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HIV PREVALENCE AND DEMOGRAPHIC RISK FACTORS IN BLOOD DONORS
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ABSTRACT

Objectives: **To estimate HIV prevalence in various blood donor populations, to identity socio-demographic risk factors associated with prevalent HIV and to assess the feasibility of offering routine voluntary counselling services to blood donors.**
Design: **Cross-sectional study.**
Setting: **Thyolo district, Malawi.**
Methods: **Data analysis involving blood donors who underwent voluntary counselling and HIV testing between January 1998 and July 2000.**
Results: **Crude HIV prevalence was 22%, while the age standardised prevalence (>15 years) was 17%. Prevalence was lowest among rural donors, students and in males of the age group 15-19 years. There was a highly significant positive association of HIV prevalence with increasing urbanisation. Significant risk factors associated with prevalence for both male and female donors included having a business-related occupation, living in a semi-urban or urban area and being in the age group 25-29 years for females and 30-34 years for males. All blood donors were pre-test counselled and 90% were post test counselled in 2000.**
Conclusions: **HIV prevalence in blood donors was alarmingly high, raising important concerns on the potential dangers of HIV transmission through blood transfusions. Limiting blood transfusions, use of a highly sensitive screening test, and pre-donation selection of donors is important. The experience also shows that it is feasible to offer pre and post test counselling services for blood donors as an entry point for early diagnosis of asymptomatic HIV infection and, broader preventive strategies including the potential of early access to drugs, for the prevention of opportunistic infections.**

INTRODUCTION

In Malawi, the National HIV prevalence rate has been steadily increasing over the past 15 years and is currently estimated at 14% for the 15-49 year age group(1). In the presence of such a high HIV prevalence in the general population, blood transfusions can pose potential dangers for HIV transmission despite routine screening of all blood for HIV. Potential risks of HIV contamination in district laboratories can persist due to laboratory false-negatives, poorly staffed and overwhelmed laboratories which increase the risk of human error and limited availability of highly sensitive rapid screening tests. Donations made during the window period also pose a danger for HIV transmission (despite routine screening) and is an important reason for using highly sensitive blood tests and limiting blood transfusions(2, 3).

In 1999, the Thyolo district health services decided to monitor HIV prevalence rates in various blood donor populations in order to identify socio-demographic risk factors associated with prevalent HIV infection and to consider selective exclusion of donors with a high risk of being HIV positive. The reasoning being that such a strategy should result in a donor pool with a lower prevalence of HIV infection which in turn would lower the potential risks of transfusing HIV positive blood.

Considering also that blood donors can be a representative sentinel group under certain conditions(4,5) it was considered useful to use the data to extrapolate age standardised HIV prevalence rates for Thyolo district which is currently non-existent. Pre and post-test counselling services were also offered to all blood donors through an integrated district counselling centre under the logic that this strategy could serve as an early entry point for diagnosing HIV positive and HIV negative individuals and for introducing primary and secondary preventive action in these apparently healthy individuals(6,7).

This cross sectional study was meant to: (a) estimate HIV prevalence in various blood donor populations; (b) to identify possible socio-demographic risk factors associated

with prevalent HIV infection and (c) to assess the feasibility of offering routine pre and post-test counselling for blood donors. The rural district of study, Thyolo, with 450,000 inhabitants is an economic growth point, well known for its HIV risk arenas of lively nightclubs, bars and readily available and inexpensive commercial sex workers.

MATERIALS AND METHODS

Blood donor population and data collection: The blood donor population consisted essentially of members of villages and communities, neighbours of patients and friends or relatives of a patient requiring transfusion. No pre-donation screening for risk factors for HIV existed and there was no active recruiting for voluntary blood donations in any group of the population. Only data from first time donors was used for this study so that counselled donors who knew their HIV status would be unlikely to return for further blood donations and could have an impact on the estimated prevalence in the donor population.

The counselling unit registers were used to put together information for all consecutive voluntary blood donors for a two year period from January 1999 to December 2000. Variables for identifying risk factors included age group, sex, occupation and residence. Rural villages were defined as countryside villages without institutions and no health centre or school. Semi-urban villages were villages having a health centre and/or a school. A town (urban) has a hospital or a comprehensive health centre, was easily reached by public transport and had a variety of institutions and shops including a supermarket. Occupation based grouping of donors included village farmers, students (secondary school), business, unskilled employees (tea estate workers, guards, cooks, and cleaners on permanent contract) and skilled employees (teachers, nurses, senior civil servants, or senior staff in companies or tea estates). The proportions of donors that were pre and post-test counselled in 1999 and 2000 were calculated.

Counselling and serological methods: All potential donors underwent pre- and post-test counselling (after obtaining voluntary informed consent) by trained and experienced counsellors in an integrated, voluntary counselling unit. Pre-test counselling (which was done before testing for HIV) involved giving basic information about HIV and AIDS, explaining the reasons for recommending the HIV test and the clients right to refuse the test. If consent was given, blood was withdrawn and the person requested to return for post-test counselling. Post-test counselling involves either a negative or a positive blood test. If the test was negative for HIV, the client was given primary preventive counselling on how to prevent contacting HIV and AIDS. If the test was found to be positive, the client received secondary preventive counselling on how to prevent reinfection, on how to prevent transmission to partner(s) and counselling on how to use condoms.

Information on the possibility of continuing supportive counselling and the existence of a home based care and support programme was also given. The laboratory technicians were also trained as counsellors in case of donations being required on weekends or public holidays when the main counselling unit was closed. Confidentiality of results was maintained.

Blood was screened for HIV-1 and HIV-2 using a combination of the Capillus test (Cambridge diagnostics Ltd, Galway, Ireland) followed by HIV Spot (Genelabs Diagnostics Pte Ltd, 85 Science park Drive, Singapore). All tests were performed according to the manufacturers instructions. The choice of tests conformed with World Health Organisation (WHO) strategy 11 for HIV antibody testing which recommends the serial use of 2 simple/rapid assays for diagnosis (of asymptomatic HIV infection) when prevalence of HIV infection is over 10%(8). Any discordant sample was retested and if it remained discordant, was sent for ELISA testing at the referral hospital in Blantyre. There were a total of 12 specimens that remained discordant and these results were excluded from the analysis of this study. A system for laboratory control testing was in place and external control by the regional blood transfusion centre was done on regular basis.

Statistical analysis: Analysis was done using the Epi-info software of the Centre for Disease Control, Atlanta, and the LOGISTIC software (LOGISTIC a Logistic Regression Program for the IBM PC" Dallal GE, The American Statistician, 422, 272). Direct age standardisation of crude prevalence rates was performed for the adult population (>15years) using Thyolo district, age specific population census figures from 1998(9). Chi -square for trend was used for demonstrating a linear trend in HIV prevalence with urbanisation. The level of significance was set at 0.05 and 95% confidence intervals (CI) were used through out. The measures of risk were determined by crude and adjusted odds ratios separately for males and females. The age group 20-24 years, farmers and rural donors were used as baseline categories as they comprised the majority in their respective groups. Odds ratios were adjusted using multivariate logistic regression, and all p-values were based on the likelihood ratio statistic.

RESULTS

Between January 1999 and December 2000, a total of 1128 first time blood donors were registered. Seven hundred and forty two (66%) were males and 386 (34%) were females; the mean age for male and female donors being 29 and 30 years respectively. Sixty three per cent of donors came from rural villages while 21% came from semi-urban villages and 16% from towns. Forty eight per cent of all donors were farmers, 26% were unskilled employees, 6% were skilled employees, 11% were involved in business and 9% were students. The overall crude HIV prevalence of all registered donors was 22% (Table 1). Age standardised prevalence rates using the district population census figures for adults (>15 years) was 17% (15% for males, and 19% for females) (Table 1).

Table 1

Crude and age standardised prevalence rates in male and female blood donors (>15 years)

Donor	Crude prevalence (%)	Age standardised* prevalence (%)
Males	150/742 (20.2)	15.2
Females	96/386 (24.9)	19.3
Total	246/1128 (21.8)	17.4

* Standardised for age (> 15 years) using district age-specific population census figures (1998)

There was a progressive increase in prevalence by age, peaking in the 30-34 year age group (34%) and 25-29 year age group (49%) in males and females respectively followed by a progressive decrease in the older age groups (Tables 2 and 3). In both males and females, the age group 15 - 19 year, students and donors from rural areas had the lowest prevalence

when compared to other groups. There was a highly significant linear trend in prevalence rates in both males and females associated with increasing degrees of urbanisation (p-values for Chi-square for linear trend <0.001).

Table 2

HIV prevalence and associated risk factors in various subgroups of male blood donors

Variable	HIV+ (%)	Crude OR	*Adjusted OR (0.95, CI)	P value
Male donors	150/742 (20.2)	–	–	–
Age group				
15-19	3/76 (3.9)	0.2	0.3 (0.1-0.9)	0.02
20-24	33/193 (17.1)	1	1	–
25-29	43/168 (25.6)	1.7	1.3 (0.7-2.2)	0.37
30-34	40/119 (33.6)	2.5	2.5 (1.4-4.5)	<0.01
35-39	20/78 (25.6)	1.7	1.4 (0.7-2.8)	0.31
40-44	6/41 (14.6)	0.8	0.8 (0.3-2.1)	0.59
45-49	3/36 (8.3)	0.4	0.5 (0.1-1.8)	0.25
>=50	2/31 (6.5)	0.3	0.3 (0.1-1.2)	0.04
Occupation				
Farmers	49/299 (16.4)	1	1	–
Unskilled employees	55/249 (22.1)	1.5	1 (0.6-1.5)	0.83
Skilled employees	8/41 (19.5)	1.2	0.5 (0.2-1.2)	0.09
Business	34/75 (45.3)	4.2	1.9 (1.0-3.6)	0.04
Student	4/78 (5.1)	0.3	0.2 (0.1-0.8)	<0.01
Residence **				
Rural	57/447 (12.8)	1	1	–
Semi-urban	40/163 (24.5)	2.2	3.0 (1.8-4.9)	<0.001
Urban	53/132 (40.2)	4.6	5.2 (3.1-8.9)	<0.001
Time period				
Jan 99 - Dec 99	65/322 (20.2)	–	–	
Jan 00 - Dec 00	85/420 (20.2)	–	–	

* Adjusted for age group, occupation, and residence using logistic regression.
** Chi square for linear trend = 49.5, P-value <0.001

Table 3

HIV prevalence and associated risk factors in various subgroups of female blood donors.

Variables	HIV+ (%)	Crude OR	* Adjusted OR (0.95, CI)	p-value
Female donors	96/386 (24.9)	–	–	–
Age group				
15-19	5/50 (10.0)	0.4	0.4 (0.1-1.3)	0.12
20-24	21/92 (22.8)	1	1	–
25-29	33/67 (49.3)	3.3	2.5 (1.1-5.7)	0.03
30-34	20/65 (30.8)	1.5	1.2 (0.5-3.0)	0.62
35-39	10/43 (23.3)	1.0	1.0 (0.4-2.7)	0.97
40-44	4/30 (13.3)	0.5	0.5 (0.1-1.8)	0.26
45-49	2/23 (8.7)	0.3	0.5 (0.1-2.7)	0.41
>=50	1/16 (6.3)	0.2	0.3 (0-2.6)	0.20
Occupation				
Farmers	44/239 (18.4)	1	1	–
Unskilled employees	14/48 (29.2)	1.8	2.0 (0.9-4.5)	0.11
Skilled employees	6/21 (28.6)	1.8	0.4 (0.1 - 1.1)	0.07
Business	29/49 (59.2)	6.4	2.5 (1.1-5.6)	0.03
Student	3/29 (10.3)	0.5	0.4 (0.1-1.6)	0.16
Residence **				
Rural	30/263 (11.4)	1	1	–
Semi-urban	32/69 (46.4)	6.7	6.9 (3.4-14.0)	<0.001
Urban	34/54 (63.0)	13.2	13.1 (5.9-29.2)	<0.001
Time period				
Jan 99 - Dec 99	43/191(22.5)	–	–	
Jan 00 - Dec 00	53/195 (27.2)	–	–	

* Adjusted for age group, occupation, and residence using logistic regression.
** Chi square for linear trend=82.1, P-value <0.001

Significant risk factors associated with prevalence for both male and female donors were having a business-related occupation, living in a semi-urban or urban area, as well as being in the age group 25-29 years for females and 30-34 years for males. The reference categories were farmers, rural donors and the age group 20-24 years respectively (Tables 2 and 3). Moreover among males, the age group 15-19 years and students had significantly lower odds of being HIV positive than these reference groups. All blood donors were pre-test counselled while 70% were post-test counselled in 1999 and 90% in 2000 respectively. Out of those who were not post-test counselled in 2000, 61% were farmers, 20% were unskilled workers, 2% were skilled workers, 10% were in business while 7% were students. The specific reasons why post-test counselling was not done in these individuals were not documented.

DISCUSSION

The overall crude prevalence of HIV among blood donors (22%) was alarmingly high highlighting the potential dangers of HIV transmission through blood transfusions. The age standardised prevalence rate for adults of 17% could represent a similar alarming HIV prevalence in the general population (>15 years) in Thyolo district. This estimate was, however, within limits of the assumption that age distribution is the principal manner in which the blood donors differ from the general population since data on occupation and residence profiles for the district are non-existent and has not been included in standardisation. It is also possible that blood donors tend to be healthier than the general population, so that unhealthy individuals (which could be at higher risk of being HIV positive) are under-represented in the sampled population. The high prevalence rates in the younger age groups and particularly in females could be linked to the cultural practices, beliefs and behaviour as well as some of the unprotected sexual initiation rites that facilitate HIV transmission among the predominantly Lomwe tribes of Thyolo(10). The high prevalence in business people might be linked to higher socio-economic status, travel away from homes and increased indulgence in risky sexual behaviour. The highly significant positive linear trend of HIV prevalence with increasing urbanisation and particularly in towns located on the main road in Thyolo could be consistent with increased and extensive risky behaviour(11) in town arenas in the district that are well known for its lively night life, bars and readily available commercial sex workers.

HIV prevalence was lowest among students (5% for male and 10% for female students), among males 15-19 year old(4%) and in donors from rural areas (12.8% for males and 11.4% for females). If active recruitment of blood donors is required for whatever reason, these groups should be preferred. Although all blood donors were pre-test counselled in both years, in 1999 only 70% underwent post test counselling as compared to 90% in 2000. This was because in 1999, both the counselling unit and

laboratory were understaffed and it was not possible to ensure that all donors were pre and post-test counselled the same day. Patients were often requested to return on a different day for post-test counselling incurring additional time and transport costs for the donor and this might be the reason why some of these patients failed to return. In 2000, the post-test counselling rate improved drastically to 90% as additional trained staff were recruited for the counselling unit and laboratory making it possible to offer pre and post test counselling to all blood donors on the same day.

From an economic perspective, the strategy of counselling blood donors adds an important advantage in that HIV tests are used for dual purposes (blood screening and HIV counselling) in a context where resources are limited and HIV tests are expensive. In the presence of the alarmingly high HIV prevalence among blood donors, it is essential to ensure strict criteria to avoid unnecessary transfusions. There is also an absolute need to ensure the availability of highly sensitive HIV rapid tests for blood screening. The information on risk factors for prevalent HIV infection will be useful in advocating pre-donation selection of blood donors in the area of study although this could have limitations due to the already high prevalence and widespread nature of the epidemic.

The experience is particularly encouraging as it shows that it is feasible to implement pre and post-test counselling services for blood donors within a rural district set up and such a strategy could serve to reinforce primary and secondary preventive strategies in apparently healthy HIV positive and HIV negative individuals. It could equally be an important entry point for early diagnosis of asymptomatic HIV infection and the potential of early access to drugs for the prevention of HIV-related opportunistic infections. The potential of preventive therapy against tuberculosis using isoniazid prophylaxis can be considered(12). Patients could also have the possibility of being monitored on a continuing basis and once they develop symptoms (WHO stage 2, 3, 4) or their total lymphocyte count drops to 2000 or less (CD4 count of < 500cells/mm3, if available), they can also be offered co-trimoxazole prophylaxis(13).

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