

Horizontal versus vertical transmission of human immunodeficiency virus type 1 (HIV-1)

Experience from southwestern Saudi Arabia

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Twenty-five confirmed cases of human immunodeficiency virus type 1 (HIV-1) infection due to blood transfusion have been documented at King Fahad Hospital (KFH) in Al-Baha, southwestern Saudi Arabia since 1986, but complete follow-up was only possible on 19 of these cases and their contacts. Seventeen cases were diagnosed as having acquired immunodeficiency syndrome (AIDS) or AIDS-related complex (ARC) after admission to the hospital due to the deterioration of their health status. Two cases were found to be anti-HIV-1 positive on routine screening for blood donation. This cluster of HIV-1 infected patients through blood transfusion allowed us to study the efficiency of sexual transmission of HIV-1 infection between spouses, the rate of perinatal transmission of HIV-1 infection, and to see whether intrafamilial transmission is a possible route of spread of the virus. Firstly, the present results confirm our earlier observation that transmission of HIV-1 infection was more efficient from the infected husband to his wife(s) in contrast to the inefficient transmission of the infection from the infected wife to her husband. Secondly, by the age of 16 months, all nine newborns to HIV-1 infected mothers became HIV-1 infected. This highlights the importance of medical advice to those mothers regarding conception and/or breast-feeding, particularly as breast-feeding up to 2 years is not an uncommon practice among Saudi women. Finally, none of the household contacts of the 19 cases was infected until now, indicating that intrafamilial spread of HIV-1 did not occur among the population studied.

Key words: AIDS, HIV-1, blood transfusion, transmission, Saudi Arabia

Although acquired immunodeficiency syndrome (AIDS) was first seen among homosexuals¹, heterosexual transmission is now the leading route of spread of the human immunodeficiency virus (HIV), the aetiological agent of AIDS, worldwide.^{2,3} However, before efficient screening of donated blood for antibodies to HIV (anti-HIV) started, a sizeable number of the AIDS cases were due to HIV-contaminated blood transfusion.⁴⁻⁶ Because the date of infection in this type of patients is known, the incubation period for the development of AIDS can be calculated and it has been estimated that within 6-7 years after HIV infection 50% of contaminated blood recipients will develop AIDS.^{7,8} Since June 1986 when screening for anti-HIV started at King Fahad Hospital (KFH) in Al-Baha, southwestern Saudi Arabia, twenty-five adult cases of HIV-1 infection have been identified and a history of blood transfusion between 1982-1986 was documented in all of them. This cluster of HIV-1

infected patients through blood transfusion allowed us to study the efficiency of sexual transmission of HIV-1 infection between spouses, the rate of perinatal transmission of HIV-1 infection, and whether intrafamilial transmission is a possible route of spread of the virus.

PATIENTS AND METHODS

In June 1986, screening for anti-HIV using enzyme immunoassay (EIA) started on all donated blood at KFH in Al-Baha, southwestern Saudi Arabia. This 376-bed hospital serves a population of about 400,000 people in the demographically distinct Al-Baha region which has a stable population. In December 1988, a HIV clinic has been established at KFH and 25 adult cases have been identified as HIV-1 positive. All these patients had a documented history of blood transfusion between 1982-1986. The transfused blood used during that period was imported and not tested for anti-HIV as the test was not available then. Follow-up was only possible on 19 of these cases and their contacts. When a person was found to be anti-HIV-1 positive, confirmed by Western blot assay, his spouse and all family members were informed and called for counselling and complete evaluation including HIV testing. Contacts of HIV-1 positive patients were followed-up on a monthly basis and those who were anti-HIV-1 positive were started on zidovudine therapy and until now no major side-

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effects have been encountered. Patients were diagnosed as having AIDS, AIDS-related complex (ARC), or asymptomatic following the 1987 standard of the Centers for Disease Control surveillance case definition.⁹ None of our HIV-1 positive patients or their contacts have been abroad or had a history of drug abuse.

Laboratory analysis

Serum testing for anti-HIV and for HIV-Ag was done by two commercially available enzyme-linked immunosorbent assays (ELISA)¹⁰ from Abbott Laboratories, North Chicago, Illinois. All positive samples were confirmed by Western blot assay¹¹ at the Central Laboratory of the Ministry of Health, Riyadh. Furthermore, complete blood count and analysis of T-cell subsets were performed on all seropositive patients.

RESULTS

Relevant information on the 19 Saudi HIV-1 positive patients and their contacts are shown in the table. The majority of cases were diagnosed as having AIDS (10/19) or ARC

(5/19) after admission to the hospital due to the deterioration of their health status. All cases who were diagnosed as having AIDS died within two months after diagnosis while those who were in the ARC stage died within 1–2 years after the diagnosis. Two of the cases (cases 1 and 2) were found anti-HIV-1 positive on routine screening for blood donation and 3 cases (cases 11, 17 and 18) were detected when their respective children were admitted and diagnosed as having AIDS. In case 6, as in case 7, the husband infected both wives which is unlikely in case 15, where there was no evidence of infection from the infected wife to her husband and hence to the second wife. All children born before the mother had the blood transfusion and hence the infection were anti-HIV-1 negative and are still negative after 3–7 years of follow-up. In contrast, all nine children born to HIV-1-positive mothers became infected. Although some of the infants had no evidence of infection up to 9 months of age or more, all became anti-HIV-1 positive and HIV-Ag positive by 16 months of age. These children had no blood transfusion during the 16 months period.

Table Relevant information on 19 Saudi anti-HIV-1 positive cases, their spouses and other family members

Case No.	Sex/age	Index case 1st detected anti-HIV-1 positive and clinical diagnosis	Anti HIV-1 results on spouse and other family members and diagnosis		
			Spouse	Other family members	Current clinical status
1	M/40	12/86; blood donor (asymptomatic)	+ (asymptomatic)	4 -	Husband and wife are now in ARC; other family members still -
2	M/21	3/87; blood donor (asymptomatic)	+ (asymptomatic)	1 + (asymptomatic)	Husband and wife are now in ARC; child died of AIDS 2/89
3	M/49	3/88; AIDS (expired 4/88)	+ (expired 10/89)	8 -	Other family members are still -
4	M/69	4/89; AIDS (expired 5/89)	Expired 5 months earlier; possible AIDS	5 -	Other family members are still -
5	M/51	9/89; AIDS (expired a week later)	+; ARC (expired 7/90)	6 -	Other family members are still -
6	M/71	2/90; AIDS (expired a week later)	1st wife +; ARC (expired 10/91) 2nd wife + (asymptomatic)	6 - NA	Other family members are still - 2nd wife is in ARC now
7	M/55	8/91; AIDS (expired 9/91)	1st wife +; ARC (expired 10/92) 2nd wife + (asymptomatic)	NA NA	2nd wife is in ARC now
8	F/30	5/87; AIDS (expired 7/87)	-	1 +; ARC (expired 6/92)	Husband is still -
9	F/55	7/87; AIDS (expired 1 week later)	-	5 -	Husband and other family members are still -
10	F/66	9/88; AIDS (expired 11/88)	-	8 -	Husband and other family members are still -
11	F/19	7/88; ARC (expired 6/89)	+ (asymptomatic)	3 +	Husband is in ARC now; 1 child died of AIDS 1988; 2 are in ARC now
12	F/40	12/88; AIDS (expired 1 week later)	+ (asymptomatic)	12 -	Husband is still asymptomatic; other family members are still -
13	F/27	5/89; ARC (expired 2/90)	-	NA	Husband is still -
14	F/32	11/89; ARC (expired 11/90)	-	2 +	Husband is still -; 1 child died and 1 is in ARC now
15	F/55	11/89; AIDS (expired 10 days later)	Husband - Next wife -	5 - 2 -	Husband, 2nd wife and other family members are still -
16	F/40	11/90; ARC (expired 4/91)	-	7 -	Husband and other family members are still -
17	F/25	12/90; Asymptomatic (now in ARC)	+ (asymptomatic)	2 +	Husband is still asymptomatic; 1 child died of AIDS and 1 is in ARC now
18	F/29	12/90; Asymptomatic (now in ARC)	-	1 +	Child died of AIDS; husband is still -
19	F/44	6/91; ARC (expired 8/92)	-	No children	Husband is still -

+; positive; -: negative; NA: not available

DISCUSSION

Although it is well established now that the heterosexual route is the leading route of spread of HIV-1 infection^{1,2}, it is still controversial whether the spread is more efficient from infected men to women or from infected women to men.^{12,13} The results of the present large number of cases (19 cases) strongly confirm our earlier observation (follow-up of only 5 cases)¹⁴ and show that transmission of HIV-1 infection is much more efficient from infected husband to his wife than from the infected wife to her husband. This is particularly clear in cases 6 and 7 where in each case the infected husband transmitted the infection to both wives, in contrast to case 15 where no evidence of infection could be detected in the husband or in his second wife. It must be mentioned, however, that transmission of HIV-1 infection can occur from the infected wife to her husband after a long period of sexual relationship as seen in case 12, or when the couple is young and sexually active as can be concluded from cases 11 and 17. It is worth mentioning that none of our patients admitted the use of condoms before the diagnosis of AIDS or ARC was made.

Transmission of HIV-1 infection from an infected mother to her offspring was first described in 1983.¹⁵ Since then several cohort studies have estimated the rate of vertical transmission of HIV-1 to be between 13% and 40%¹⁶⁻¹⁹ compared to 1.2% for HIV-2.¹⁹ Evidence now indicates that transmission of infection takes place either at the end of pregnancy or at delivery²⁰ and the stage of infection influences perinatal transmission rates and disease outcome in the infected child.²¹ In this study, all nine newborns to HIV-1 infected mothers were infected by the age of 16 months. As neither polymerase chain reaction (PCR) nor virus culture were attempted on these newborns in the early weeks of life we cannot tell whether all of them were infected perinatally or that some were infected due to breast-feeding.

None of the infected children had blood transfusion and to our knowledge no other route of infection (e.g. circumcision, scarification or any other custom) was likely. It is documented now that breast-feeding can transmit HIV-1²² and in affluent settings where infant mortality associated with infectious diseases or malnutrition is low, breast-feeding in HIV-1 infected mothers is not recommended.²³ It is of importance to mention, however, that according to local customs, breast-feeding is recommended and up to 2 years of breast-feeding is not an uncommon practice among Saudi women. The fact that all our newborns to HIV-1 infected mothers became HIV-1 infected by the age of 16 months emphasizes the importance of medical advice and counselling to HIV-1 positive mothers regarding conception and/or breast-feeding.

Lastly, our results show that intrafamilial transmission of HIV-1 infection did not occur as all the children who were born before the mother or father were infected are still HIV-1

negative after at least 3-7 years since the diagnosis of HIV-1 infection was initially made. This is in agreement with others²⁴ and confirms our current observation that none of the 38 family members of anti-HIV-1 positive Saudi hemophiliacs seroconverted after 7 years of follow-up.

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