) were detected. Our results indicate that, during the civil war in Somalia, no evidence of an increase of HIV infections was found. Our findings indicate that preventive measures in Somalia should focus mainly on prevention of HBV-infections. HBV-vaccine could be administered within the framework of the expanded programme on immunization, as none of the children less than 2 years of age were HbsAg positive.

INTRODUCTION

Only limited population-based surveys to establish the prevalence of serum antibodies against blood-borne and sexually transmitted agents have been carried out in sub-Saharan African countries. However, some studies carried out among the general population and at risk groups indicate that Central and Eastern Africa have been amongst the most severely affected regions in the world in this respect [1–4]. In Somalia infection with hepatitis B virus (HBV) is widespread and also infections with hepatitis C virus (HCV) have

been identified [5]. Few data are available about the prevalence of HIV infections and no data exist on infections with *Chlamydia trachomatis* and herpes simplex virus type 2 (HSV-2). In contrast, data from the neighbouring countries, such as Kenya, Djibouti and Ethiopia indicate that the seroprevalence of HIV specific antibodies varies from 5–15% in both their blood donors and general populations [6–8]. The limited data reported from Somalia, involving both rural and urban populations, did not show the presence of antibodies against HIV in serum samples collected between 1978 and 1984, between July 1986 and January 1987 and between February and March

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1989 [9–11]. The last serological survey, dating back to 1990, was conducted among 155 prostitutes in Mogadishu. Only one sample was HIV positive [12]. In a follow up study carried out in 1991 the seroprevalence of HIV-1 antibodies was 3% amongst prostitutes in Mogadishu [13]. No subsequent studies were carried out due to the civil war and to the collapse of the health infrastructure in Somalia. The first four cases of acquired immunodeficiency syndrome (AIDS) were officially reported from Somalia in July 1989, a number that had increased to 13 by December 1991 [14, 15]. These figures are clearly far below those reported from the neighbouring countries. To further investigate the spread of HIV and other bloodborne or sexually transmitted agents, we carried out a serological study amongst individuals selected randomly from a population of blood donors, hospitalized adults and children in Mogadishu, Somalia.

We screened all sera for antibodies to HIV-1 and HIV-2, hepatitis C virus (HCV), human T-cell leukaemia virus types 1 and 2 (HTLV-I, HTLV-II), herpes simplex type 2 (HSV-2), *Chlamydia trachomatis* and *Treponema pallidum*, as well as for hepatitis B virus (HBV) markers.

MATERIALS AND METHODS

Site of the study and serum samples

The Benadir Emergency Hospital in Mogadishu, Somalia is a government hospital of 144 beds, in which approximately 50–100 children are seen each day in the adjoining outpatient clinic. This hospital is the main hospital in Mogadishu, serving a population of about 1.5 million. During the study period the hospital was mainly dealing with war casualties. Between 21 and 31 July 1995, blood donors donating blood to their relatives (family donors), acutely ill adults and children admitted to two hospitals, were included in the study. At the time of collection of serum samples the living conditions in Mogadishu were poor and the health infrastructure which had collapsed due to the ongoing war was being partially restructured.

Blood donors

During the sampling period, 273 healthy adults donated blood to their relatives, requiring surgery. For 157 of those donors (57.5%) adequate serum samples were available and all consented to participate

in the study. All were young male adults except one female. Their age range was 18–40 years, with a mean age of 26 years.

Hospitalized adults

Fifty-seven serum samples were collected from adults admitted to the Benadir hospital for tuberculosis ($n = 18$), malaria or malaria-like illness ($n = 19$), acute respiratory infections ($n = 12$) and unknown diagnosis ($n = 8$). No clinically evident case of hepatitis was seen among the patients. The age range of these patients was 17–66 years.

Hospitalized children

Forty-two serum samples were collected from hospitalized children, ranging in age from 5 months to 9 years. These patients were initially seen and sampled at the outpatient clinic of Benadir hospital, and hospitalised at the SOS paediatric hospital in Mogadishu (about 15 km apart). They were admitted for measles, tuberculosis, anaemia and other febrile illnesses.

The serum samples of the respective donors and patients were stored during the collection period at 4 °C, until shipment to the University Hospital Rotterdam where the samples were stored at –20 °C before they were tested. All the sera were tested for antibodies against HIV-1 and 2, HTLV I and II and HCV. For the detection of the respective HBV markers, limited number of samples were available; 115 serum samples from blood donors, 36 samples from hospitalized children and 47 samples from hospitalized adults. In addition we tested 54 serum samples from blood donors for the presence of HSV-2, *Chlamydia trachomatis* and *Treponema pallidum* specific IgG antibodies.

Laboratory analysis

For the detection of the respective IgG antibodies and HBV antigen commercially available assays were used. HIV-1 and HIV-2 specific IgG antibodies were tested using a recombinant specific enzyme-linked immunosorbent assay (EIA) (Biotest AG, Dreieich, Germany). HTLV I and II antibodies were measured using the Vironostica EIA (Organon Technika, Boxtel, Netherlands). Detection of HCV specific antibodies was carried out using an HCV EIA system (Ortho Diagnostic Systems, Neckargemünd,

Table 1. Prevalence of serum antibodies to HIV, HCV and HTLV in selected Somalian groups (percentage)

Groups	No. tested	Anti-HIV		Anti-HCV		Anti-HTLV	
		No. pos.	%	No. pos.	%	No. pos.	%
Blood donors	157	0	0	1	0.6	0	0
Hosp. children	42	0	0	1	2.4	0	0
Hosp. adults	57	0	0	4	7.0	0	0
Total	256	0	0	6	2.0	0	0

Table 2. Prevalence of HBV markers in selected Somalian groups (percentage)

Groups	No. tested	HbsAg		aHbs		aHbs + aHbc	
		No. pos.	%	No. pos.	%	No. pos.	%
Blood donors	115	22	19.1	18	15.6	33	28.7
Hosp. children							
< 1 year	15	0	0.0	3	20.0	0	0.0
1–2 years	15	0	0.0	3	20.0	0	0.0
> 2 years	6	2	33.3	1	16.7	0	0.0
Hosp. adults	47	10	21.3	2	4.3	14	29.8
Total	198	34	17.2	27	13.6	47	23.7

Germany). If a serum sample was considered positive for HCV by EIA, this was confirmed by HCV immunoblot (Chiron, Emeryville, USA). HCV confirmed positive serum samples were further typed by PCR as described [16]. For the detection of HBV specific markers, samples were tested for the presence of antibodies against Hbc and Hbs and the presence of HbsAg (DiaSorin, Vercelli, Italy). Antibodies against HSV-2 and *Tp* were measured with the CAPTIA Select HSV-2 EIA and CAPTIA Select Syph-G (Centocor, Malvern, USA). *Ct* specific IgG antibodies were detected using a peptide specific EIA system (Labsystems, Helsinki, Finland). Ninety-five percent confidence intervals (CI) were calculated for the observed percentages.

RESULTS

A total of 256 serum samples from blood donors and hospitalized patients were tested for the presence of antibodies against HIV-1 and 2, HTLV-I and HTLV-II (Table 1). In none of the 256 serum samples were antibodies to HIV-1 and 2, HTLV-I and HTLV-II detected. Six out of 256 (2.3%, CI 0.5–4.2) were seropositive for HCV, after confirmation by immunoblot. Among the blood donors, antibodies against

HCV were detected in only 1 out of 157 (0.6% CI, 0–1.9) serum samples, in 1 out of 42 hospitalized children (2.4%, CI 0–7.0) and in 4 of 57 hospitalized adults (7.0%, CI 0.4–13.6). All of the six HCV positive sera were tested for HCV-RNA by RT-PCR. One of the six samples could be classified by subsequent sequence analysis of the 5' UTR, as HCV type 1B. In 34 of the 198 tested serum samples (17.2%, CI 11.9–22.4) from the blood donors and hospitalized patients HbsAg was detected (Table 2). Among the blood donors, HbsAg, anti-Hbs and anti-Hbc combined with anti-Hbs was detected in 22/115 (19.1%), in 18/115 (15.6%) and in 33/115 (28.7%) respectively. In the samples of the hospitalized children and adult patients, HbsAg, anti-Hbs and anti-Hbc combined with anti-Hbs was detected in 2/36 (5.6%), 7/36 (19.4%), and in 0/36, and in 10/47 (21.3%), in 2/47 (4.3%) and in 14/47 (29.8%) respectively. HBV markers in the hospitalized children, stratified by age, are shown in Table 2. HbsAg was found in none of 30 children younger than 2 years of age. In those children over 2 years of age, 2 out of 6 samples tested positive. Antibodies to Hbs were detected in 3 out of 15 children (20%) less than 1 year of age, in 3 of 15 children between 1 and 2 years (20%) and 1 out of 6 (16.7%) of those above 2 years of age. If anti-Hbc was

combined with anti-Hbs no children in any age group had antibodies to anti-Hbc and anti-Hbs combined (Table 2).

A total of 54 serum samples from the blood donors were tested for the presence of specific antibodies against HSV-2, *Treponema pallidum* and *Chlamydia trachomatis*. Specific antibodies against HSV-2, *Treponema pallidum* and *Chlamydia trachomatis* were demonstrated in 2/54 (3.7%), 1/54 (1.9%) and in 12/54 (22.2%) respectively.

DISCUSSION

Knowledge about the distribution of sexually transmitted diseases in different parts of the world and in particular in Africa is important for the planning of preventive measures and development of vaccination [17]. The present study, which under the current situation in Somalia was difficult to carry out, failed to detect any HIV infections amongst the groups studied. Earlier studies have also shown that HIV-infection is not widespread in Somalia [9–12]. This study also indicates that HBV, as well as HCV are common infections after the age of 2 years in all age groups of Somalians. However the prevalence of both infections compare favourably to those found in other sub-Saharan African countries [2]. The low prevalence rate of HIV infections in Somalia is somehow surprising as HIV and HBV share their major modes of transmission. These findings contrast sharply with those recently observed in Eritrean prostitutes, in whom high rates of HIV-1 antibodies (29%) and relatively low HbsAg (3%) positivity were found [18]. In our study none of the 256 individuals tested positive for HIV antibodies, while a high percentage of individuals were positive for HBV markers. The first documented cases of AIDS in Somalia coincided with the beginning of the collapse of the health infrastructure due to civil war. This observation as well as the lack of systematic serologic surveillance and proper hospital documentation of AIDS cases in the whole country may have masked the real incidence of HIV-infection in Somalia as a whole. Nevertheless as HIV infection is apparently not yet widespread in Somalia and the possibilities for its transmission are abundantly present, especially in the present situation of civil unrest, design and implementation of primary intervention strategies are of utmost importance. These should primarily be targeted at education of sexually active people, proper serological surveillance programmes and the screening of donated blood.

In Africa the numerous cases of severe anaemia caused by malaria, malnutrition and infectious diseases, has created a large requirement for transfusion of whole blood. At present most of the blood collected in Somalia is used for war casualties and for young children before they reach the age of five years when most of them are still uninfected with HBV. Therefore these children are at increased risk to acquire transfusion related HBV and other bloodborne infections. It should however be borne in mind that the best and most feasible approach to reduce HBV infection in Somalia is probably the implementation of HBV vaccination in the framework of the ongoing EPI programme of WHO [19]. In the present study we demonstrated that none of the children aged up to 2 years of age were found positive for HbsAg, which further confirms the relatively limited perinatal transmission of HBV infection in Africa [20]. The present study also shows that in Mogadishu there is a risk of 0.6% of being infected with HCV through blood transfusion in previously uninfected recipients. Only a limited number of sera from male donors could be examined for specific antibodies against HSV, *Treponema pallidum* and *Chlamydia trachomatis*. As compared to one other Somalian study [21], *Treponema pallidum* antibody positivity was low in our population (1.9 versus 24%, respectively). This difference may be due to the different social backgrounds of the study populations.

We conclude that the systematic screening of blood donated in Somalia is crucial to prevent, or at least minimize transmission of blood-borne agents. Taken together our data indicate that the prevalence of bloodborne and sexually transmitted agents, with the exception of HBV is relatively limited in Somalia at present. However since all these agents share certain routes of transmission, the design and implementation of blood screening procedures as well as intervention strategies to prevent sexual transmission, should be given priority.

REFERENCES

1. Piot P, Plummer FA, Mhalla FS, Lamboray JL, Chin J, Mann JM. AIDS: an International perspective. *Science* 1988; **239**: 573–9.
2. Kiire CF and the African Regional Study Group. Hepatitis B Infection in sub-Saharan Africa. *Vaccine* 1990; **8**: 107–12.
3. Wilson JW, Lloys G, Howells J. Prevalence of HIV-1 in East African lorry drivers. *AIDS* 1989; **3**: 759–61.
4. Jacobs B, Mayoud P, Berega ZA. Sexual transmission

- of hepatitis B in Mwanza, Tanzania. *Sex Transm Dis* 1997; **24**: 121–6.
5. Bile K, Mohamud O, Aden C, et al. The risk for hepatitis A, B, and C at two institutions for children in Somalia with different socio-economic conditions. *Am J Trop Med Hyg* 1992; **47**: 357–64.
 6. Jackson DJ, Ngugu EN, Plummer FA, et al. Stable antenatal HIV-1 seroprevalence with high population mobility and marked seroprevalence variation among sentinel sites within Nairobi, Kenya. *AIDS* 1999; **13**: 583–9.
 7. Rodier G, Couzineau B, Salah S, et al. Infection by the human immunodeficiency virus in the Republic of Djibouti. *Med Trop* 1993; **53**: 61–7.
 8. Duncan ME, Tibaux G, Roggen E. STD in women attending family planning clinics: A case study in Ethiopia. *Soc Sci Med* 1997; **44**: 441–54.
 9. Titti F, Aceti F, Verani P, Sebastiani A. Lack of evidence of HTLV-II seropositivity in Somalia. *AIDS Res* 1986; **2**: 161–2.
 10. Aden O, Titti F, Nur YA, Vernai P. Screening for HIV infection in Somali blood donors. *AIDS* 1987; **1**: 257–8.
 11. Scott DA, Corwin AL, Watts DM. Low prevalence of human immunodeficiency virus-1 (HIV-1), HIV-2, and human T cell lymphotropic virus-infection in Somalia. *Am J Trop Med Hyg* Dec 1991; **45**: 653–9.
 12. Ahmed HJ, Omar K, Aden SY, Gulle AM, Grillner L, Bygdeman S. Syphilis and human immunodeficiency virus seroconversion during a 6-month follow-up of female prostitutes in Mogadishu, Somalia. *Int J STD AIDS* 1991; **2**: 119–23.
 13. Edward C, Oldfield III, Guenael RR, Gregory CG. The endemic infectious diseases of Somalia. *Clin Infect Dis* 1993; **16**: S132–57.
 14. Corwin AL, Olson JG, Douglas M. HIV-1 in Somalia, prevalence and knowledge of prostitutes. *AIDS* 1991; **5**: 902–4.
 15. World Health Organisation and the Centers for Disease Control. World Health Organisation global statistics. *AIDS* 1991; **5**: 911–5.
 16. Smith DB, Mellor J, Jarvis LM, et al. Variation of the hepatitis C virus 5 non-coding region: implications for secondary structure, virus detection and typing. The International HCV Collaborative Study Group. *J Gen Virol* 1995; **76**: 1749–61.
 17. Edmunds WJ, Medley GF, Nokes DJ. Vaccination against hepatitis B virus in highly endemic areas: waning vaccine-induced immunity and the need for booster doses. *Trans R Soc Trop Med Hyg* 1996; **90**: 436–40.
 18. Ghebrekidan H, Cox S, Wahren B, Grandien M. Prevalence of infection with HIV, hepatitis B and hepatitis C viruses, in four groups in Eritrea. *Clin Diag Virol* 1998; **9**: 29–35.
 19. Ghendon Y. WHO strategy for the global elimination of new cases of hepatitis B. *Vaccine* 1990; **8**: 129–33.
 20. Ghendon Y. Perinatal transmission of hepatitis B virus in high incidence countries. *J Virol Methods* 1987; **17**: 69–79.
 21. Ismail SO, Ahmed HJ, Jama MA, et al. Syphilis, gonorrhoea and genital chlamydia infection in a Somali village. *Genitourin Med* 1990; **66**: 70–5.