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Male condom use, multiple sexual partners and HIV: a prospective case-control study in Kinshasa (DRC)

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ABSTRACT

In the Democratic Republic of Congo no previous studies have assessed the factors associated with different patterns of condom use and with multiple sexual partners, and the association between condom use simultaneously taking into account multiple sexual partnerships, and HIV infection. We carried out a prospective case-control study. From December 2010 until June 2012, 1630 participants aged 15–49 getting HIV Voluntary Counseling and Testing in a hospital in Kinshasa were selected. Cases were new HIV diagnosis and controls were HIV-negative participants detected along the study period. We recruited 274 cases and 1340 controls that were interviewed about HIV-related knowledge, attitudes and behaviours. Among cases there was a high prevalence of multiple lifetime and concurrent sexual partnerships (89.8% and 20.4%, respectively) and most cases never used condoms with only 1.5% using them consistently. Condom use and multiple partnerships were associated with male, single and high-educated participants. An association was found between multiple lifetime partners and ‘any condom use’ (OR = 2.99; 95%CI: 2.14–4.19) but not with consistent use. Both having two or more multiple concurrent sexual partners or not using condoms were variables similarly and highly associated to HIV risk. The association found between having two or more concurrent sexual partners and HIV was slightly higher (OR = 3.58, 95%CI: 2.31–5.56) than the association found between never condom use and HIV (OR = 3.38, 95%CI: 1.15–9.93). We found a high prevalence of multiple lifetime sexual partners and an extremely high prevalence of inconsistent condom use, both strongly associated with HIV seropositivity. Local programmes would benefit from comprehensive interventions targeting all behavioural and sociocultural determinants.

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Introduction

In addition to the new biomedical strategies for HIV prevention that are currently being developed (Marrazzo et al., 2014), the underlying sexual behaviours responsible for most infections are still critical to prevent new transmissions. Thus, HIV prevention programmes must address the avoidance of early sex, the reduction of sexual partners and the correct and consistent condom use among people at risk (Centers for Disease Control and Prevention, 2014; Halperin et al., 2004).

Since the first condom report in 1563 (Fallopium, 1563), its effectiveness in preventing sexually transmitted infections (STIs) has been widely analysed (Centers for Disease Control and Prevention, 2014; Holmes, Levine, & Weaver, 2004; National Institutes of Health, 2001; Vera, Orozco, Soto, & Aburto, 2008; Winer et al.,

2006). HIV is the STI with stronger evidence supporting the preventive role of condoms (Centers for Disease Control and Prevention, 2014; Fitch et al., 2002). Right after HIV discovery, condom effectiveness in reducing the HIV risk was evaluated (Conant, Hardy, Sernatinger, Spicer, & Levy, 1986; Davis & Weller, 1999; Judson, Ehret, Bodin, Levin, & Rietmeijer, 1989; Pinkerton & Abramson, 1997; Rietmeijer, Krebs, Feorino, & Judson, 1988; Van de Perre, Jacobs, & Sprecher-Goldberger, 1987). Regarding heterosexual transmission, a 60–96% relative risk reduction has been estimated (Giannou et al., 2015; Lassi, Imam, Dean, & Bhutta, 2014; Liu et al., 2014; UNAIDS, 2004; Weller & Davis, 2002). A meta-analysis carried out by Giannou et al., 2015 evaluated HIV infection RRs after comparing “always” vs. “never”, and “always” vs. “not always” use and estimated

that, consistent use provide an approximately 70% relative reduction in HIV risk.

Although most HIV infections occur in sub-Saharan Africa (SSA), local research has been mainly focused on condom availability, use patterns and determinants and barriers of use. Less research has assessed condom effectiveness in Africa (Ahmed et al., 2001; Eaton & Hoesley, 2014; Hearst, Ruark, Hudes, Goldsmith, & Green, 2013; Hughes et al., 2012; Medley, Bachanas, Grillo, Hasen, & Amanyeiwe, 2015; Mindel & Sawleshwarkar, 2013; Peltzer, 2012;). A study carried out at 14 sites in Eastern/Southern Africa, in which serodiscordant couples received free condoms, found a per-act-risk relative reduction of 78% (Hughes et al., 2012). In the Giannou et al. review only 4 out of the 25 studies were African (Allen et al., 1992; Hira et al., 1997; Hughes et al., 2012; Kamenga et al., 1991). In all four studies, free condoms were distributed and as much as a 77% relative reduction in HIV risk was observed for consistent use (Giannou et al., 2015).

To achieve the maximum protective effect, condoms must be used consistently and correctly (Centers for Disease Control and Prevention, 2014; Food and Drug Administration; Workowski & Bolan, 2015) but in SSA use is still low and mostly inconsistent (MacQuarrie, Bradley, Gemmill, & Staveteig, 2014; Mutevedzi & Newell, 2014; Papo, Bauni, Sanders, Brocklehurst, & Jaffe, 2011; UNAIDS, 2014a). Objections to condoms are widespread due to culture, religion, misconceptions, stigma and other factors (Abdool Karim et al., 2012; Abdulai et al., 2012; Amo-Adjei, 2012; Carlos et al., 2015; Earnshaw et al., 2014; Exavery et al., 2011; Exavery et al., 2012; Hawkes et al., 2013; Hearst et al., 2013; Kajubi et al., 2005; Mantell et al., 2011; Maticka-Tyndale, 2012; Namisi et al., 2015; Padian, Buvé, Balkus, Serwadda, & Cates, 2008; Rwenge, 2013; Skovdal, Campbell, Nyamukapa, & Gregson, 2011; Ukwuani, Tsui, & Suchindran, 2003; UNAIDS, 2004; UNAIDS, 2014b). Moreover, programmes that address and provide free condoms, do not always give instructions on their correct use, or about breakage and slippage that can occur (Grasso et al., 2016; Remis, Alary, Liu, Kaul, & Palmer, 2014; Sanders et al., 2012; Spaar et al., 2010; Walsh et al., 2004).

To develop effective preventive programmes, epidemiological and behavioural evidence within each country in SSA is necessary (Abdool Karim et al., 2012; Kamwi, Kenyon, & Newton, 2006; Ogden, Gupta, Warner, & Fisher, 2011).

The Democratic Republic of Congo (DRC) has an HIV prevalence of 1.2% in the 15–49 aged general population, and of 2.6% in women and 0.3% in men in Kinshasa (Demographic Health Survey, 2014). No studies

have simultaneously evaluated on the general population condom use for HIV prevention also taking into account multiple sexual partnerships. In 1991 (when no antiretrovirals nor generalised Voluntary Counseling and Testing (VCT)-services were available in Kinshasa), a study evaluated among 149 serodiscordant couples the effect of a VCT programme (which promoted condoms) and collected data on condom effectiveness (Kamenga et al., 1991). Despite an increase in abstinence and in condom use six months after, 6 couples (4%) reporting condom use became HIV concordant due to inconsistent and incorrect use. Subsequent studies in Congo have just shown information about condom availability (which is not nationally ensured) (Bosmans, Cikuru, Claeys, & Temmerman, 2006), condom use (Laga et al., 1994), determinants (Kayembe et al., 2008; Ntumbanzondo, Dubrow, Niccolai, Mwandagaliwa, & Merson, 2006) and barriers for using condoms (Irwin et al., 1991; Kabamba Mulongo, Schirvel, Mukalay, Wa Mukalay, & Dramaix Wilmet, 2011; Kayembe, Fatuma, Mapatano, & Mambu, 2006). A recent cross-sectional study among people attending VCT in a rural area found a very low prevalence of consistent use and a non-significant association, in a bivariate analysis, between any condom use and HIV (Kautako-Kiambi, Ekila, Kama-Lemba, Wumba, & Aloni, 2015).

We analyse in a population receiving VCT at a hospital in Kinshasa: (1) the association of sociodemographic characteristics with condom use and consistent use; (2) with multiple sexual partnerships and (3) the association between condom use, simultaneously taking into account multiple sexual partnerships, and HIV infection.

Methods

Study design

Case-control study that evaluates the knowledge, attitudes and sexual behaviours associated with HIV.

Setting

Outpatient Centre at Monkole referral hospital in Kinshasa that provides VCT and treatment, and also screens blood donors for HIV.

Study participants

People aged 15–49 attending Monkole to receive VCT or as blood donors to whom VCT was offered. Those never HIV tested or with a previous HIV-negative result were accepted.

Cases and controls were defined based on the result of the HIV test. Along the study period (from December 2010 until June 2012) local researchers selected incident HIV+ cases as well as new diagnosed HIV-controls.

Sample size

When the study was designed, about 1000 people aged 15–49 annually used Monokole as VCT attendees or blood donors, with around 15% newly HIV+.

Considering a 90% response rate, we estimated that during 18 months about 1350 people could participate, with around 200 new HIV+ diagnosis (Grimes & Schulz, 2005). In logistic regressions about 10 events are needed for each parameter in the model (Hosmer & Lemeshow, 2013), so we were confident to simultaneously adjust for around 20 parameters.

Data collection

We collected information and compared lifetime exposures that occurred prior to the classification of our participants as cases or controls.

The interviewer-administered questionnaire (available in French and Lingala) was composed of closed questions and few open-ended questions and included 59 items on: sociodemographics, health-related aspects, perceived risk, HIV knowledge, information, attitudes, stigma and sexual behaviours. For this specific paper we evaluated the sociodemographic and behavioural data.

Laboratory analyses

A serum sample was analysed by the Determine®HIV-1/2 test. If positive, it was analysed by two other rapid tests: DoubleCheckGold® and Unigold®. A confirmatory test was not available and ‘undetermined’ tests were excluded from the analyses.

Statistical analysis

Initially we carried out a descriptive analysis of our participants’ sociodemographic and behavioural characteristics. Concerning sexual behaviours we first evaluated their use of condoms, which was collected by asking ‘Have you ever used a condom?’. The different answer options to this question were: ‘never’, ‘in some sexual relationships’, ‘in almost all sexual relationships’ or ‘always, in every sexual relationship’. We also recategorised this variable into (1) ‘any’ vs. ‘never’; (2) ‘a more consistent use’ (almost always/always) vs. ‘never/sometimes’ and (3) ‘consistent use’ (always) vs. ‘never/sometimes/almost always’. With regards to multiple

sexual partnerships, the questionnaire included different questions for concurrent sexual partners (‘Do you actually have multiple sexual partners’ (no/yes), ‘how many partners do you have?’) and lifetime sexual partners (‘how many lifetime partners have you had?’). The number of sexual partners was categorised as a dichotomous categorical variable (multiple sexual partners, yes/no).

We evaluated the association between sociodemographic characteristics and condom use and multiple sexual partnerships and additionally, we evaluated the association between sexual behaviours and HIV simultaneously taking into account both condom use and multiple sexual partnerships.

Multivariate unconditional logistic regressions were carried out with Stata 12.1.

Ethical issues

The study was approved by the Ethics Committee of the University of Kinshasa and the University of Navarra.

Oral informed consent was obtained, consistent with local clinical practices (Obermeyer et al., 2012; Wembo nyama, Mpaka, & Tshilolo, 2007).

Results

From December 2010 until June 2012, 274 HIV-positive cases and 1340 controls were identified. The response rate was 99.9%.

Sixteen HIV-undetermined participants and 59 who had never had sex, were excluded.

Table 1 shows that overall, our participants were mainly adults (25–49 year old), with a low/medium socioeconomic level and a secondary education level. Among cases the percentage of VCT attendees, women, adults, illiterate and widowed, separated or cohabitating was significantly higher than among controls. Regarding sexual behaviours, among cases the prevalence of multiple sexual partners (lifetime and concurrent) and of never condom use was higher than among controls. Thirty-nine percent of participants never used condoms and only 5.7% of participants reported consistent condom use, which was less frequent for cases than for controls (1.5% and 6.5%; $p = .001$).

With regards to the specific differences between the study subgroups (data not shown), among VCT attendees there were significantly more women than among blood donors (54.5% vs. 11.6%, $p < .001$) and a higher percentage of people of a high economic (11.1% vs. 4.2%, $p < .001$) and education level (21.1% vs. 11.5%, $p < .001$), divorced (5.3% vs. 0.9%, $p < .001$) and widowed people (4.9% vs. 0.1%, $p < .001$). Concerning sexual behaviours, among VCT attendees the percentage of

Table 1. Sociodemographic and behavioural characteristics of cases and controls.

	Cases (n = 274)	Controls (n = 1340)	p ^a
	%	%	
<i>Study subgroup</i>			
VCT	81.75	39.55	<.001
Blood donors	18.25	60.45	
<i>Sex (women)</i>	52.92	27.31	<.001
<i>Age (years)</i>			
15–24	13.5	36.19	<.001
25–49	86.5	63.81	
<i>Socioeconomic status</i>			
Low	47.08	32.54	<.001
Medium	48.54	59.4	
High	4.38	8.06	
<i>Education</i>			
No studies/Illiterate	12.04	2.84	<.001
Primary	9.12	2.39	
Secondary	67.52	77.84	
University	11.31	16.94	
<i>Marital status</i>			
Single	41.61	69.48	<.001
Married	33.58	24.48	
Widowed	11.31	0.52	
Separated/Divorced	10.22	3.88	
Cohabitation	3.28	1.64	
≥2 lifetime sexual partners	89.78	83.51	.009
≥2 concurrent sexual partners	20.44	7.91	<.001
<i>Condom use</i>			
Never	61.31	36.72	<.001
Sometimes	32.12	46.49	
Almost always	5.11	10.52	
Always	1.46	6.27	

^ap-value obtained by Chi² test or Chi² for linear trend for ordinal variables.

people with multiple concurrent partners was significantly higher than among blood donors (12.7% vs. 7.7%, $p = .001$) but there were no significant differences regarding the prevalence of multiple lifetime sexual partners (85.4% vs. 83.8%, $p = .382$) and of inconsistent condom use (86.1% vs. 83.9%, $p = .235$).

When we analysed the characteristics of participants associated with condom use and with having multiple sexual partners (Table 2) we found that men, people with university studies, single respondents and participants reporting multiple lifetime partners were more

likely to report any condom use and a more consistent use. However, significance for the association between educational level or for reporting two or more lifetime partners and condom use was lost for consistent use. Having concurrent sexual partners was not significantly associated with condom use. Frequency of condom use decreased with age, although the magnitude of this inverse association was low.

VCT attendees, men, and adults were more likely to report multiple sexual partners. Reporting 'any' condom use was associated with having multiple lifetime partners compared to 'never' use.

Both having two or more multiple concurrent sexual partners and not using condoms were variables similarly and highly associated to HIV risk (Table 3). The association found between having two or more concurrent sexual partners and HIV was slightly higher (OR = 3.58, 95%CI:2.31–5.56) than the association found between never condom use and HIV (OR = 3.38, 95% CI:1.15–9.93).

The magnitude of the association with HIV positivity was higher for concurrent than for multiple lifetime sexual partners and with regards to inconsistent condom use, the association with HIV was stronger for never use than for sometimes use, compared to always use.

Discussion

To our knowledge, this is the first study in the DRC that has simultaneously analysed the prevalence of different condom use patterns and information on multiple sexual partnerships and related this information to newly diagnosed HIV status.

We found an overall prevalence of 61% of condom use, with HIV+ people using them much less frequently than the negative controls. In the 2013–2014 Demographic Health Survey from the DRC (Demographic Health Survey, 2014) when women were asked about

Table 2. Characteristics of participants associated with condom use and with having multiple sexual partners.

	Condom use			Multiple sexual partners	
	Any use (n = 952)	OR (95%CI) ^{a,b}		OR (95%CI) ^{a,b}	
		Almost always/ Always (n = 242)	Always (n = 88)	Concurrent (n = 162)	Lifetime (n = 1362)
Study group (VCT compared to blood donors)	0.58 (0.42–0.69)	–	–	2.80 (1.92–4.09)	1.69 (1.14–2.50)
Sex (men compared to women)	1.48 (1.13–1.93)	1.72 (1.18–2.51)	1.93 (1.05–3.55)	3.73 (2.30–6.03)	2.07 (1.40–3.05)
Age (for each additional year)	0.98 (0.96–0.99)	0.97 (0.95–0.99)	0.93 (0.89–0.97)	–	1.07 (1.04–1.10)
Education (university compared to no studies/ primary)	3.14 (1.92–5.13)	2.91 (1.25–6.76)	–	–	–
Marital status (single compared to others)	1.85 (1.38–2.49)	3.12 (1.96–4.97)	2.63 (1.16–5.98)	–	–
≥2 lifetime sexual partners (compared to 1)	2.99 (2.14–4.19)	2.10 (1.24–3.56)	–	NA	NA
≥2 concurrent sexual partners (compared to 1)	–	–	–	NA	NA
Condom use (any compared to never use)	NA	NA	NA	–	2.91 (2.09–4.05)

^aAdjusted for all the variables listed in the table.

^bOnly statistically significant associations ($p < .05$) are shown.

contraception, only 6.7% reported using male condoms in Kinshasa (where condoms are used more frequently than in rural areas). This was even lower than the 8.7% found in the previous 2007 national survey. In this survey, behavioural information concerning condoms was collected for the last sexual encounter and for people reporting two or more sexual partners in the last 12 months. In that particular high-risk situation, 20% of women and 28% of men in Kinshasa reported condom use (14% and 31% in 2007). Among our study participants reporting multiple partnerships, the prevalence of 'any' condom use was close to 65%. We found higher prevalence than the official estimates, however, populations attending healthcare centres are more health-conscious (Wang, Aoumya, & Shanxiao, 2012).

The most important aspect for HIV prevention using condoms is not the overall use but the pattern of use, as inconsistent use can even lead to a higher STI risk (Centers for Disease Control and Prevention, 2014). In the 2013/2014 DRC survey, as in other African surveys, different condom use frequencies are not registered. A comparative publication from several SSA countries that did include information on different condom use patterns, showed that consistent use was rare: less than 1/6 women and 1/3 men reported any condom use at last sex, with consistent use being even lower (Mishra, Praween, Soumya, Yuan, & Shanxiao, 2009). Only 1.5% of our HIV+ cases and 6.5% of controls used condoms consistently. Thus, although there is evidence that in the DRC and other SSA countries condom use may have increased (UNAIDS, 2013), consistent use is still very low, particularly in high-risk sexual relationships.

We found, as many other African studies (Apondi et al., 2011; De Coninck & Marrone, 2012; Hearst et al., 2013; Kabamba Mulongo et al., 2011; Maticka-Tyndale, 2012; Michielsen et al., 2010; Mishra et al., 2009; Oyeyemi & Oyeyemi, 2012; Shewamene, Legesse,

Tsega, Bhagavathula, & Endale, 2015; UNAIDS, 2013), that male, younger and single participants and those with a higher education were more likely to use condoms. Participants with a higher lifetime number of sexual partners also reported a higher frequency of condom use.

Women in the DRC, as in most SSA countries, are particularly affected by HIV with an HIV incidence and prevalence higher than among men, especially among young women (1.2% and less than 0.1%, respectively) (Demographic Health Survey, 2014; Murray et al., 2014). However, condoms do not seem to be the magic bullet for reducing new infections among women. The DRC has a 75–100% dependency on international sources for HIV response (UNAIDS, 2013; UNAIDS, 2014a). A 2011 USAID audit found that only 30% of male condoms and 0% of female condoms were efficiently distributed (USAID, 2011), with important delays in provision and promotion. This can be generalised for many African countries where the donor supply provides around one condom per every ten women per year compared to eight condoms for men. And more critical than this lack of supply, are the traditional gender norms (Exavery et al., 2012; Geary & Bukusi, 2014; Karim, Baxter, Frohlich, & Karim, 2014; Mantell et al., 2011; Namisi et al., 2015; Padian et al., 2008). A recent UNAIDS gender-related report, described some women's barriers towards HIV prevention/treatment services, such as cultural beliefs, unequal power gender relations, stigma or mistrust (UNAIDS, 2014b). Thus, gender-related and cultural barriers need to be first overcome to improve the female adherence to any of the available prevention strategies, including condoms (Carlos et al., 2015; Green, 2011; Ogden et al., 2011).

We also found that younger participants were slightly more likely to report condom use than adults. At the 2014 DRC survey, around 30% of urban young women and 40% of men used condoms in their last sex, 18% and 40% when they had more than one sexual partner and 2% and 0.5% in HIV+ persons (Demographic Health Survey, 2014). When 2014 and 2007 surveys are compared, condom use has not changed much among young people (except for the HIV+ youth in which condom use has in fact decreased). Moreover, usually young people use condoms for contraception and not for HIV prevention (Maticka-Tyndale, 2012). In addition, the age of first sex (critical for HIV risk), remained similar in 2007 and 2014, with around 12% and 17% single, 15–24 aged, women and men having sex before age 15, and 42% and 55% before age 18. Multiple sexual partnerships among young people have not been reduced since 2007, with around 3% of women and 15% of men reporting 2 or more sexual partners in the previous year. Since

Table 3. ORs (95%CI) for having a positive HIV test for the different sexual behaviours.

	OR (95%CI) ^{a,b}
<i>Multiple concurrent sexual partners</i>	
No concurrent sexual partners	1 (Ref.)
≥2 concurrent sexual partners	3.58 (2.31–5.56)
<i>Multiple lifetime sexual partners</i>	
1 lifetime sexual partner	1 (Ref.)
≥2 lifetime sexual partners	1.86 (1.07–3.23)
<i>Condom use</i>	
Never	3.38 (1.15–9.93)
Sometimes	1.99 (0.68–5.87)
Almost always	1.83 (0.55–6.13)
Always	1 (Ref.)

^aAdjusted for sex, age, education, marital status, study group (VCT/blood donors), multiple concurrent sexual partners, multiple lifetime sexual partners and condom use.

^bInteraction between having multiple lifetime sexual partners and condom use was evaluated ($p = .731$).

risk avoidance measures offer a higher protection to prevent new HIV infections (Halperin et al., 2004; Okware, Kinsman, Onyango, Opio, & Kaggwa, 2005) and considering that condom availability remains low in these settings, preventive campaigns and VCT information must keep insisting on the benefits of delaying sexual initiation among adolescents and of avoiding multiple sexual partnerships for those sexually active. With regards to adults, the majority of those over 50, even those with multiple partners, do not use condoms (UNAIDS, 2014a). Consequently, youth-friendly and older-age specific HIV information services might have to reconsider how to inform about the preventive strategies for each population group and to increase the adherence to such measures. For example, among young people the uptake and impact can be improved with age-specific training to providers, flexible clinic hours, mobile services or even considering adolescents under 18 years in research so that interventions can be well adapted to them (Dellar, Dlamini, & Karim, 2015).

Our single participants were more likely to report condom use and consistent use. Other SSA studies, including Congolese, have consistently shown that single people are significantly more likely to use condoms than married or cohabiting, both for women and men, whether they are HIV+ or not (Ahmed et al., 2001; Anand et al., 2009; Ayiga, 2012; Exavery et al., 2012; Kabamba Mulongo et al., 2011; Reynolds et al., 2011).

Our highly educated participants were nearly three times more likely to use condoms than participants with no studies or primary studies. The 2007 and 2014 DRC surveys showed that condom use was more frequent for men and women with a higher level of education than for those with no studies. A higher education level has been associated with a higher consistent use and a lower educational level with not using condoms (Marshall et al., 2016; Pilapil et al., 2016). However, we found the highest prevalence of multiple partnerships in the highly educated, which clearly increases their risk (Green, Mah, Ruark, & Hearst, 2009; Hearst et al., 2013), despite the possible protection due to their education.

Apart from the mentioned socio-ecological factors, prevention programmes need to address all sexual risk behaviours. The last UNAIDS report found a significant increase in the number of sexual partners for some SSA countries. In Kinshasa the population reporting two or more sexual partners in the last year slightly decreased between 2007 and 2014 but we still found 10% and 88% of our participants reporting multiple concurrent or lifetime sexual partners, respectively. Men were more likely to report both multiple partnerships and since they are potential HIV transmitters to susceptible

women, strategies to prevent these behaviours need to involve both sexes.

No matter the type of multiple sexual partnerships, this behaviour was significantly associated with HIV infection in our study, whether condoms were used or not. We also found an association between inconsistent condom use and HIV status, with a higher magnitude for those never using than those using in some sexual relations compared to always use. Consequently, if those with a higher risk are using condoms only in some occasions, the benefits of condom use can be greatly offset since sex with multiple partners is highly prevalent. Today most studies regarding condom use do not take into account that condoms are not always used consistently or that sexual relationships are not always mutually monogamous. Local HIV prevention programmes need to therefore consider all these behavioural aspects, together with the underlying sociocultural and structural factors to have a real impact on the infection epidemic.

This study has some limitations. Firstly, it is based on self-report which can be associated with social desirability bias, and could lead to over-reporting condom use and under-reporting multiple partnerships (Hearst et al., 2013). Nevertheless, this bias would likely be present in both cases and controls, resulting in a non-differential bias of our estimates towards the null. Secondly, only a very low percentage of our participants reported consistent condom use which makes it difficult to adequately analyse the specific predictors of consistent use and the association with HIV. Another constraint is that we did not have information on the correct or incorrect use of condoms. Nevertheless, even if we had considered that participants reporting condom use always used them correctly, the figures for risk reduction would be far away from the goal of optimal protection. Finally, we did not collect information about anal/oral sex and cannot rule out these routes. Today there are still no estimates about the prevalence of these routes among the general Congolese population. We are collecting this information in two prospective cohorts in Kinshasa and will have data on this in the future.

This study also has some strengths. Firstly, participants didn't know their HIV status at the time of the survey so test results could not influence their self-report. Secondly, we evaluated condom use using four categories and not dichotomously, which allows investigating the different use patterns that can be observed in real life (Devine & Aral, 2004). Thirdly, participants did not receive any intervention pre-interview (i.e., condom counselling) and responses were therefore not influenced. Finally, as far as we know, this is the first study in Congo evaluating condom use patterns in participants

with a new HIV diagnosis taking into account the concomitant effect of multiple partners. In future studies we will also consider the different types of sexual partners (i.e., casual, stable) in which condoms are or not used (Lagarde et al., 2001; Omori & Abu-Raddad, 2016).

In summary, we found a very low prevalence of consistent condom use. Men, single and participants with a higher education were more likely to use them but also more likely to have multiple sexual partners. When these sexual behaviours were analysed altogether we found a significant association between multiple sexual partnerships and HIV infection, whether condoms were used or not. We found a stronger inverse association with HIV for consistent use than for inconsistent use compared to never use. However, the magnitude of the potential protection of inconsistent use seemed offset by the potential riskier effect of multiple sexual partners. In consequence, local HIV prevention programmes in Kinshasa might need to take into account all sexual behaviours from a more comprehensive and holistic approach. In addition, the underlying gender, age-related and sociocultural determinants might also have to be thoroughly addressed if an optimal HIV prevention is targeted.

Disclosure statement

No potential conflict of interest was reported by the authors.

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