

## Correlates of condom use among males in North Sudan

*Badreldin A. Mohamed*

Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University,  
PO Box 10219, Riyadh 11433, Saudi Arabia. Email: [bmohamed@ksu.edu.sa](mailto:bmohamed@ksu.edu.sa)

**Abstract.** *Objectives:* In sub-Saharan Africa countries, HIV infections are transmitted primary through heterosexual contact. Correct and consistent condom use has been promoted as a method to prevent sexually transmissible infections, including HIV. The aim of this study was to assess and determine the factors influencing condom use in Khartoum, Sudan. *Materials and methods:* Out of the 45 voluntary counselling and testing centres in Khartoum region, 10 centres were selected. A random sample of 804 respondents aged 20–40 years was selected. Stepwise multiple logistic regression analysis was used to investigate the predictors of condom use. *Results:* About 12% of respondents reported using condoms consistently, 41.5% used them sporadically and 46.3% were nonusers. Most of the participants had problems with condom use (81.9%) and friends were the main source of condoms (72%). Knowledge about AIDS transmission, knowing someone who is infected with or had died of AIDS, experiencing condom problems, type of sexual partners, purchase embarrassment and education were the main predictors of condom use. *Conclusions:* Condom use among the Sudanese is low. Strategies to promote condom use should focus on price support for condoms by the government, expanded private sector condom distribution and the integration of sex education in school curriculums or via frequent discussion on television.

**Additional keywords:** AIDS, HIV, sub-Saharan Africa.

Received 9 June 2013, accepted 13 December 2013, published online 24 February 2014

### Introduction

The male condom is a popular sexual protective device, often promoted to prevent HIV and other sexually transmissible infections (STIs) and unintended pregnancies.<sup>1</sup> Studies have demonstrated that the appropriate and consistent use of condoms provides as much as 94% reduction in the risk of HIV transmission, if properly used.<sup>1,2</sup> In Sudan, the prevalence of AIDS in the general population is on the rise: the estimated number of cases was 186 000 in 2003 and had increased to 260 000 in 2010.<sup>3,4</sup> The lack of awareness with regard to HIV/AIDS is mainly due to insufficient government commitment towards public health education, the weak role of the media and educational policies with no sex education in the curriculum at all educational levels.<sup>5</sup> Due to this lack of sufficient public health education, the use of condoms has been viewed more as a method of contraception than a method for the prevention of STIs and HIV/AIDS. Despite the health and social problems caused by HIV, condom use is generally not popular in Africa.<sup>1,6,7</sup> For example, only 21.5% of respondents in Tanzania, 25% in Uganda, 54.4% in South Africa and 46% in Nigeria reported using a condom during the most recent incident of sexual intercourse. The proportion of study subjects who had never used a condom was also high, ranging from 57% in Tanzania to 41% in Uganda.<sup>2,6–8</sup>

Previous studies in Africa indicated that condom use is determined by multiple factors.<sup>2,6,7,9</sup> These studies indicated that condom use is associated with personal risk perception, self-

efficacy, perceptions about condoms and social support. Empirical information is lacking on which factors determine condom use, yet the development of policies and interventions to encourage condom use requires an understanding of the factors that influence condom use practices. The aim of this study was to assess and to determine factors influencing condom use. To the best of our knowledge, this is the first study to address this topic in North Sudan.

### Materials and methods

#### *Study population*

The study was conducted in the Khartoum region. The data was collected from voluntary counselling and testing centres. There are 45 of these centres in Khartoum. According to the World Health Organisation, these voluntary counselling and testing centres are ranked as some of the best international centres in the region.<sup>10</sup> The clients of these centres come from different segments of society and represent all regions of the Sudan. Ten centres were selected at random for the purpose of this study.

#### *Sampling method*

The sample size was calculated using the proportion of condom use (5%) and to detect a difference of 5% with a power of 90% and an error of 5%. The inclusion criteria were: (1) male (2) aged 20–40 years, (3) reporting having sexual intercourse with a

female more than twice in the past 6 months, and (4) not married. In all, 2100 candidates were screened and 953 met the inclusion criteria; of these, 804 agreed to participate. Eighty persons were selected from each centre, since the number of clients seen in each centre is almost the same across all centres (50 clients per day). Participants completed a self-administered questionnaire, which lasted 15–20 min. Clients who agreed to join the study were given 100 000 Sudanese pounds (SP; US \$1 = 5600 SP).

### *Instruments*

The study was carried out using a self-administered questionnaire. The questionnaire was administered in the Arabic language and then translated back again in English by a different person to ensure that translation did not change the meaning of the questions. The translated version was submitted for peer review to the Department of Community Health, College of Applied Health Sciences, Saudi Arabia, for content validity. The interviewers were medical students selected from different medical schools. Prior to the study, all interviewers were given training on how to administer the questionnaire. The questionnaire was evaluated in a pilot study to ascertain its appropriateness. The questionnaire, which was developed from the literature, contained four general domains: demographic information, sexual behaviour, condom use behaviour and perceived barriers to condom use. Questions relating to religion were measured using a five-point scale, measuring the frequency of a practice (not at all, rarely, sometimes, often or always). The score was the sum of the responses, yielding a maximum possible score of 25. Condom use was dichotomised into 'users', and 'nonusers'. Questions related to condom use problems were coded as 1 if the answer was 'yes' and 0 if the answer was 'no'. Logistic regression was used to determine factors predicting condom use, with condom use as the dependent variable.

The sample was selected from males attending the clinics and they were recruited from the waiting room of the centre; the purpose of the study was explained and they were invited to participate before being seen by the centre staff. After providing written informed consent, participants were escorted to a private room.

### *Data analysis*

All questionnaires were cross-checked to ensure completeness, and the data was then entered into SPSS ver. 20 (IBM Corporation, Armonk, NY, USA) for analysis. The analysis included descriptive statistics, cross-tabulation and logistic regression. Stepwise multiple logistic regression was used to determine the factors predicting condom use, with condom use as the dependent variable. Predictor variables were knowing someone who is infected with or had died of AIDS, having knowledge about AIDS transmission, condom problems, type of partner and education.

## **Results**

### *Sociodemographic characteristics*

Data was obtained for 804 subjects, giving a response rate of 95%. Thirty-eight subjects were excluded from the study

because the information given by them was not complete. Table 1 shows the sociodemographic characteristics of the selected subjects. The majority of the subjects were aged 25–29 years (54.4%). For education level, most of the subjects had finished secondary school (44.8%) or were university graduates (51.7%), and ~64% had an income of between SP400 000 and SP1 000 000 per month. For occupation, the majority worked in the private sector (55.7%). For religiosity, 18.4% read the Koran, 99.6% fast at Ramadan, 39.3% attended the mosque and 88.6% performed their five daily prayers.

### *Sexual behaviour*

Table 2 displays the sexual behaviour of the respondents. All of the respondents reported having a sexual relationship in the preceding 6 months. Most of the respondents (58.1%) expressed that they had their first sexual experience when they were aged between 25 and 30 years. The answer to the question 'number of sexual partners in the last 6 months' showed that ~47.8% had two partners, with most classing their partner(s) as 'steady' (43.7%). About 64% practised vaginal sex and the majority reported a sexual duration of more than 25 min (84.3%). About 31% reported that they knew someone who is infected with or who had died of AIDS, and 52.8% had knowledge about AIDS transmission.

### *Condom use and barriers to condom use*

Table 3 reports the frequency of condom use, source and problems associated with condom use. A condom was never used by 46.3% of respondents, used sometimes by 16.5%, rarely

**Table 1. Socioeconomic characteristics in the study population**  
SP, Sudanese pounds (US\$1 = 6000 SP)

Variable	<i>n</i> (%)
Age	
20–24 years	187 (23.2)
25–29 years	437 (54.4)
30–34 years	144 (17.9)
>35	36 (04.5)
Education level	
Intermediate	28 (03.5)
Secondary	360 (44.8)
University and above	416 (51.7)
Monthly income	
SP100 000–<SP400 000	11 (14.1)
SP400 000–SP700 000	29 (28.5)
SP700 000–SP1 000 000	288 (35.8)
>1 000 000	174 (21.6)
Occupation	
Government employee	286 (35.6)
Private sector	448 (55.7)
Student	56 (07.0)
Unemployed	14 (01.7)
Religious practices	
Read Koran	148 (18.4)
Fast during Ramadan	801 (99.6)
Frequent the mosque	316 (39.3)
Do the five daily prayers	712 (88.6)

**Table 2. Sexual behaviour among study respondents**

Sexual behaviour	n (%)
Age at first sexual encounter	
<20 years	11 (01.4)
20–25 years	283 (35.2)
25–30 years	467 (58.1)
>30 years	43 (05.3)
Number of sexual partners in last 6 months	
1	221 (27.5)
2	384 (47.8)
3	148 (18.4)
>4	51 (6.3)
Type of partner	
Steady partner	351 (43.7)
Casual partner	166 (20.6)
Commercial sex worker	287 (35.7)
Sexual practices	
Vaginal sex only	512 (63.7)
Vaginal and anal sex	292 (36.3)
Duration of intercourse (minutes)	
<25	126 (15.7)
>25	608 (84.3)
Know someone who is infected with or had died of AIDS	
Yes	252 (31.3)
No	552 (68.7)
Knowledge about AIDS transmission	
Yes	425 (52.8)
No	379 (47.2)

**Table 3. Condom use, source and problems for respondents**

Behaviour	n (%)
Frequency of condom use	
Usually	98 (12.2)
Sometimes	133 (16.5)
Rarely	201 (25.0)
Never	372 (46.3)
Condom source	
Friends, siblings or peers	311 (72.0)
Sexual partner	24 (5.6)
Purchased (pharmacy)	69 (5.9)
Health establishment	28 (6.5)
Knowledge of good condom use	
Yes	75 (17.4)
No	357 (82.6)
Have any problems with condom use	
Yes	354 (81.9)
No	78 (18.1)
Problems	
Condom breakage	
Yes	321 (74.3)
No	111 (25.7)
Condom slipped	
Yes	313 (72.4)
No	119 (27.6)
Condom does not fit (tight, big)	
Yes	308 (71.3)
No	94 (29.7)

by 25% and usually by 12.2%. In terms of consistent use, 12.2% were consistent condom users, 41.5% were sporadic condom users and 46.3% were nonusers. Friends, siblings and peers were the main source of condoms (72.0%). Most of the participants reported poor knowledge of condom use (82.6) and ~82% had experienced problems with condom use. About 74% reported condom breakage, 72.4% reported condom slippage during intercourse and 71.3% reported condom slippage during withdrawal. Regarding barriers to condom use, embarrassment when purchasing was mentioned by all participants as the main barrier. For other barriers, the majority reported 'don't know', except for difficulty securing condoms (90.5%) (Table 4).

#### Predictors of condom use

Stepwise multiple regression (Table 5) shows that knowledge of AIDS transmission, knowing someone who is infected with or had died of AIDS, condom problems, type of partner and education level were important factors for condom use. Knowing someone who is infected with or had died of AIDS was strong predictor: a ~3.5 fold increase in condom was noted when compared with not knowing someone who is infected with or had died of AIDS. Those who have knowledge about AIDS transmission are more likely by about more than 400% to use condoms compared with those with no knowledge. A significant relationship between condom problems and condom use was observed. Those who have problems are less likely by ~60% to use condoms. For type of partner, those who have sex with a steady partner were four times more likely to use condoms compared with those who have sex with casual partners. Those who have higher education are more likely to use condom (odds ratio=3.93) when compared with intermediate-level education.

**Table 4. Perceived barriers to condom use**

Barrier	n (%)
Reduce sexual pleasure	
Agree	212 (26.4)
Disagree	47 (5.8)
Don't know	535 (67.8)
Embarrassing to buy	
Agree	804 (100)
Disagree	0
Don't know	0
Religious faith	
Agree	219 (27.2)
Disagree	135 (16.8)
Don't know	440 (56.0)
Not safe	
Agree	118 (14.9)
Disagree	61 (7.6)
Don't know	623 (77.5)
Difficult to secure	
Agree	728 (90.5)
Disagree	0
Don't know	104 (9.5)

**Table 5. Stepwise multiple logistic regression of predictors for condom use**

Variable	Odds ratio	P-value	95% confidence interval
Know someone who is infected with or had died of AIDS			
No	1	0.028	1.76–4.03
Yes	3.4		
Have knowledge about AIDS transmission			
No	1	0.013	3.27–5.09
Yes	4.2		
Condom problems			
No	1	0.014	0.13–0.88
Yes	0.41		
Type of partner			
Casual partner	1	0.002,	2.35–4.74,
Steady partner	4.1	0.063	1.27–4.01
Commercial sex worker	1.7		
Education			
Intermediate	1	0.611,	0.28–1.41,
Secondary	1.02	0.032	1.27–5.31
University and above	3.93		

## Discussion

This study was the first to examine the correlates of condom use in North Sudan. A range of factors associated with condom use were highlighted. Factors that emerged were purchase embarrassment, knowledge of AIDS transmission, knowing someone who was infected with or had died from AIDS, income, type of partner, education and condom problems. These findings should be considered in any strategy within the country that aims to address condom use.

Our findings that knowledge of the modes of transmission for HIV and knowing someone who is infected with or had died of AIDS were potent predictors of condom use concur with earlier findings.<sup>8,11</sup> About 53% of the respondents had good knowledge about the modes of AIDS transmission and ~31% know someone who is infected with or had died of AIDS. The estimated cases of AIDS in 2012 was 260 000 among the general population.<sup>3</sup> However, the actual prevalence of the disease is likely to be higher. As the epidemic becomes more widespread, most people are likely to know a person infected with HIV/AIDS and hence will become more aware of the risk of being infected with HIV themselves. This could be used as a cue for action to promote preventive behaviour, particularly condom use. Previous studies in Africa documented how AIDS illness or the death of a family member or a friend, as indicators of the severity of the disease, motivated people at risk to use condoms.<sup>11,12</sup>

The negotiation of whether to request a partner to use condoms relies on several factors, including the type of partner.<sup>8</sup> In Khartoum, Mohamed reported condom use by 45% of female sexual workers at their last sexual encounter with a client, and consistently in the last month by 35.9%, with many clients offering additional money for unprotected sexual intercourse.<sup>13</sup> Many FSWs prefer their customers not to use condoms because they are perceived to be uncomfortable;

besides, clients pay less for protected sex. Zeidan *et al.*,<sup>14</sup> in their study on condom use among illegal multipartners in Khartoum, found that ~60% of males did not use condoms during sexual intercourse, 20% resisted condom use via the excuse that they did not have AIDS and the negative attitude towards the effect of condoms on pleasure, and 15% accepted this because their partner paid more if a condom was not used. Our results contradict previous research that states that a steady relationship is associated with decreased condom use.<sup>6,8</sup> This may be due to the fact that, in regular relationships, people tend to know each other's habits, respect each other's values and morals, and avoid broaching the topic of protected sex. In our study, condom use was more frequent with a steady partner (44%) than with other partners.

Our results showed that the majority of respondents have had problems with condom breakage, slippage and fit. The percentages reported were breakage (74.3%), slippage (72.4%) and fit (71.3%), which was very high compared with other studies<sup>15,16</sup>. Condoms are regulated medical devices and must conform to international standards such as ISO 4074 : 2002 and ASTM D 3492–08, which directly or indirectly dictate the allowable sizes.<sup>17</sup> Most condoms are ~7 inches long and 2 inches wide.<sup>18</sup> There are no previous studies regarding erect penile dimensions in Africa but it is known that Africans have larger penises. Previous international studies found that men with a larger penile circumference have increased problems with condom breakage and slippage.<sup>15,16</sup> A second explanation for breakage and slippage is that Sudanese males are known for being very intense during sex. Most of our participants (84%) reported the duration of sexual intercourse to be more than 25 min, and ~40% practiced both anal and vaginal intercourse. A third explanation is the low quality of free condoms. About 79% obtained their condom from friends or from their sexual partner. Purchased condoms are more likely to be used than free condoms. The price for a pack of three condoms is \$17.30. The mean salary for a public or private sector employee in Sudan ranges between \$100 and \$350 per month, so for many people, condoms are a luxury that they cannot afford and thus buying a condom may act as motivation for using it. This finding is also consistent with previous studies, namely that purchased condoms are more likely to be used than free condoms in the most recent incidence of intercourse.<sup>7,8</sup> A fourth explanation for slippage and breakage is condom use error. This is expected, since the majority (91.2%) did not have any experience of using condoms properly. These problems may be due to shyness in coming forward for appropriate counselling regarding condom use, even from friends, as this would involve disclosure of their risky practices. A fifth explanation is the tightness of condoms. About 71% of the participants complained about condom fit, mainly that they were too tight. It is possible that discomfort with the fit and feel of a condom may affect the decision to remove the condom before sex is over or to begin sex without using a condom.<sup>19</sup>

Purchase embarrassment has a direct negative impact upon the frequency of condom use.<sup>20,21</sup> In Sudan, condoms are only available in some pharmacies, nongovernment organisations and family planning clinics. The customer usually has to ask the pharmacist when he wants to buy a condom; condoms are usually kept under the counter and only dispensed to those

who ask for them. Awareness of other people (real or imagined) when purchasing condoms evokes embarrassment. Thus lack of privacy and being embarrassed to ask for a condom, especially if the seller is female, were the most significant barriers to their use. In a conservative society, to be seen obtaining or in possession of a condom was described as giving rise to negative social consequences. Hesitant to disclose that they are sexually active and out of fear of stigmatisation, buyers at the pharmacy do not ask about the quality or size of the condom they are purchasing. We discussed with some respondents how they cope with purchase embarrassment. Some of the strategies used are: they go at midday or at prayer time, they go to pharmacies in remote areas where they are unlikely to see anybody they know, they buy other items with the condom or they ask someone they know to buy them the condom.

Currently, 70% of the Sudanese population is Muslim. The Islamic faith condemns sexual intercourse before marriage, and therefore the guilt associated with strong religious faith may be predictive of condom use. Studies that have examined the relationship between AIDS and religion show that people who see the disease as a shameful condition and associate with it punishment for breaking God's moral values are likely to estimate their risk as low and therefore are less likely to engage in protective behaviour.<sup>22,23</sup>

Educational attainment is highly correlated with condom use.<sup>24,25</sup> Higher education enables people to have greater access to prevention information about HIV/AIDS. This information may not be available to people with lower levels of education. A lack of awareness with regard to HIV and STI transmission is mainly due to educational policies, with sex education not integrated into the school curriculums or discussed on television or radio. Parents or family members never communicate with their children or with each other about matters related to sexual behaviour, as even adults fear that they would be strongly rebuked if they introduced the subject of sex within the household boundary.

### Limitations

The main limitation of our study is that all the data reported in this study were based on self-reporting. With self-reported data, a risk of recall bias or a social desirability effect is always present, particularly when assessing behaviours and attitudes associated with sensitive topics.

### Conclusions

This study confirms that the rate of condom use among the Sudanese is low, indicating that the ongoing efforts to promote condom use have been less successful, but it has also emphasised factors that interventions need to address in the promotion of condom use. Innovative strategies to promote condom use among male adults should be directed at increasing the awareness of people regarding condom use, improving the quality of interactions between pharmacists and male adults, supporting the price of condoms, expanding private sector condom distribution and the inclusion of sex education at the secondary school curriculum level.

### Conflicts of interest

None declared.

### Acknowledgements

The author extends his appreciation to the Research Center, College of Applied Medical Sciences and Deanship of Scientific Research at King Saud University for funding this research.

### References

- 1 Maticka-Tyndale E. Condoms in sub-Saharan Africa. *Sex Health* 2012; 9: 59–72. doi:10.1071/SH11033
- 2 De Coninck Z, Marrone G. Trends and determinants of condom use in Uganda. *East Afr J Public Health* 2012; 9: 105–11.
- 3 UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance. Sudan National AIDS Control Program 2004 Annual Surveillance Report. Available online at: [http://www.who.int/3by5/support/EFS2004\\_sdn.pdf](http://www.who.int/3by5/support/EFS2004_sdn.pdf) [verified 20 December 2013].
- 4 Joint United Nations Programme on HIV/AIDS and World Health Organisation (WHO). AIDS epidemic update 2010. Geneva: WHO; 2010.
- 5 Tompkins M, Smith L, Jones K, Swindells S. HIV education needs among Sudanese immigrants and refugees in Midwestern United States. *AIDS Behav* 2006; 10: 319–23. doi:10.1007/s10461-005-9060-8
- 6 Conserve D, Sevilla L, Younge S, Mbwambo J, King G. Condom use among HIV-positive sexually active adults and partner's HIV status in Dar es Salaam, Tanzania. *J Health Care Poor Underserved* 2012; 23: 191–203. doi:10.1353/hpu.2012.0010
- 7 Reynolds HW, Luseno WK, Speizer IS. The measurement of condom use in four countries in East and Southern Africa. *AIDS Behav* 2012; 16: 1044–53. doi:10.1007/s10461-012-0146-9
- 8 de Walque D, Kline R. Variations in condom use by type of partner in 13 sub-Saharan African countries. *Stud Fam Plann* 2011; 42: 1–10. doi:10.1111/j.1728-4465.2011.00259.x
- 9 Sarkar NN. Barriers to condom use. *Eur J Contracept Reprod Health Care* 2008; 13: 114–22. doi:10.1080/13625180802011302[Review]
- 10 Joint United Nations Programme on HIV/AIDS and World Health Organisation (WHO). Guidance on provider-initiated HIV testing and counselling in health facilities. Geneva: WHO; 2007.
- 11 Palekar R, Pettifor A, Behets F, MacPhail C. Association between knowing someone who died of AIDS and behavior change among South African youth. *AIDS Behav* 2008; 12: 903–12. doi:10.1007/s10461-007-9325-5
- 12 Bogart LM, Skinner D, Weinhardt LS, Glasman L, Sitzler C, Toefy Y, et al. HIV misconceptions associated with condom use among black South Africans: an exploratory study. *Afr J AIDS Res* 2011; 10: 181–7. doi:10.2989/16085906.2011.593384
- 13 Abdelrahim MS. HIV prevalence and risk behaviors of female sex workers in Khartoum, North Sudan. *AIDS* 2010; 24: S55–60. doi:10.1097/01.aids.0000386734.79553.9a
- 14 Zeidan AZ, Mohamed ZA, Mohamed OG, Nuha MB. Condom use among illegal multi-partners females in the Sudan. *Sudan J MedSci* 2011; 6: 195–8.
- 15 Smith AM, Jolly D, Hocking J, Benton K, Gerofi J. Does penis size influence condom slippage and breakage? *Int J STD AIDS* 1998; 9: 444–7. doi:10.1258/0956462981922593
- 16 Crosby RA, DiClemente RJ, Wingood GM, Salazar LF, Rose E, Levine D, et al. Correlates of condom failure among adolescent males: an exploratory study. *Prev Med* 2005; 41: 873–6. doi:10.1016/j.ypmed.2005.09.003
- 17 ASTM International. ASTM Standard D3492 - 08. Specifications for rubber contraceptives (male condoms). West Conshohocken: ASTM

- International; 2008. Available online at: <http://www.astm.org/Standards/D3492.htm> [verified December 2013].
- 18 Promodu K, Shammughadas KV, Bhat S, Nair KR. Penile length and circumference: an Indian study. *Int J Impot Res* 2007; 19: 558–63. doi:[10.1038/sj.ijir.3901569](https://doi.org/10.1038/sj.ijir.3901569)
  - 19 Crosby R, Yarber WL, Sanders SA, Graham CA. Condom discomfort and associated problems with their use among university students. *J Am Coll Health* 2005; 54: 143–7. doi:[10.3200/JACH.54.3.143-148](https://doi.org/10.3200/JACH.54.3.143-148)
  - 20 Scott-Sheldon L.A.J., Glasford DE, Marsh KL, Lust SA. Barriers to condom purchasing: effects of product positioning on reactions to condoms. *Soc Sci Med* 2006; 63: 2755–69. doi:[10.1016/j.socscimed.2006.07.007](https://doi.org/10.1016/j.socscimed.2006.07.007)
  - 21 Moore SG, Dahl DW, Gorn GJ, Weinberg CB, Park J, Jiang Y. Condom embarrassment: coping and consequences for condom use in three countries. *AIDS Care* 2008; 20: 553–9. doi:[10.1080/09540120701867214](https://doi.org/10.1080/09540120701867214)
  - 22 Hasnain M. Cultural approach to HIV/AIDS harm reduction in Muslim countries. *Harm Reduct J* 2005; 2: 23–31. doi:[10.1186/1477-7517-2-23](https://doi.org/10.1186/1477-7517-2-23)
  - 23 Gray PB. HIV and Islam: is HIV prevalence lower among Muslims? *Soc Sci Med* 2004; 58: 1751–6. doi:[10.1016/S0277-9536\(03\)00367-8](https://doi.org/10.1016/S0277-9536(03)00367-8)
  - 24 Hargreaves JR, Glynn JR. Educational attainment and HIV-1 infection in developing countries: a systematic review. *Trop Med Int Health* 2002; 7: 489–98. doi:[10.1046/j.1365-3156.2002.00889.x](https://doi.org/10.1046/j.1365-3156.2002.00889.x)
  - 25 Mohamed BA, Mahfouz MS. Factors associated with HIV/AIDS in Sudan. *BioMed Res Int* 2013. doi:[10.1155/2013/971203](https://doi.org/10.1155/2013/971203)