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Prevalence of, and risk factors for, HSV-2 antibodies in sexually transmitted disease patients, healthy pregnant females, blood donors and medical students in Tanzania and Norway

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SUMMARY

The prevalence of specific HSV-2 antibodies was studied in Tanzanian and Norwegian sexually transmitted disease (STD) patients (1095) and non-STD patients (488). Correlates to demographic and behavioural factors were evaluated. Seropositivity was determined by the non-commercial peptide-55 enzyme-linked immunoassay. The prevalence of HSV-2 antibodies was 70% in Tanzanian and 17% in Norwegian STD patients, 35% in Tanzanian blood donors and pregnant women, and 4, 7 and 14% in Norwegian medical students, blood donors and pregnant women respectively. A higher HSV-2 prevalence was associated with female sex, increasing age, previous STDs, history of genital HSV infection, coitarchal age (age at first intercourse) <15 years and HIV seropositivity. Compared to previous data, the prevalence of HSV-2 antibodies in Tanzanian STD patients has increased remarkably. In Norwegian STD patients our results are consistent with, or lower than, the prevalence previously reported in Western Europe. Demographic rather than behavioural factors were associated with higher prevalence of HSV-2 antibodies in STD patients.

INTRODUCTION

Herpes simplex virus type 2 (HSV-2) infection is considered to be almost exclusively sexually transmitted [1]. Only a minority of infected patients are aware of their infection [2, 3]. Most infections are acquired during the third decade of life, although some recent data indicate an earlier age at acquisition [3, 4].

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Recently, type-specific anti-HSV assays have become available commercially, being able to differentiate between antibodies against HSV-1 and HSV-2. HSV-2 antibodies are usually detectable within 8 weeks of acquisition, and antibodies are generally considered to persist throughout life, although loss of HSV-2 antibodies over time has been reported [5–7].

Serological surveys have shown an increase of 30% in the prevalence of HSV-2 antibodies over the past two decades in the United States [3], United Kingdom [8] and Sweden [9]. In patients attending clinics for sexually transmitted diseases (STD), prevalence

figures of up to 65% have been reported from different parts of the world [for review, see 10], and even higher figures have been observed in commercial female sex workers [11, 12]. HSV-2 prevalence on the African continent is reported to be higher than in the United States, which in turn has higher seroprevalence rates than Europe [10]. HSV-2 seropositivity data will often underestimate the total magnitude of genital HSV disease, as in some parts of the world HSV-1 is the causative agent in quite a high proportion of cases [13–15].

A strong association between HSV-2 seropositivity and HIV infection has been documented, particularly on the African continent [16, 17]. Numerous studies have found that female gender and increasing age are independent risk factors for the presence of HSV-2 antibodies. Some investigators have found a strong association between HSV-2 seropositivity and sexual lifestyle [10], and it has been suggested that the presence of HSV-2 antibodies might be used as a serological marker for patterns of sexual behaviour [18–20].

One of the objectives of this study was to investigate whether HSV-2 seropositivity in Tanzania has increased compared to previous studies [21]. A second objective was to investigate whether demographic and behavioural risk factors for HSV-2 antibodies differ between Tanzania and Norway. Identification of risk factors for acquiring HSV-2 (and HIV) infection could be important for the planning of preventive strategies. Since STD patients have higher prevalences of both HSV-2 and HIV infection, a comparison of HSV-2 prevalence and common or different risk factors in areas with high (Tanzania) and low (Norway) HIV prevalence would be of interest.

METHODS

Study design

In this two-centre study, 753 Norwegian and 500 Tanzanian STD patients were invited to participate (Outpatient Clinic for STD, Haukeland University Hospital, Bergen, Norway and the Infectious Disease Clinic, Dar es Salaam, Tanzania). Additionally, 110 pregnant women, 100 blood donors and 100 medical students from Norway were included, as were 100 pregnant women and 100 blood donors in Tanzania. The local Tanzanian ethical committee did not approve the inclusion of medical students. Acceptance was confirmed by written (Norwegian) or verbal (Tanzanian) consent. The participants completed a questionnaire on demographic and behavioural characteristics. Serum samples were drawn and frozen for later serological analyses.

Laboratory methods

A non-commercial peptide-55 ELISA was used for detection of HSV-2 antibodies as described by Marsden et al. [22] and modified by Nilsen et al. [23]. The cut-off values were established using a non-parametric ROC [relative (receiver) operating characteristics] analysis [24] based on sera with known HSV serostatus.

Venereal Disease Research Laboratory (VDRL) test (VDRL cardiolipin antigen, Dade Behring Marburg GmbH, Marburg, Germany) was used to screen for syphilis, and positive sera were retested by *Treponema pallidum* particle agglutination (TPPA) assay (Serodia-TPPA, Euro-Diagnostica AB, Malmo, Sweden). Active syphilis was diagnosed only if a serum sample was positive by both tests. The VDRL test might be reactive in only 60–80% of primary and late latent/tertiary syphilis, and in 90–100% of secondary and early latent syphilis. Nevertheless, due to cost implications we chose this procedure for syphilis screening even if TPPA or an ELISA using total antibody detection would be the first choice. We also chose to disregard the possibility of cross-reactions with pinta, bejel and yaws since these infections are extremely rarely diagnosed.

HIV antibody detection was carried out by Behring Enzygnost Anti-HIV 1/2 Plus (Behring). Samples found to be positive were retested by Wellcozyme Recombinant HIV-1 ELISA (Abbot/Murex, Wiesbaden-Delkenheim, Germany) for Tanzanian sera only. HIV-1 seropositivity was diagnosed only if a sample was positive in both ELISAs. All samples with discordant results in the two ELISAs were retested by Western blotting.

Statistical methods

To test the hypothesis of no bivariate associations between demographic or behavioural variables and HSV-2 seropositivity, Fisher's exact test was applied on the categorical data. The χ^2 test for trend (linear-by-linear association) was applied for age. Age at coitarche (age at first intercourse) was categorized into groups below and above 15 years. Strength of associations was estimated by calculating the odds ratios (OR). Age and reported number of lifetime sexual

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Table 1. *HSV-2 seropositivity and national groups of participants*

Origin	Group	Total number analysed	HSV-2 antibodies present (%)
Dar es Salaam, Tanzania	STD		
	Males	295	66·1
	Females	199	76·9
	Total	494	70·4
	Pregnant women	98	34·7
	Blood donors		
	Males	77	35·1
	Females	4	(1/4 positive)
	Total	81	34·6
Bergen, Norway	STD		
	Males	355	14·1
	Females	242	19·8
	Total*	601	16·8
	Pregnant women	110	13·6
	Blood donors		
	Males	56	5·4
	Females	44	9·1
	Total	100	7·0
	Medical students		
	Males	38	2·6
	Females	58	5·2
	Total	99	4·0

* Four STD patients did not state gender in the questionnaire.

partners were also categorized for subsequent graphic presentation. The bivariate analyses were carried out separately for Tanzanian and Norwegian participants and also for each national subgroup. All statistical tests were performed at a significance level of 0·05.

Multiple logistic regression analysis with seropositivity for HSV-2 as the dependent variable was used to identify independent predictors. The bivariately associated variables were included in a backwards stepwise selection analysis. Variables significant in the likelihood ratio test at the 0·05 level were retained in the final models.

Data analysis was performed using SPSS for Windows release 10·0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Participants

A total of 152 Norwegian STD patients did not want to participate in the study. The decliners did not differ from the participants with respect to gender and age. In the other groups the numbers of decliners were close to zero.

Prevalence of HSV-2 antibodies

Table 1 shows HSV-2 prevalence in STD and non-STD groups, classified by gender and nationality. There was a high prevalence of HSV-2 antibodies among Tanzanian participants as compared to Norwegian ones, evident for the STD groups (70% *vs.* 17%) as well as for blood donors and pregnant females (35–35% *vs.* 7–14%). A particularly high prevalence (77%) was demonstrated among female Tanzanian STD patients. Only 4% of the Norwegian medical students had HSV-2 antibodies. Among Tanzanian as well as Norwegian STD patients, the HSV-2 prevalence was almost twice that of non-STD participants.

Risk factors for HSV-2 seropositivity

Female gender and increasing age were associated with the highest prevalence figures (Fig. 1). Tanzanian female STD patients <20 years of age had a much higher HSV-2 prevalence than the other corresponding age groups. By 25 years of age, more than 70% of the Tanzanian female STD patients had already been infected, thereafter HSV-2 prevalence levelled off at

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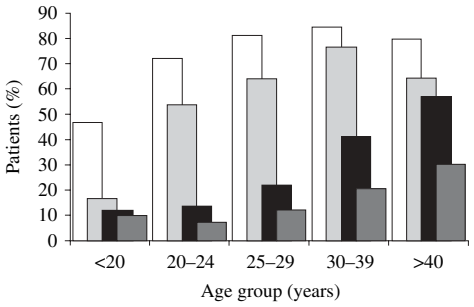

Fig. 1. Percentage of HSV-2 seropositive STD patients related to age groups in Tanzanian (Tz) and Norwegian (N) female and male patients. χ^2 test for age trend: STD-N females ($\chi^2 = 17{\cdot}65$, D.F. $= 1$, $P < 0{\cdot}001$); STD-N males ($\chi^2 = 14{\cdot}30$, D.F. $= 1$, $P < 0{\cdot}001$); STD-Tz females ($\chi^2 = 6{\cdot}96$, D.F. $= 1$, $P = 0{\cdot}008$); STD-Tz males ($\chi^2 = 8{\cdot}46$, D.F. $= 1$, $P = 0{\cdot}004$).

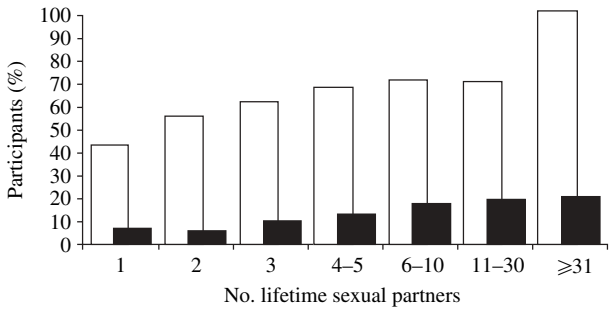

Fig. 2. Percentage of HSV-2 seropositive participants related to groups reporting increasing numbers of lifetime sexual partners in Norwegian (■) and Tanzanian (□) participants. (Only three HSV-2 positive Tanzanian participants reported ⩾31 partners.) χ^2 test for trend: Tanzanian participants ($\chi^2 = 30{\cdot}29$, D.F. $= 1$, $P < 0{\cdot}001$); Norwegian participants ($\chi^2 = 11{\cdot}99$, D.F. $= 1$, $P = 0{\cdot}001$).

values around 80%. In male Tanzanian STD patients, the main increase in HSV-2 prevalence was observed between 20 and 30 years, thereafter also levelling off, however, at lower levels than in their female counterparts. The steepest increase of HSV-2 prevalence in the Norwegian STD group is observed between 30 and 40 years. Female Norwegian STD patients had higher HSV-2 prevalence than males, and in Norwegian female STD patients >40 years of age, the seroprevalence figures approached those observed among the male Tanzanian STD patients.

Figure 2 shows that HSV-2 prevalence increased with increasing numbers of lifetime sexual partners, reaching statistical significance (χ^2 test for trend) for all Tanzanian as well as all Norwegian participants.

To identify potential factors associated with HSV-2 seropositivity, all Norwegian or Tanzanian STD patients were grouped together and subjected to bivariate analyses. The results are shown in Table 2. In addition to female gender and increasing age, seropositivity in one or both national groups was positively associated with (or closely approaching significant levels) being separated/divorced or a widow(-er), having a history of previous genital HSV infection (not Tanzanian STD patients) or other STDs, and homo- or bisexual preference. Coitarchal age <15 years was associated with higher HSV-2 prevalence among Norwegian STD patients and blood donors only, not among their Tanzanian counterparts. Among the Tanzanian participants, there was no statistically significant association between HSV-2 seropositivity and history of previous genital HSV infection. A strong association between HSV-2 antibodies and HIV seropositivity was documented (except for the blood donors). A low level of education was weakly associated with HSV-2 seropositivity for the total study group, however, this did not reach statistically significant levels in any of the subgroups (data not shown).

Several factors were found not to be associated with HSV-2 seropositivity (data not shown). These included history of previous labial HSV infection, having a regular income or not, having a regular sex partner at enrolment, being previously tested for HIV or accepting an HIV test at enrolment. Except for low coitarchal age, additional coitarchal data (various relationships to partner, under influence of alcohol, use of contraceptives) were also not associated with HSV-2 seropositivity. History of previous syphilis and presence of serological markers for syphilis were not predictive for HSV-2 seropositivity among the Tanzanian participants.

Independent risk factors for HSV-2 antibodies

In the Tanzanian STD patients, female gender, previous STDs, homo-or bisexual preference and HIV seropositivity were identified as independent HSV-2 predictors in the multiple logistic regression model (Table 3), while increasing age approached significant levels ($P = 0{\cdot}074$).

In the group of Norwegian STD patients, coitarchal age <15 years, female gender, increasing age and history of previous genital HSV infection were independent predictors, whereas reporting previous STDs (other than HSV), homo- or bisexual preference and being separated/divorced or a widow(-er), lost statistical significance as independent risk factors.

Apart from HIV seropositivity, we were not able to find any independent statistically significant predictive

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Table 2. *HSV-2 seropositivity related to demographic and behavioural factors (bivariate analyses)*

Groups/ nationality	Gender OR (95%CI) *P* value	Age χ^2 test for linear trend, *P* value	Separated, divorced or widow (-er) OR (95%CI) *P* value	Previously genital HSV infection OR (95%CI) *P* value	Previously STD (other than HSV) OR (95%CI) *P* value	Homo- or bisexual preference OR (95%CI) *P* value	Coitarchal age <15 years OR (95%CI) *P* value	HIV+ OR (95%CI) *P* value
STD								
Norway	1·51 (0·98–2·33)		**2·89** (1·46–5·74)	**10·23** (5·55–18·84)	**1·86** (1·20–2·89)	**2·38** (1·00–5·64)	**1·91** (1·19–3·08)	—
	0·072	***<0·001***	***0·004***	***<0·001***	***0·007***	*0·056*	***0·011***	
Tanzania	**1·71** (1·13–2·57)		**6·03** (1·42–25·71)	1·01 (0·63–1·61)	**1·82** (1·23–2·69)	2·22 (0·90–5·44)	0·81 (0·53–1·24)	**4·79** (2·79–8·22)
	0·012	***0·014***	***0·005***	*1·000*	***0·003***	*0·089*	*0·329*	***<0·001***
Pregnant women								
Norway			6·71 (0·40–119·56)	**14·46** (1·22–170·89)	2·21 (0·71–6·90)		0·93 (0·24–3·60)	—
		0·029	*0·255*	***0·048***	*0·203*		*1·000*	
Tanzania			*	*	1·45 (0·46–4·58)		0·59 (0·11–3·12)	**7·67** (1·49–39·50)
		0·103			*0·556*		*0·709*	***0·009***
Blood donors								
Norway	1·77 (0·37–8·34)		*	7·58 (0·60–96·02)	3·28 (0·56–19·19)	*	**6·56** (1·01–42·65)	—
	0·696	*0·064*		*0·197*	*0·200*		*0·084*	—
Tanzania	0·62 (0·06–6·23)		*	1·92 (0·26–14·45)	1·18 (0·47–2·98)	*	1·17 (0·34–3·99)	6·12 (0·61–61·85)
	1·000	*0·464*		*0·609*	*0·815*		*1·000*	*0·121*
Medical students								
Norway	1·91 (0·19–19·10)		*	*	3·63 (0·34–39·02)	*	*	—
	1·000	*0·556*			*0·321*			

OR, Odds ratio; CI, confidence interval.
—, Analysis not performed; *P* value, analysed by Fisher's exact test.
For each category and variable (except age) there are two rows, the upper row representing OR and 95% CI, the lower *P* values (in italics).
Statistically significant values appear in **bold**.
* Statistical calculation not performed, due to too low figures or missing data.

Table 3. *Factors independently associated with HSV-2 seropositivity* (*logistic regression analysis*)

Groups/ nationality	Female gender OR (95% CI) *P* value	Increasing age (per 10 years) χ^2 test for linear trend, *P* value	Separated, divorced or widow (-er) OR (95% CI) *P* value	Previously genital HSV infection OR (95% CI) *P* value	Previously STD (other than HSV) OR (95% CI) *P* value	Homo- or bisexual preference OR 95% CI) *P* value	Coitarchal age <15 years OR (95% CI) *P* value	HIV+ OR (95% CI) *P* value
STD								
Norway	**2·02** (1·20–3·42)	**1·82** (1·36–2·46)		**7·94** (4·17–15·11)			**1·84** (1·07–3·17)	
	0·009	***<0·001***	n.s.	***<0·001***	n.s.	n.s.	***0·028***	—
Tanzania	**1·83** (1·11–3·02)	1·37 (0·97–1·92)			**1·99** (1·26–3·14)	**2·83** (1·03–7·80)		**3·57** (2·03–6·28)
	0·017	*0·074*	n.s.	n.s.	***0·003***	***0·044***	n.s.	***<0·001***
Pregnant women								
Norway		**5·93** (1·22–28·64)		**18·58** (1·37–252·36)				
		0·027	n.s.	***0·028***	n.s.	—	n.s.	—
Tanzania								**7·40** (1·44–38·14)
		n.s.	n.s.	n.s.	n.s.	—	n.s.	***0·017***
Blood donors								
Norway		**3·76** (1·17–12·63)					**12·40** (1·43–107·23)	
	n.s.	***0·033***	—	n.s.	n.s.	—	***0·022***	—
Tanzania	n.s.	n.s.	—	n.s.	n.s.	—	n.s.	n.s.
Medical students								
Norway	n.s.	n.s.	—	n.s.	n.s.	—	—	—

OR, Odds ratio; CI, confidence interval.
—, Not included in the logistic regression analysis due to too low figures or missing data.
n.s., Not significant.
For each category and variable (except age) there are two rows, the upper row representing OR and 95% CI, the lower *P* values (in italics).
Statistically significant values written in **bold**.

factor for HSV-2 antibodies among the Tanzanian pregnant women, whereas increasing age and history of previous genital HSV infection remained independent predictive factors among the Norwegian pregnant women (Table 3).

Increasing age and coitarchal age <15 years were identified as independent risk factors for HSV-2 antibodies among the Norwegian blood donors, whereas none of the analysed variables could be identified as independently predictive among Tanzanian blood donors and Norwegian medical students (Table 3).

DISCUSSION

The prevalence of HSV-2 antibodies in various demographic groups in Tanzania and Norway has been investigated. Questionnaires were used to identify potential risk factors for HSV-2 infection, and different statistical methods applied to evaluate the significance of these factors. Apparent risk factors, identified by bivariate analyses, were put into a logistic regression model, to identify truly independent risk factors for HSV-2. The seroprevalence as well as the various risk factors are discussed below.

HSV-2 prevalence in STD patients

We have studied the prevalence of HSV-2 antibodies among Tanzanian STD patients both in the present work and by analysis of 294 sera collected during the period 1989–93 [21], using methods which are similar in sensitivity and specificity to Norwegian [23] as well as Tanzanian sera [25]. Consequently, we conclude that the HSV-2 seroprevalence has increased from 43 to 70% during the last 10 years. High figures of HSV-2 infection have recently also been reported in other studies of Tanzanian STD patients, both in Dar es Salaam (78·6%) [26] and in the Northern part of the country (66·7%) [27].

HSV-2 infections are also common in STD cohorts in other parts of the world. High figures have been reported from Brazil (53%) [28] and among female STD patients in the United States (64%) [29]. Most women (89%) in the latter study were Afro-Americans. A recent multicentre study [30] from STD outpatient clinics in the United States showed 41% HSV-2 seropositivity in cohorts consisting of 61% black persons.

The HSV-2 seroprevalence of 17% among Norwegian STD patients (Table 1) compares reasonably well with figures varying from 22 to 32% in other European studies on heterosexual STD patients [19, 31–34]. A considerably higher prevalence (55%) reported from a STD clinic in Paris [35] might be explained by the fact that 60% of the participants were of non-European origin. One should keep in mind that a large proportion of genital herpes in Norway as well as in other European countries is caused by HSV-1 infection [13–15].

HSV-2 prevalence in non-STD cohorts

An HSV-2 seroprevalence of 35% in the Tanzanian non-STD groups (Table 1) is consistent with other reports from this country, both from rural (31%) [20] and from urban [36] (39%) communities. In the United States the prevalence is lower. The NHANES III study (National Health and Nutrition Examination Survey) has shown that 21·9% of individuals >12 years of age have HSV-2 antibodies [3].

HSV-2 infection among Norwegian pregnant women (13·6%) (Table 1) is comparable with antenatal data from other European countries [5, 37–39], but higher than expected when related to the figures for Norwegian blood donors and medical students. Both Arvaja et al. [5] and Eskild et al. [7] have reported that HSV-2 antibodies present early in pregnancy might be undetectable at the end in 25–50% of the cases. Most Norwegian pregnant women in the present study were included at an early stage. Assuming that the state of pregnancy might influence the analysis outcome as suggested by these authors – and that their results were not caused by biological non-specific reactivity or other problems with the assay – the true HSV-2 prevalence in the Norwegian pregnant women may consequently be lower than we report.

Norwegian blood donors and medical students were expected to have low rates of HSV-2 infection (4 and 7%, respectively, Table 1) since other European studies of similar groups have shown prevalences of HSV-2 antibodies varying from 3 to 12% in London [31], from 4 to 5% in Switzerland [40] and from 3 to 5% in a cohort of adult immunocompetent individuals in England and Wales [41].

HSV-2 prevalence and specific predictive factors

Age and gender

Several studies show that age and female gender are independent risk factors for HSV-2 infection among STD patients [19, 28–35]. Our results (Table 3) are

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consistent with these data, except that this was not the case for age in the Tanzanian group. We observed that a larger proportion of infections occur at an earlier age in Tanzania than in Norway (Fig. 1). Consequently, interventions targeted towards reducing the number of sexual partners would not be likely to be successful among Tanzanian STD patients (mean age 25–33 years), where pre-coitarchal interventions seem more warranted. A relatively high degree of seroconversion in young people has also been reported from Ethiopia [42].

Age has also been shown to be independently associated with HSV-2 seropositivity in female non-STD cohorts [12, 43, 44]. The numbers of persons infected with HSV-2 in the non-STD group in our study are too small to assess any firm statistical relationship.

Number of sexual partners

The χ^2 test for trend (linear-by-linear association) confirms the association between increasing numbers of lifetime sexual partners and HSV-2 seroprevalence, analysing all Tanzanian and all Norwegian participants respectively (Fig. 2). This association did not reach statistically significant levels within each of the STD and non-STD groups, indicating that larger scale research is needed to obtain more data. Although most investigators find that higher numbers of sexual partners and HSV-2 seropositivity are independently and positively associated [19, 29–31, 33, 42, 45–47], others [35, 48, 49] have reported the lack of a significant association. In a cohort with very high HSV-2 seroprevalence (like our Tanzanian participants), the risk of being sexually infected with HSV-2 should logically be very high, even if the number of sexual partners is low. Most HSV-2 seropositive Norwegian STD patients are $\geqslant$30 years old, and the majority of them report many lifetime sexual partners. This higher age may obscure detection of a significant association between HSV-2 and the number of reported lifetime sexual partners in this group.

Previous STDs (other than HSV infection)

Consistent with the observation by many investigators [11, 19, 29–32, 47, 50, 51] we found a history of previous STDs to be an independent predictive factor for HSV-2 seropositivity among Tanzanian STD patients. This was not the case in the Norwegian STD patients, and lack of such an association has also been reported by others [21, 34]. The two STD groups in our study are really not comparable with regard to previous STDs, as the majority of Tanzanians report syphilis, gonorrhoea or genital ulcer disease (GUD), whereas their Norwegian counterparts nearly exclusively report chlamydial or human papillomavirus infections. Furthermore, as the concept of syndromic diagnosis and management is used at the STD clinic in Dar es Salaam, some cases of previous genital herpes virus infection might have been reported as previous STDs. Consequently, the figures for statistically significant association between HSV-2 seropositivity and previous STDs in this group might be increased falsely, and the figures for previous genital HSV infection decreased falsely.

HSV-2 seropositivity and HIV

The strong and independent association between HSV-2 seropositivity and HIV seropositivity shown in several reports was confirmed for the Tanzanian participants in our study (Table 3), except for the blood donors. Lack of association among these blood donors is probably caused by a bias selection, as people who think that they are likely to be HIV positive do not volunteer to donate blood.

HSV-2 seroprevalence and other potential risk factors

A likely explanation as to why being divorced, separated or widowed seems to be a predictive factor for HSV-2 seropositivity in bivariate analysis (Table 2), but not in logistic regression analysis (Table 3), is that participants in these groups are older than others, and consequently have age as the independent risk factor.

Homo- and bisexual preference was an independent risk factor among Tanzanian STD patients (Table 3). In the Norwegian STD group, however, this was not the case although such association might be suggested by bivariate statistical analysis (Table 2). The reason for this apparent discrepancy is probably that the Norwegian homo- or bisexual participants are slightly older than the heterosexual (mean 31·8 *vs.* 26·7 years), while the mean ages in the corresponding Tanzanian groups did not differ (26·9 *vs.* 28·8 years). Again, age seems to be the determining factor. In this context, reports about the significance of homo- or bisexual preference are conflicting, as some find an association with HSV-2 serum antibodies [11, 19, 31], but most do not [32–35, 47].

Lack of association between a history of previous genital herpes and HSV-2 seropositivity in the Tanzanian STD patients was surprising, in contrast to

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a strong association in the corresponding Norwegian group (Table 3). This might partly be due to the fact that a much higher proportion of Norwegian than Tanzanian STD patients has a verified viral diagnosis, and has consequently received proper information about genital herpes. As already mentioned, most African STD clinics (including that in Dar es Salaam) use the concept of syndromic diagnosis rather than laboratory detection of HSV infection.

An association between low coitarchal age and HSV-2 antibody prevalence has been reported in a few studies [29, 48]. This is consistent with our findings in the Norwegian STD and blood donor groups (Table 3). In the blood donor group, however, the results should be interpreted with caution since the figure is based on very few participants (Table 1). Other coitarchal data such as type of partner, condom usage, being influenced by alcohol or drugs, were not associated with HSV-2 seropositivity in our study.

CONCLUSIONS

HSV-2 seroprevalence among Norwegian STD patients is similar to, or lower than, that of STD patients form most other Western nations, and much lower than among Tanzanian counterparts.

Some risk factors for HSV-2 infection are common for Tanzanian and Norwegian STD patients, including female gender and increasing number of sexual partners. Other risk factors differ, such as coitarchal age <15 years, homo- or bisexual preference and history of previous genital herpes.

The very high prevalence of HSV-2 antibodies among Tanzanian STD patients represents a remarkable increase over only one decade. Considering the well-documented association between HSV-2 and HIV infection, this is alarming and calls for intervention. One possibility would be to incorporate drugs against HSV in the management of GUD. The efficiency of such treatment would have to be tested, but lack of resources may preclude such usage of antivirals in African countries.

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