

Hiv Prevention Among University Students In Sudan

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HIV PREVENTION AMONG UNIVERSITY STUDENTS IN SUDAN



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HIV PREVENTION AMONG UNIVERSITY STUDENTS IN SUDAN

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CHAPTER 1

INTRODUCTION

HIV EPIDEMIOLOGY

Global epidemiology of HIV

Since the emergence of the human immunodeficiency virus (HIV), which causes the acquired immunodeficiency syndrome (AIDS) in the early 1980s, it continues to represent an important public health threat in almost every part of the globe. Since the start of the epidemic, more than 75 million people have become infected with the virus and more than 32 million of them have died of AIDS-related illnesses globally. In 2019, it was estimated that around 1.7 million people were newly infected with HIV and around 690 000 people died of AIDS-related illnesses worldwide (1). The public concerns about HIV are not only due to its physical impact on the health of people living with HIV/AIDS (PLWHA) but also because of the social, psychological and economic impacts on the affected individuals and communities (2-4).

In 2016, the United Nations General Assembly's Political Declaration on Ending AIDS committed countries to the 90-90-90 target, which called for having 90% of people living with HIV being diagnosed, 90% of people diagnosed being on sustained antiretroviral treatment and 90% of those on treatment being virally suppressed by the end of 2020 (5). However, none of these targets was achieved and the progress towards ending AIDS as a public health threat by 2030 is currently off-track (6). Furthermore, multiple mathematical models have shown that COVID-19 has the potential to increase the number of new HIV infections and AIDS-related deaths due to service disruption in many countries, especially those in sub-Saharan Africa and other resource-poor countries (7).

HIV epidemiology in the Middle East and North Africa

The Middle East and North Africa (MENA) region, which includes 21 countries and a population of approximately 400 million, has the lowest HIV prevalence in the world ($< .1$ [$< .1 - .1$]) with only 230000 estimated adults and children living with HIV in 2020 (8). However, the region is still far from controlling HIV and the epidemic is still growing in many of the region's countries (9). The new HIV infections increased by 25% in 2019 as compared with 2010. It was estimated that in 2019 only 52% of the people living with HIV knew their HIV status, only 38% were on antiretroviral therapy (ART) and less than one third were virally suppressed, which was far from the 90-90-90 target (6).

Despite having the lowest HIV prevalence in comparison with the other regions, the MENA region has the slowest progress towards ending the epidemic, as shown by the incidence: prevalence ratio (IPR) (figure 1). The HIV incidence: prevalence ratio (IPR) is currently considered one of the important metrics used to evaluate the epidemic response and monitor the progress made towards the goal of ending the HIV epidemic. It is defined as the number of new infections occurring per year in a population divided by the number of persons living with HIV in the same population. The ratio combines two desirable conditions: long, healthy lives for people living with HIV and a reduction in new infections.

IPR ratio threshold of 3% indicates successful progress towards ending the epidemic (10). Although the global IPR was successfully reduced from 7% in 2010 to less than 4.4% in 2019 and reached only 3.5 in eastern and southern Africa, the MENA region showed the highest IPR in 2019 globally (8%). This was attributed to several factors, including the ongoing humanitarian emergencies, large-scale population movements, high levels of stigma against PLWHA and limited resources. Therefore, controlling the HIV epidemic in the region by 2030 is a big challenge. It requires scaling up the implementation of innovative prevention programmes and using evidence-informed approaches (6).

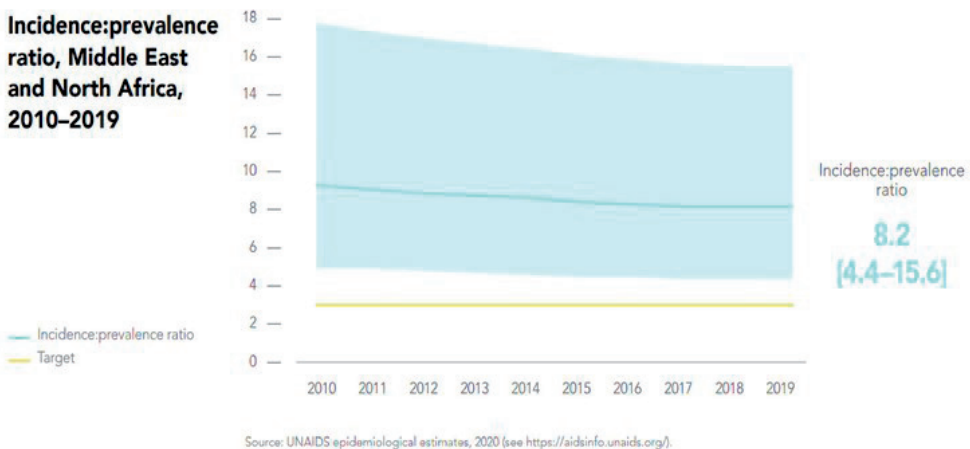


Figure 1: HIV Incidence: prevalence ratio in MENA region (Source: UNAIDS, 2020)

HIV epidemiology in Sudan

Sudan is one of the Arab and Islamic countries in MENA region (figure 2). The country has the highest HIV incidence mortality rates in the MENA region (9). The estimated number of PLWHA in 2019 was 46000. However, the country has a very low coverage of interventions related to 90-90-90 targets. In 2019, only 37% of the estimated number of PLWHA knew their HIV status, only 22% were on ART and only 10% of those on ART were tested for viral load. Therefore, the Sudanese national strategic plan for 2019-2025 focuses on scaling up the key interventions aiming to increase case detection, linkage to care and treatment, retention on treatment and improving the quality of ART services to reduce the gaps to the 90-90-90 targets. However, financing the HIV response in Sudan is totally dependent on external resources, which have been remarkably reduced. Moreover, the country is suffering from severe political instability that affects the whole health system and endangers implementing the national strategic plan. In addition to lack of finance, the political instability has resulted in a decline in HIV prevention services, including Post Exposure Prophylaxis (PEP), harm reduction and condom promotion in 2019 (11).



Figure 2: Map of Sudan

TRANSMISSION ROUTES AND RISK FOR HIV

HIV can be transmitted through the exchange of a variety of body fluids from infected individuals, such as semen, vaginal secretions, blood and breast milk. The virus could also be transmitted from a mother to her child during pregnancy and delivery (12). Some behaviours and conditions may put individuals at greater risk of contracting HIV. These include having unprotected anal or vaginal sex, having another sexually transmitted infection, sharing contaminated needles when injecting drugs, experiencing accidental needle stick injuries, including among health care workers and receiving unsafe injections, blood transfusion and tissue transplantation (12). Sexual transmission is the main route of transmission that fuel the epidemic globally. It was estimated that nearly 70% of HIV-1 infections are transmitted through heterosexual practices worldwide (13). In Sudan, HIV is predominantly transmitted through heterosexual practices as well (9).

The risk of heterosexual transmission of HIV is also influenced by several biomedical, behavioural and socioeconomic factors. A high viral load, the presence of genital ulcer disease and pregnancy increase the transmission risk, whereas male circumcision reduces it (13). Regarding the behavioural factors, a previous meta-analysis concluded that penile-anal sex carries a higher transmission risk than penile-vaginal sex (14). Inconsistent condom use, early sexual debut, having multiple or concurrent sexual partners and forced sex are all behaviours that can increase the risk of HIV transmission significantly (15). Moreover,

previous review studies revealed that both male to female (MTF) and female to male (FTM) HIV transmission rates are higher in low-income countries as compared to high-income countries; which points to the role of socioeconomic factors in HIV transmission (14).

UNIVERSITY STUDENTS AS A HIGH-RISK GROUP

University students are targeted by HIV prevention interventions in many countries because they are believed to be at a higher risk of acquiring HIV compared to the general population in these countries (16-18). This has been similarly observed in many countries in the MENA region, where increasing numbers of university students become involved in risky sexual behaviours (19-21). University Students in Sudan are no exception. A previous survey done by the Sudan National AIDS Program (SNAP) showed a rise in premarital sexual practices among university students in Sudan, from 6.5 to 12.5% between 2002 and 2010. It also showed low condom use among this group (32.4%) (22). Despite having no recent data, the country poverty and prolonged political instability are likely to have had a negative impact on the previous efforts to prevent HIV among this highly vulnerable group.

Several factors could explain why university students commonly engage in sexual risk behaviours. University students usually come from different socio-cultural backgrounds. Together, they begin a new autonomous life characterized by relations with the opposite sex at a younger age. This university lifestyle with diminished parental control and monitoring and increased peer pressure for the first time in their life commonly results in high-risk sexual behaviours (23-25). The poor comprehensive knowledge about HIV/AIDS and sexual reproductive health (SRH) among university students in countries lacking SRH in their curricula is also a significant contributing factor (26-28). In addition, poor access to HIV counselling and sexual health services due to unavailability, stigma and lack of confidentiality was previously identified as a determinant of high-risk sexual behaviours (25). Alcohol and drug use among this population could also affect their decision-making with subsequent involvement in high-risk behaviours, including unprotected sex with multiple sex partners (25, 29). Poverty is a leading cause of transactional sex among university students in different communities (30, 31). A recent study has concluded that transactional sex elevates the risk of HIV acquisition among young women and suggests its reduction as an important HIV prevention activity (32). Finally, the lack of coverage with behavioural and biomedical interventions increases university students' vulnerability to HIV. Therefore, it is necessary to target university students with well-designed interventions that address their high-risk sexual behaviours and their determinants.

HIV PREVENTION STRATEGIES

In the early 1980s, the HIV epidemic was initially considered a medical problem that should be managed by medical professionals and scientists using technical and biomedical solutions (33). However, soon after, the importance of behavioural interventions and their role in HIV prevention were observed. Since then, both biomedical and behavioural HIV prevention strategies have been used (34).

Biomedical interventions

HIV biomedical interventions prevent HIV transmission by blocking infection or decreasing infectiousness (35). They encompass male medical circumcision, use of barrier methods, use of oral antiretroviral therapy for prevention, treatment of sexually transmitted infections, harm reduction for intravenous drug users and HIV vaccines (35, 36).

Male medical circumcision (MMC)

Male medical circumcision (MMC) is considered one of the very effective interventions against HIV and other sexually transmitted infections that increase its risk (36). An early meta-analysis of 27 studies conducted in sub-Saharan Africa found strong evidence of an almost 50% reduction in HIV risk among circumcised men and a higher association among men at high risk (37). A recent study has also confirmed the protective role of voluntary male medical circumcision against HIV and other sexually transmitted infections among men and women in real-world scale up settings (38). Being an Islamic community, almost all of the males in Sudan are circumcised by the time they become sexually active, as circumcision is usually performed during early childhood according to the religious traditions (39). It has been suggested that universal male circumcision among Muslims could have a role in the low HIV prevalence in Islamic countries (40). Despite the concerns that MMC could increase risk behaviours among circumcised men, researchers found no risk compensation associated with MMC (41, 42).

Barrier methods for HIV prevention

Despite the revolutionary role of ART in HIV prevention, condoms remain of utmost importance for STI/HIV prevention. It has been suggested that condoms were first used as a contraceptive method by the Ancient Egyptians. However, the earliest description of condoms as a protective method against STI was in 1956 by the Italian anatomist Gabriello Fallopio. The original condoms were made from the cecum of sheep, calves, and goats. In the mid-1930s, liquid latex was used instead as it provides greater tensile strength and longer shelf life. In the later 1960s, plastic or polyurethane was used to produce thinner condoms with better heat transfer but less flexibility than latex condoms (43).

A recent systemic review and meta-analysis of 25 studies done in America, Europe, Asia and Africa, has been conducted to produce updated and more precise estimates of male

condom effectiveness in preventing HIV. According to this study, HIV-uninfected consistent condom users were 71–77% less likely than never or intermittent users to acquire HIV following repeated heterosexual encounters with an infected partner. The participants of most of the studies included in this meta-analysis were monogamous, which can lead to an overestimate of condom effectiveness compared to HIV incidence in non-monogamous sexual partners. Despite this limitation, the authors found that the protection offered by condoms in preventing heterosexual HIV transmission remains high, regardless of the study design, the geographic setting and the gender of the infected partner. They concluded that in synergy with other prevention measures, promoting condom use is very important (44). However, condoms are costly and not readily available in Sudan, which contributes to the observed low condom use (45).

Women in many countries could not negotiate male condom use, which makes them more vulnerable to HIV and other STIs. This warrants the need for an effective female initiated method for HIV and STI prevention (46). Therefore, the first polyurethane female condom (FC1) was approved in 1993. In 2009, it was replaced by a second-generation female condom (FC2) which was made of synthetic latex to reduce production costs. Currently, there are four female condoms: Cupid, FC2, Velvet and the Woman's condom and others are being developed with the aim of reducing costs and increasing acceptability (46, 47). A recent systematic review and meta-analysis study concluded that the use of female plus male condoms is more effective than the use of male condoms only in preventing STIs and may be as effective as the male condom only in preventing HIV(46).

Antiretroviral therapy for prevention

Previous randomized control and prospective cohort studies confirmed that highly active antiretroviral therapy (HAART) could effectively prevent HIV transmission among both heterosexual serodiscordant couples and MSM and suggested that the provision of ART to HIV-1 infected patients could reduce HIV transmission at the population level (48-50). In addition, antiretroviral therapy (ART) has been widely used to prevent mother to child transmission (PMTCT) effectively and as pre-exposure and post-exposure prophylaxis (PrEP and PEP) (34). These studies led to a shift in paradigm with greater emphasis on biomedical HIV prevention strategies at the expense of behavioural interventions. Furthermore, some scientists believe that the strategy of using ART as prevention (TasP) could be the game-changer of the battle against HIV/AIDS. Others even went further to call for the remedicalization of the epidemic (33). However, the preventive benefit of ART depends on several success factors, including the proportion of HIV-infected individuals in the population who know their HIV status, the proportion of those on treatment among the diagnosed, the proportion of the treated individuals who achieved and sustained viral suppression and the emergence of drug-resistant strains of the virus. Recent reports have shown a very low coverage with ART is in Sudan. It has been estimated that as low as 37% of the estimated number of HIV infected persons in the community knew their HIV status and only 22% of

them were on ART in 2019 (11). Furthermore, the success of ART-based interventions could be compromised by human behaviours such as the stigma and discrimination against PLWHA and poor adherence to ART (33, 51, 52). This underlines the importance of behavioural change interventions in HIV prevention.

Treatment of sexually transmitted infections (STI)

Sexually transmitted infections, including both ulcerative and non-ulcerative STIs, increase the risk of HIV transmission by 3-5 fold and HIV/STI co-infection increases the infectiousness of individuals with STI. This epidemiological synergy could be responsible for the high prevalence of HIV in some populations (53). A previous randomized clinical trial of syndromic treatment of bacterial STIs in Mwanza, Tanzania, found a 40% reduction in HIV incidence following the intervention (54). However, a similar trial in Uganda showed no difference (55). This could be explained by the differences between Tanzania and Uganda in the stages of the HIV epidemic or the prevalence of incurable STIs or possibly due to greater effectiveness of continuously available services than of intermittent mass treatment to control rapid STI reinfection (56). The high levels of stigma associated with STIs, as well as the weakness of the health system in Sudan, compromised efforts to diagnose and treat STIs to reduce HIV transmission among high-risk groups (11).

Harm reduction for drug users

Harm reduction is a strategy to prevent HIV transmission among intravenous drug users (IDUs) who are considered one of the most at-risk populations (MARPs). In addition to behavioural risk reduction, this approach includes needle exchange and opioid substitution to reduce the risk of sharing contaminated needles among IDUs (57). Previous ecologic studies showed a reduction in HIV infections in countries where these interventions were implemented (58, 59). Implementing harm reduction programs is challenging in the Islamic world because of the religious values and social norms prohibiting drug use and the laws criminalizing it (60). This is similarly observed in Sudan, where no harm reduction program has yet been implemented (11). However, some Islamic countries managed to implement these programs in response to the observed increased prevalence of IDUs and increased incidence of HIV among their populations (61). Lessons are to be learnt from these countries by the other countries where local stakeholders still oppose harm reduction programs.

HIV vaccines

Despite extensive research and many clinical trials, no HIV vaccine has been made available yet. Producing a vaccine against HIV is a challenge because of HIV genetic diversity and high mutation rates (62). However, there is an optimism that principles used to develop SARS-CoV-2 vaccines could inform HIV vaccine development and help researchers produce a vaccine with broad activity against several HIV variants. As with most biomedical technologies, HIV vaccines, when produced, are unlikely to be 100% effective (63). Moreover, consumer and

epidemiological models suggest that the HIV vaccine may increase risk behaviour as a result of individuals perception of protection (64). Therefore, behavioural change interventions will still be needed to demonstrate the effectiveness of the HIV vaccine (36).

Behavioural interventions

Behavioural interventions are defined as those strategies which attempt to promote abstinence from premarital sex, promote consistent condom use, delay onset of first intercourse, reduce the number of sexual partners, reduce stigma and discrimination against PLWHA, provide counselling and testing for HIV, encourage adherence to biomedical strategies, decrease sharing of needles and decrease substance use (65). To reduce HIV transmission, behavioural strategies should focus on individuals, couples, families, peer groups and networks, institutions, and entire communities to produce a radical and sustainable behavioural change in a sufficiently large number of people who are potentially at risk (65). This change could be achieved through different approaches, including educational, motivational, peer-group, skills-building approaches, and community normative approaches.

Promoting abstinence

The different terms used to define abstinence from premarital sex reflect how differently health professionals and religious scholars look at it. For example, health professionals commonly use terms such as “postponing sex” or “never had vaginal sex” or “refraining from further sexual intercourse if sexually experienced” as they consider it a health issue (66). On the other side, religious scholars describe abstinence as a “commitment to chastity”, reflecting the religious origin of their view (66). This difference in views has also been reflected in the response of these important stakeholders to abstinence promotion as a strategy to prevent HIV, not only in conservative Islamic communities but also in many western liberal communities (66-68). As a result, two different approaches have been widely used in behavioural interventions aiming to promote abstinence from sex to prevent HIV transmission: Abstinence-only-until marriage (AOUM) and abstinence-plus programs (66, 69).

Abstinence-only until marriage (AOUM) is the term given to programs that focus exclusively on promoting abstinence. AOUM programs consider abstinence from sexual activity the only certain way to avoid out-of-wedlock pregnancy, sexually transmitted diseases, and other associated health problems. This approach was first adopted in the United States in the early 1980s and received federal support and funding since 1996 (66). AOUM strategy has been supported by religious leaders and faith-based organizations in different communities as it looks at mutually faithful monogamous relationships in the context of marriage as the expected standard of human sexual activity, which is in line with all religious values. In addition, religious leaders agree with the messages conveyed by

AOUM programs emphasizing that sexual activity outside of the context of marriage is likely to have harmful social, psychological and physical effects (66, 67, 70, 71).

Oppositely, many health professionals have been criticizing AOUM programs both scientifically and ethically. They outline that AOUM programs lack scientific evidence of efficacy and often fail to prevent premarital sex (66, 72). Previous systematic reviews of abstinence-only curricula revealed that the best implemented and evaluated programs in high-income countries failed to delay initiation of sexual intercourse or to produce other demonstrable reductions in HIV risk behaviours (73-75). This failure was attributed to several reasons, including the fact that in western communities, few people remain abstinent until marriage; many do not or cannot marry, and most initiate sexual intercourse and other sexual behaviours as adolescents (66), although this may not be generalizable to Islamic communities. Another reason is the rising age of marriage globally due to poverty and the increased cost of marriage. This approach was also criticized for violating youth's right to health, information and life and providing misleading information about other protective methods (66, 72, 76).

Alternatively, abstinence-plus interventions, as defined by Dworkin and Santelli, "provide participants with a hierarchy of safe-sex strategies. At the top of the hierarchy is the promotion of sexual abstinence as the safest route to HIV prevention. Recognizing that some participants will not be abstinent, abstinence-plus approaches encourage individuals also to use condoms and to adopt other safer-sex strategies" (69, 77). Some of these interventions have positively impacted both short and long-term safe sex practices and abstinence (78-81). A previous systematic review also showed that the abstinence-plus approach effectively promoted both abstinence and condom use in high-income countries and had no undermining effect on any of the behavioural outcomes, including the incidence of sex, frequency of sex, sexual initiation, or condom use (69).

In addition, the abstinence-plus approach has the advantage of respecting the conservative communities' religious values and social norms while addressing health professionals' scientific and ethical concerns against AOUM programs. Some studies suggest that interventions solely focusing on sexual risk reduction and neglecting abstinence run a risk of becoming rejected since they are regarded as potentially promoting premarital sex in Muslim communities (31, 82). Therefore, incorporating abstinence, a religious obligation and highly valued norm in Muslim communities (31, 67), could promote religious leaders' support and facilitate programs implementation (83). Although abstinence, as a religious obligation, is frequently discussed and encouraged by religious scholars in both public and social media, promoting abstinence is not mentioned in the official reports of the National AIDS Program as a strategy that could be used to prevent HIV transmission in Sudan (11).

Promoting consistent condom use

In spite of the effectiveness of condoms as barrier methods against the sexual transmission of HIV, several personal, social and psychological factors contribute to acting as barriers

to consistent condom use (84). Therefore, the importance of behavioural interventions to promote consistent condom use was early recognized (85). A recent systematic review of behavioural interventions to increase condom use among college students in the United States showed a significant increase in condom use and condom use intentions among the students following the interventions. This review also revealed that including modules to increase self-efficacy for condom use and teaching participants where to get condoms and how to negotiate condom use with partners were associated with increased condom use or intention to use condoms (86). This review has some limitations. Firstly, only a few (7) studies were included in the review. Secondly, all of the studies included in this review looked only for consistent condom use as a behavioural outcome and used self-reported information, which is subject to inherent bias such as the social desirability bias (86). Nevertheless, a previous systematic review and meta-analysis of 67 behavioural interventions to increase condom use, conducted in North America (62%), Asia (17%), Africa (14%), Europe (5%), and South America (2%), found that behavioural interventions increase condom use and reduce HIV and STI incidence. Furthermore, addressing socio-cultural barriers was associated with increased condom use (87). In addition to considering both behavioural and biological outcomes, the interventions included in this meta-analysis were implemented in different communities and used different behavioural change approaches. However, these findings may not be generalizable as most of the studies included in this meta-analysis were conducted in the U.S. and it did not include studies from any of the Arab countries. In spite of its importance, previous attempts to promote condom use in Sudan were resisted by some religious scholars and community leaders as these attempts were believed to promote promiscuity and sabotage the community (39, 88). Therefore, condom promotion programs are only directed to MARPs with very limited coverage and interventions to promote condom use among university students hardly exist in Sudan (11).

Reducing stigma against PLWHA

Stigma against PLWHA undermines HIV prevention efforts as it hampers HIV testing, linkage to care, treatment adherence and viral load suppression (89). Therefore, it is essential to combat stigma and discrimination to achieve the 90-90-90 targets and end AIDS. Stigma reduction is currently considered an essential component of comprehensive HIV prevention programs (89) and behavioural change interventions play a significant role in reducing stigma. A previous large systematic review of 48 studies showed that behavioural interventions to reduce HIV stigma and discrimination were effective and recommended prioritizing such interventions (90). Nevertheless, interventions to reduce stigma and discrimination in Sudan have also been affected by the political instability and poor resources. This has been reflected in the reported high levels of stigma and discrimination against PLWHA in the country (11).

Combination HIV Prevention Strategies

Most of the currently used HIV prevention methods, including both the biomedical and behavioural interventions, are only partially effective and each has its barriers and limitations. As a result, it is now widely believed that no single HIV prevention intervention could be sufficient to control the pandemic (33, 34, 51). However, combining several partially protective strategies together might have additive or synergistic effects. Therefore, multi-component packages of evidence-based behavioural, biomedical, social and structural interventions are recommended for HIV prevention (33, 34, 51, 52). Large scale combined HIV interventions are lacking in Sudan and previously implemented interventions among key populations have witnessed marked reduction since 2019 as a result of the political instability and lack of finance (11).

UNDERSTANDING LOCAL EPIDEMICS AND THEIR DETERMINANTS

Effective interventions developed for one specific group in one country may not necessarily be similarly effective for a different group in the same community or another country and thus may need cultural adaptation in another community because the determinants for the behaviour may be different. Also, different communication methods may be needed (34). Although behavioural change is challenging, the highest chance for success can be expected if a theory and evidence-based approach is adopted to develop behavioural change interventions. Intervention Mapping (IM) is an example of such approaches that have been used successfully to change human behaviours (91). According to the IM protocol, the first step in intervention development involves assessing the problem, identifying the determinants of the behaviours related to the problem and understanding the epidemiological context in which the intervention will operate (91); this step is the main focus of this thesis. Two approaches could be helpful for this purpose; adopting a mixed research methodology (92) and using a theoretical framework (93).

Mixed research method

Both qualitative and quantitative research methods have been used to design HIV interventions. However, each research method has its specific limitations and weaknesses, which implies that a combination of qualitative and quantitative methods could be helpful to compensate for their mutual and overlapping weaknesses and overcome the limitations of each method (92). This is particularly recommended in the development and evaluation of complex interventions (94). Although they could be conducted simultaneously, the sequential qualitative-quantitative design is more commonly used. In this approach, a qualitative study is carried first with a limited number of participants to identify and explore core issues and develop theoretical concepts. This is followed by a quantitative study to

examine the qualitative findings and determine whether these findings could be generalized to the study population (92). Such a design has the advantage of overcoming two limitations of mono-method research: the limited transferability of qualitative research findings from a small sample size and the lack of local sociocultural knowledge that may prevent quantitative researchers from identifying the most critical phenomena in the investigated field. Starting with qualitative research provides researchers with local knowledge and helps the construction of standardized research instruments with meaningful and relevant items (92).

Theoretical framework (The Integrated Change (I-Change) Model)

Understanding HIV prevention behaviours, such as abstinence and condom use, implies understanding these behaviours' determinants. Health behaviour theories and models can be used for deepening such understanding of health behaviours and their determinants and changing health behaviours (93). Furthermore, these theories can inform the focus of the content of comprehensive HIV prevention interventions that aim to promote abstinence from premarital sex and consistent condom use among vulnerable groups. However, there is an enormous number of theories and constructs that have been used for this purpose. Integrating behavioural theories and models, which involves a critical analytic approach to identify how constructs interact with each other rather than just adding up theories, could produce new theories with added value (93). The Integrated Model, or the I-Change Model (figure 3), is derived from the Attitude – Social influence – self-Efficacy Model that can be considered as an integration of ideas of Ajzen's Theory of Planned Behaviour, Bandura's Social Cognitive Theory, Prochaska's Transtheoretical Model, the Health Belief Model, and goal setting theories. This model and its previous version (referred to as the ASE-model) have been used to explain various types of health behaviour (93), including understanding HIV prevention behaviours (95-99).

The I-Change Model distinguishes three phases of behavioural change: pre-motivational, motivational and post-motivational phases. The pre-motivational phase is the awareness phase in which individuals become aware of a problem and their own risks. This pre-motivational phase is determined by knowledge, risk perceptions, cues to action and cognisance about a person's own behaviour and whether it meets the recommendations. If awareness about a health problem and its risk behaviours is developed, individuals can proceed to the motivational phase in which they will consider taking up a health-promoting behaviour or reducing their risk behaviour. A person's motivation or intention to do this is determined by three factors: attitude, social influence and self-efficacy. A person's attitude consists of the perceived cognitive and emotional advantages and disadvantages of the behaviour. Social influences consist of the perception of others carrying out this type of behaviour (social modelling), the norms that people have concerning these behaviours (social norms) and the support they encounter from others in carrying out a particular type of behaviour (social support). Self-efficacy refers to a person's perception of his capability to

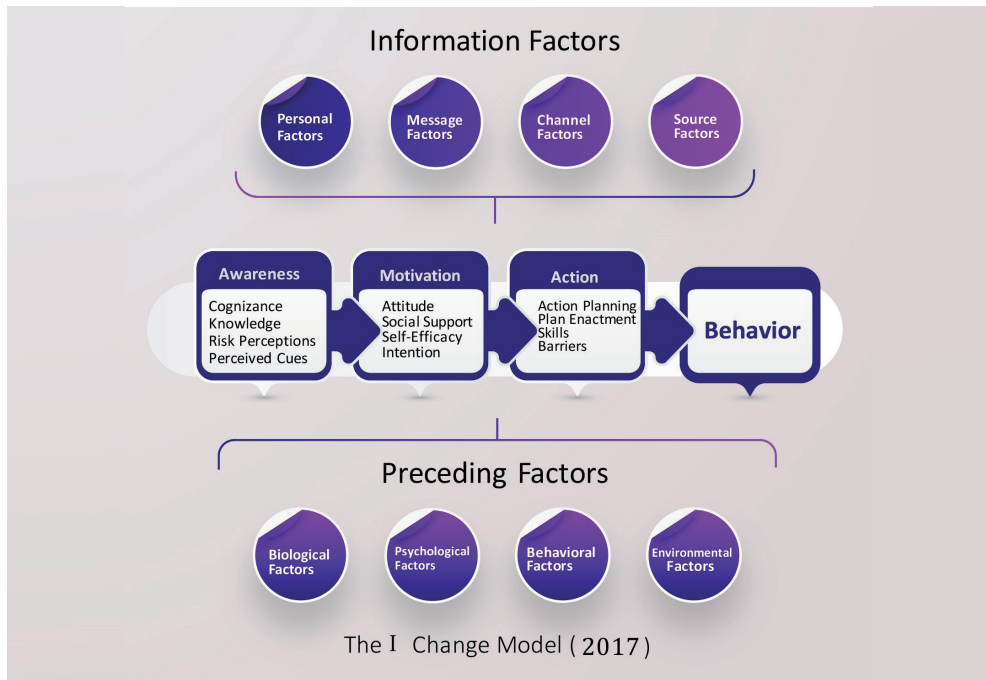


Figure 3 (I-Change Model)

carry out the type of behaviour in a variety of situations. Together, these motivational factors predict the intention to adopt certain healthy behaviour. The translation of intention into behaviour is the third and post-motivational phase which is determined by a person's level of intention that can range from not contemplating behavioural change to contemplating to change the behaviour very rapidly, self-efficacy, action planning, plan enactment and the level of barriers that are encountered.

Finally, as a psycho-social-ecological model, the I-Change model indicates that these factors are influenced by predisposing factors such as psychological factors (e.g. personality), behavioural factors (e.g. lifestyles), social and cultural factors (e.g. policies, cultural norms, religion), biological factors (e.g. gender, genetic predisposition) and information factors (the quality of messages, channels and sources used) (93, 100-104).

Psychosocial determinants of sexual behaviours among university students

Among university students, the psychosocial determinants of risky sexual behaviours, including premarital sex, multiple sex partners and condomless sex, have been extensively studied in many international studies (105-110). These included studies carried among university students in neighbouring African (111-117) as well as Arab and Islamic countries (118-121). Although knowledge, cues to action, risk perception, attitude, social influence

and self-efficacy were all identified as factors influencing students' sexual practices in many studies, differences exist. Some of these differences may reflect the cultural differences between liberal and conservative communities (122), while others could be attributed to socioeconomic variations (123).

A previous study among youth in Lusaka, Zambia, revealed that "high levels of knowledge concerning HIV/AIDS was protective against ever having had sex among both males and females, and was associated with a lower number of lifetime sexual partners and lower odds of having had more than one partner in the last three months among males". It was also associated with a higher probability of condom use at last sex among males but not females (124). Another study conducted in Rwanda found quite contradicting results; HIV knowledge, including basic knowledge and knowledge of the protective effect of having one uninfected faithful partner, had no association with risky sexual behaviour (RSB). More interestingly, knowledge of the protective effect of using condoms was positively associated with having multiple sex partners in the past year; but was not significantly associated with condom use (125). These mixed research results regarding the role of knowledge and gender differences point to the importance of exploring the association between HIV knowledge and risky sexual behaviours among university students in Sudan for a better focus of HIV interventions among this population. However, in Sudan, hardly any research exists concerning the determinants of Sudanese students' sexual behaviours, including premarital sex and consistent condom use. Although a previous study identified knowledge about AIDS transmission as a predictor of condom use among visitors to voluntary counselling and testing (VCT) centers in Khartoum (126), this result may not be generalized to university students. A more recent cross-sectional study has reported serious gaps in comprehensive correct HIV/AIDS knowledge among university students in Sudan, especially among females; however, the correlation between poor knowledge and RSB was not investigated (127).

Watching pornography has been identified as an important cue that predicts risky sexual behaviours among university students (128-130). This has also been reported in some conservative Muslim communities with strict anti-pornography laws (131-133). Prior research indicated that repeated watching of pornography could lead to the normalization, acceptance, and integration of sexual risk activities, such as condomless sex, into one's own sexual practices (134). Despite these important research findings and their implications on HIV intervention development, little is known about the role of watching pornography in RSB among university students in Sudan. The association between alcohol consumption and engagement in risky sexual behaviours among university students has been observed in many non-Muslim communities (135-137). Although this association may exist in some Muslim communities, including Sudan, its contribution to HIV spread among university students in Sudan is unlikely to be considerable because alcohol is banned in Sudan on religious grounds and law and is not practised openly in public (138).

There is a remarkable inconsistency in research findings regarding the role of HIV risk perception in university students' risky sexual behaviours. In 2014, a study was conducted

to assess and compare HIV risk behaviours and perception of the risk of HIV infection among university students from three countries with cultural, religious and ethnic differences: US, South Africa and Turkey. The study revealed significant differences in risk perception among the students in the three countries, with marked gender differences in all countries as well. The researchers found “no agreement between engaging in risky sexual behaviour and self-perception of HIV risk among South African female students, while the agreement was poor for US male and female students, Turkish male and female students, and South African male students”(139). A cross-sectional study among Lebanese university students found that students who perceived the danger of risk behaviours were more cautious and concluded that health education programmes to increase risk perception among university students could reduce health risk-taking behaviours in Lebanon (140). In Iran, low perceived susceptibility of getting HIV/AIDS infection was significantly associated with increased chances of risky sexual behaviours (141). In Sudan, a previous survey had also revealed a low perception of HIV risk among university students, but the association between their HIV risk perception and sexual behaviours was not studied (22). Therefore, research is needed to fill this gap.

University students` attitude towards premarital sex and condom use has been identified as one of the motivational determinants of university students` risky sexual behaviours (21, 142-144). Nevertheless, students` attitudes vary between countries with different sexual norms and religious values. In Iran, an example of a conservative and religious community, a previous study showed that university students` attitude towards abstinence was generally positive and students` religiosity was positively correlated with their attitude towards abstinence (145). Oppositely, a previous study conducted among university students in South Africa, an example of a more liberal community, found a positive attitude of both males and females towards premarital sex with no significant gender-related differences (146). However, sexual norms and attitudes towards sexual behaviours are changing substantially. As a result of modernity and urbanization, these behaviours become more permissible and these changes may have implications on the HIV spread in communities (147, 148). Therefore, continuous monitoring of these changes is vital. Unfortunately, little is known about Sudanese university students` attitudes towards risky sexual behaviours and how these attitudes correlate with their sexual behaviours.

Research findings suggest that social norms and peer influence are important predictors of university students` risky sexual behaviours, including premarital sex and condom use (149-151). Parents also play a significant role in influencing youth sexual behaviours (152, 153). In addition to monitoring, a recent study among young adults in Malaysia has identified comfort, information and value as important family sexual communication dimensions associated with sexual behaviour and attitude. According to that study, these dimensions of family sexual communication are associated with delayed sexual initiation, safe sex behaviours and less open-minded sexual attitudes (107). Although sexual communication among family members in liberal communities is permissible (154), it remains a taboo in

most Islamic cultures where discussing sexuality out of marriage is seen as inappropriate (67). In Sudan, the influence of parents, peers and other social networks on university students' sexual behaviours has been poorly studied.

Self-efficacy to abstain from premarital sex and condom use self-efficacy are both important determinants of university students' intentions and behaviours, as reported by several previous studies (155-158). Due to the importance of self-efficacy as a predictor of consistent condom use, several parameters have been developed to evaluate condom use self-efficacy and its impact on actual condom use. Condom Use Self-Efficacy Scale (CUSES), which was originally developed for English speaking American population, is one of the widely accepted and valid instruments used for this purpose. A previous study was conducted among university students in Ghana to assess the suitability of CUSES for Ghanaian youth. The authors concluded that CUSES was culturally appropriate for Ghanaian youth, but they suggested some adaptations. They also "cautioned researchers against the use of the original CUSES without validation in African settings and contexts"(159). This alludes to the importance of understanding the influence of cultures and contexts on self-efficacy and its impact on university students' risky sexual behaviours. Unfortunately, to the best of our knowledge, this area has never been studied in Sudan.

In conclusion, a paucity of research exists outlining the psychosocial determinants of premarital sex and condom use in Sudan in general and among university students in particular.

Aims of the current thesis

Although university students in Sudan are considered at higher risk of HIV because of their increased engagement in unprotected premarital sex, they still lack behavioural interventions that could minimize their exposure to HIV. Considering the social contexts, HIV prevention packages that combine both behavioural (abstinence from premarital sex) and biomedical interventions (consistent condom use) could be helpful. However, little is known about the psychosocial determinants of these behaviours among this population. Since this knowledge is crucial for developing and implementing such intervention, this thesis aims to explore and identify the psychosocial determinants of abstinence from premarital sex and consistent condom use among university students in Sudan.

Outlines of the thesis

This thesis is divided into two parts:

Part 1. Psychosocial determinants of abstinence from premarital sex

To identify the psychosocial determinants of abstinence from premarital sex among this highly conservative community, a mixed research methodology was adopted with a sequential qualitative-quantitative design. Initially, a comprehensive qualitative study using semi-structured interviews was conducted among university students to explore the

psychosocial determinants of abstinence from premarital sex. The findings of this study are described in **chapter 2**. This was followed by an online quantitative assessment of the psychosocial determinants of abstinence from premarital sex as described in **chapter 3**. The I-change model was used as a theoretical framework in both studies to better understand students' behaviours and their determinants.

Part 2. Psychosocial determinants of consistent condom use

In the second part, the psychosocial determinants of consistent condom use among university students were studied using a sequential qualitative-quantitative mixed research methodology as well. In the first qualitative study, the psychosocial determinants of consistent condom use were explored through semi-structured interviews with a sample of university students. The findings of this study are described in **chapter 4**. This was followed by an online quantitative assessment of these determinants, as described in **chapter 5**. The I-change model was also used as a theoretical framework in both studies.

Finally, **Chapter 6** discusses the main findings of each study and how this thesis adds to the field. Recommendations for further research and implications on a combined HIV intervention development, adoption and implementation are provided. The impact paragraph highlights the practical, scientific and societal relevance of this dissertation.

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CHAPTER 2

ASSESSING SEXUAL PRACTICES AND BELIEFS AMONG UNIVERSITY STUDENTS IN KHARTOUM, SUDAN; A QUALITATIVE STUDY

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ABSTRACT

University students in Sudan are more at risk of contracting HIV than the general population, due to a high rate of sexual activity and low uptake of preventive measures such as condoms. Hence, they are considered an important target for HIV prevention programs. This study explored students' beliefs about abstinence and premarital sex. Thirty semi-structured individual interviews were conducted, based on constructs from the Integrated Change (I-Change) Model. The study sample included 16 (53%) male and 14 (47%) female university students. Their average age was 21.2 years (Range 18-27 and SD 2.5). Both sexual abstainers (N = 19) and sexually active students (N=11) perceived HIV severity and susceptibility. Most of the participants had a positive attitude towards abstinence. However, the sexually active students also perceived some advantages of engaging in sexual practices, such as sexual pleasure and proving adulthood. Sexually active students more often mentioned to be influenced in their sexual practices by their peers than by their families. Sexually active students reported lower self-efficacy to refrain from sex than abstainers. Interventions that seek to promote abstinence among those willing to achieve this should stress the advantages of abstinence from sex until marriage, offer tools to resist peer pressure and enhance self-efficacy to abstain. These findings can be used to develop comprehensive HIV prevention programs that primarily promote abstinence among university students who are not yet sexually active but also consider promoting condom use and other safer-sex practices among those who are sexually active. These interventions should also be gender-sensitive to address the needs of both male and female students.

Keywords:

Sudan; HIV; sexual behaviours; university students; I-Change Model

INTRODUCTION

Sudan is one of the largest Islamic countries in Africa. Its population is about 34 million, of which about half are between 10 and 35 years of age with almost equal gender distribution (Sudan National AIDS Program [SNAP], 2014). Following the separation of South Sudan, it has been estimated that about 95% of the population are Muslims. A survey conducted in 2002 has shown that Khartoum state had the highest HIV prevalence in Sudan. According to that survey, the prevalence among university students was 1.1 %, raising concerns about the risk of HIV spreading among this population group (SNAP, 2002). A previous survey has shown a rise in premarital sexual practices among university students in Sudan; from 6.5 to 12.5% between 2002 and 2010 while condom use is still very low among this group (32.4% during last sexual intercourse) (SNAP, 2010). These changes have also been observed in comparable Arab and Islamic communities (Massad et al., 2014; Raheel, Mahmood, & BinSaeed, 2013). HIV is still a public health problem in Sudan. In 2016, the estimated number of new HIV infections in Sudan was 5000 [1900–9400]. It was also estimated that 56 000 [34 000–87 000] people were living with HIV in Sudan in the same year (UNAIDS, 2017).

Condom promotion programs as an effective HIV prevention strategy are difficult to implement in many Islamic countries where all types of extramarital sex are forbidden. It has been tried in some Islamic countries to promote condom use by enforcing messages about the importance of health and the preservation of human life in Islam. However, this issue still causes a significant tension and lack of trust between health policymakers and religious leaders who believe that condom promotion will promote immorality and promiscuity (Barmania & Aljunid, 2016; Kamarulzaman, 2013). In Islamic communities, social norms expect sexual abstinence; virginity at the time of marriage remains a virtue, while sex outside marriage is considered sinful (Zain Al-Dien, 2010). However, recent studies among university students in some Islamic countries have shown that many students engage in premarital sex. Moreover, the majority of sexually active students reported having multiple sexual partners and inconsistent condom use. They also reported a very low level of HIV/STI risk perception. Watching pornography has been observed as a common predictor of sexual behaviour among this population as well (Khalajabadi Farahani, Akhondi, Shirzad, & Azin, 2018; Raheel et al., 2013). As explored in a previous qualitative study, youth in Islamic communities may engage in premarital sex for several reasons including personal pleasure, challenging the culture, proving manhood, facing financial constraints and inability to marry (Massad et al., 2014).

A recent meta-analysis of 63 trials conducted in non-Islamic communities to reduce the risk of sexually transmitted infections in adolescents concluded that the interventions which did not promote abstinence were more successful in promoting condom use (Morales et al., 2018). Another meta-analysis that included 67 studies mostly in the United States also found that the interventions which focused on abstinence as a goal were less successful in reducing the sexual risk of HIV (Johnson, Scott-Sheldon, Huedo-Medina,

& Carey, 2011). However, it could be argued that these results may not be generalisable to Islamic communities where abstinence from sex until marriage is the norm. Besides, previous research has shown that the interventions which incorporate a community's social norm are more likely to be accepted and more extensively implemented (Marston & King, 2006; Willems, 2009). Despite these arguments, the findings of these meta-analysis studies highlight the importance of adopting a more comprehensive approach to HIV prevention. Therefore, comprehensive HIV prevention programs that aim to promote sexual abstinence among those who are not yet sexually active in addition to promoting condom use and other safer-sex practices among the sexually active could be a useful strategy to reduce HIV infection in Islamic communities, such as Khartoum. Some of these interventions have positively impacted on both short and long-term safe sex practices and abstinence (Aarons et al., 2000; Jemmott III, Jemmott, & Fong, 1998; O'Donnell et al., 2002; Underhill, Operario, & Montgomery, 2007). A systematic review of such interventions has affirmed that this approach has no undermining effect on safe sex or abstinence messages (Underhill et al., 2007). Comprehensive HIV programs are also more likely to be accepted among religious leaders than purely harm reduction strategies and could also play an essential role in building trust and encouraging religious leaders to participate in HIV control (Trintapoli, 2011). However, to be effective, such interventions need to address, amongst other things, the most salient beliefs students have relating to sexual abstinence. So far, that information is not available for university students in Sudan.

The main objective of this study was therefore to explore sexual abstinence, sexual practices and the pre-motivational, motivational and post-motivational beliefs about abstinence among university students in Khartoum. Since, to the authors' knowledge, sexual behaviour and beliefs regarding voluntary abstinence have not been studied in-depth within this population before, a qualitative design was used (Power, 2002). The I-Change Model was used as a theoretical framework for this purpose.

The Integrated Model for Change (I-Change Model), (figure 3) integrates several social cognitive theories including the Theory of Planned Behaviour, The Health Belief Model and Socio-Cognitive Theory (Eggers et al., 2017) and has been successful in predicting health-related behaviours, including sexual health behaviours (de Vries et al., 2014; Dlamini et al., 2009; Eggers et al., 2016; Huver, Engels, & de Vries, 2006). The I-Change Model distinguishes three phases: a pre-motivational, motivational and post-motivational phase (de Vries et al., 2003). The pre-motivational phase is the awareness phase in which individuals become aware of a problem and their own risks. Awareness is determined by knowledge, risk perceptions, cues to action and cognisance about their own behaviour. If awareness about a health problem and its risk behaviours is developed, individuals can proceed to the motivational phase in which they will consider taking up a health-promoting behaviour or reducing their risk behaviour. A person's motivation or intention to do this is determined by attitudes, social influence and self-efficacy (de Vries, Mesters, Steeg, & Honing, 2005; de Vries, 2017). A person's attitude consists of the perceived cognitive and emotional advantages

and disadvantages of the behaviour (de Vries et al., 2005). Social influence perceptions are determined by the perception of others carrying out a specific type of behaviour (social modelling), the social norms and the social support to adopt the behaviour (de Vries et al., 1994). Self-efficacy refers to a person's perception of their capability to carry out a type of behaviour in a variety of situations (de Vries, Dijkstra, & Kuhlman, 1988). Together, these motivational factors predict the intention to adopt certain healthy behaviour. The translation of intention into behaviour is the third and post-motivational phase which is determined by a person's level of intention, self-efficacy, action planning, plan enactment and the level of barriers that are encountered (Eggers et al., 2017).

METHODS

Design

For the purpose of this study, a qualitative study design was used and 30 semi-structured individual interviews were conducted. This study adheres to the Qualitative Research Review guidelines (RATS) (Clark, 2003).

Recruitment and participant selection

A purposive sample of 15 university students from five non-religious universities (Three public and two private) and with different characteristics was initially invited to participate in the study. This sample included both male and female students with varied sexual histories (including sexual abstinence), socio-economic statuses, backgrounds (rural or urban), fields of study, current academic year and university type attendance. Additional participants were recruited by the already selected students (i.e., snowball recruitment); interviewing continued until data saturation was reached (Kitzinger, 1995).

Data collection

Measurement

An interview guide was designed by the research team to refer to during the interviews. As the Integrated Change Model served as the framework, a deductive approach was used to guide the development of the semi-structured interview questions (Elo & Kyngäs, 2008). The questions were designed to explore abstinence, sexual practices and their pre-motivational, motivational and post-motivational determinants, including knowledge, risk perception, attitude, social influence and self-efficacy. Table 1 below summarises the interview guide. A pilot study was performed with five university students other than those who participated in the main study. Based on their feedback, minor linguistic modifications to the interview guide were made such as using the term "abstinence from sex until marriage" instead of "abstinence from sex" and using "premarital/ extramarital sex" instead of "sex".

Procedure

The individual interviews were conducted in August 2014 by the principal researcher and two well-trained HIV counsellors (a male and a female) with experience in conducting qualitative interviews. Individual interviews were held at the private counselling rooms of the Voluntary Counselling and Testing (VCT) centres inside their universities or the students' hostels. Each participant was interviewed separately and only the participant and the interviewer were present during each interview. Each interview lasted between 50 to 75 minutes. Each participant was asked to have the interview audio recorded. All male participants agreed, while most female participants refused for privacy concerns. For the ten female students who refused audio recording their interviews, detailed written notes were taken by their interviewers during the interviews and these notes were then included in the analysis. The interviews were carried in Arabic and all the audio-recorded interviews were transcribed verbatim and revised by the interviewers before starting the data analysis.

Data analysis

Transcribed interview data and written notes were revised and validated by the researcher and his assistants. Based on the interview questions and the collected data, an initial coding scheme was designed and agreed upon by the research team. Additional sub-codes were added to the coding scheme during the coding procedure. Data were analysed using Nvivo version 10. Data were interpreted and themes were integrated and linked to obtain a rich and deep understanding of the data collected (Bazeley, 2009). The important themes identified were supported by quotes from the participants' interviews.

Ethical consideration

The procedures followed were in accordance with the ethical standards of the institutional and national research committee and with the Helsinki declaration of 1975, as revised in 2008. Ethical approval was obtained from the Directorate of Research, Ministry of Health, Khartoum State in July 2014. All participants were informed about the objectives of the study and the confidentiality of their data. To protect their privacy, all identifying information was deleted from the data and codes were used instead. They were also informed that participation is voluntary. Informed consent was then obtained from all individual participants included in the study.

RESULTS

To check the validity of the coding process, two interviews were fully coded by the principal researcher and an assistant, as well as all interviews for a selection of codes (n=5). The inter-coder variation was then calculated using both the percentage of agreement and Kappa. The

Table 1: Summary of study interview guide

A.	
General personal and demographic data	Age
	Gender
	Marital status
	Type of university
	Field of study
	Family residence
	Sexual behaviour (abstainer or sexually active)
B.1.	
Exploring the participant's behaviours and beliefs about premarital and extramarital sex.	Introduction
	B.1.1. What do you think about the premarital and extramarital sexual practices among university students?
	Knowledge
	B.1.2. What do you know about HIV and its transmission and prevention
	Risk perception
	B.1.3. What are/could be the risks that can be associated with these sexual behaviours?
	Attitude
	B.1.4 What are/could be the disadvantages of engaging in premarital/extramarital sex?
	B.1.5 What could be potential advantages of engaging in premarital/extramarital sex?
	Social influence
	B.1.6 Which people would support you to practice premarital/extramarital sex?
	B.1.7 Who would be against you practising premarital/extramarital sex?
	Self-efficacy
	B.1.8 When will it be difficult for you to resist being engaged in premarital/extramarital sex?
	Other factors
	B.1.9 What are the other factors which encourage you to be engaged in premarital sex?

B.2. Exploring participant's behaviours and beliefs about abstinence from sex.	Introduction	B.2.1. What do you think about abstinence from sex until marriage?
	Attitude	B.2.2. What are/could be the advantages of abstaining from sex until marriage?
		B.2.3. What are/could be for you the disadvantages of abstaining from sex until marriage?
	Social influence	B.2.4. What role if any could abstinence from sex until marriage play to protect you from getting HIV?
		B.2.5. Who would support you to remain abstinent from sex until marriage?
		B.2.6. Who would be against you remaining abstinent from sex until marriage?
	Self-efficacy	B.2.7. When is/would it be difficult for you to remain abstinent from sex until marriage?
	Other factors	B.2.8. What are the other factors that encourage you to remain abstinent from sex until marriage?

results showed an agreement percentage of 98.8 (92.6-100) and Kappa of 0.88 (0.61- 0.98), indicating good inter-coder reliability.

Characteristics of the participants

Thirty university students were interviewed in this study. The sample included 16 male and 14 female students studying at six different universities in Khartoum state (Sudan). All of the participants were Muslims and their age ranged from 18 to 24 years (M=19). Eleven respondents (six males and five females) reported being currently sexually active. Table 2 below summarises the participants' characteristics.

Sexual practices among university students

Most of the sexually active participants, including both male and female students, indicated that they had heterosexual relations with multiple sex partners. Sexual relations among university students were mostly incidental and not part of steady relationships as one of them explained, *"Most of my sexual relations were accidental and temporal and only for lust"* (23-years-old male, sexually active). Most of the participants also declared practising sex without condoms. One of them said, *"only one of the girls with whom I had sex asked me to use a condom and I had one at that time. The rest of the girls were not much concerned about that and did not mind having sex without a condom"* (21-year-old male, sexually active).

Both male and female abstainers considered abstinence the behaviour which everybody needs to adopt. As seen by a female participant, abstinence is *"a basic principle as it preserves our dignity and position in the community"* (18-year-old female, abstainer).

Knowledge

Most of the male and female abstainers and sexually active participants had some knowledge about HIV and the way it is transmitted. Unprotected premarital sex, multiple partners and anal sex were all identified as risky sexual behaviours. Despite this knowledge, more than half of the male abstainers reported clear misconceptions about HIV infection and its transmission. One of them believed that *"It is very dangerous to have infected people in the community because the virus can be transmitted through saliva and using common drinking cups."* (24-year-old male, abstainer). Besides, many sexually active male participants had misconceptions about condom use and its protective role against HIV. Some of them had never seen condoms before, and the majority lacked knowledge on how to use condoms. Generally, it was observed that female participants had higher knowledge about HIV than male participants.

HIV Risk perception

No difference in the perception of susceptibility to HIV was observed between the abstainers and the sexually active or between the male and female participants. All of them

Table 2: Characteristics of the study participants

	Sexually active			Abstainers		
	Male	Female	Total	Male	Female	Total
Total number of participants	6 (20 %)	5 (17 %)	11 (37 %)	10 (33 %)	9 (30 %)	19 (63 %)
Age group						
18 -20 years	2 (7 %)	2 (7 %)	4 (13 %)	5 (17 %)	4 (13 %)	9 (30 %)
21-24 years	4 (13 %)	3 (10 %)	7 (23 %)	5 (17 %)	5 (17 %)	10 (33 %)
Residence						
Khartoum state	4 (13 %)	3 (10 %)	7 (23 %)	7 (23 %)	6 (20 %)	13 (43 %)
Other states	2 (7 %)	2 (7 %)	4 (13 %)	3 (10 %)	3 (10 %)	6 (20 %)
Type of university						
Public	3 (10 %)	3 (10 %)	6 (20 %)	3 (10 %)	3 (10 %)	6 (20 %)
Private	3 (10 %)	2 (7 %)	5 (17 %)	7 (23 %)	6 (20 %)	13 (43 %)
Field of study						
Medical field	2 (7 %)	2 (7 %)	4 (13 %)	6 (20 %)	5 (17 %)	11 (37 %)
Art & Education	4 (13 %)	3 (10 %)	7 (23 %)	4 (13 %)	4 (13 %)	8 (27 %)

perceived the risk of getting HIV if they practised sex as high. They all believed that being university students put them at higher risk because they were *“more likely to practice sex with many partners and it is difficult to know if these partners have AIDS or not”* (21-year-old male, sexually active). Although all of the participants also believed that HIV is a serious problem, female abstainers seemed to have a higher perception of severity than the other participants. One of them described HIV as the most serious disease and another called it the plaque of the century.

Cues to action

Different types of cues were mentioned by both male and female students. These cues were believed to influence their tendency to remain abstinent or become sexually active. Some female abstainers expressed how they were encouraged to abstain after hearing HIV infected persons tell their own stories and experiences of living with HIV. One of them said *“one day; I saw an infected person inside my university. He was talking about his story. I felt very sorry for him as he was young. I started to think about his family and what they did when they found out that he had HIV. Then I decided never to practice sex before marriage”* (22-year-old female, abstainer). Some of the abstainers also pointed to the rule of some religious cues such as listening to spiritual advice about abstinence, reading the Holy Quran and praying, which they considered important cues to abstinence.

On the other side, the male and female students who were sexually active also expressed different cues that encouraged them to practice sex. Some sexually active females admitted that the urgent need for money was one of the most important cues to practice sex. Among the sexually active male students, girls` seduction and watching internet pornographic movies were considered the main cues to sexual practices, *“the girls in our university wear very attractive clothes, which raises our lust. We cannot control ourselves, especially when we watch the pornographic videos exchanged through Whatsapp and Facebook”* (23-year-old male, sexually active).

Attitude towards abstinence and sexual practices

Both male and female participants, including those who are sexually active, had a positive attitude towards abstinence. Almost all of them believed in the religious, social, psychological, physical and academic advantages of abstaining from sex until marriage. Expressing his positive attitude towards abstinence, one of the female abstainers said, *“Abstinence from sex helps me to concentrate on my university study. It makes me more close to Allah because these practices are forbidden in our religion and Allah will not be satisfied with us. By abstaining, I preserve my dignity and my family`s reputation. I also protect myself against diseases”* (24-year-old female, abstainer). Another sexually active male student compared between abstinence and sexual practices saying, *“I do not think that by abstaining and avoiding sexual relations I will lose anything because believing in abstinence and adhering to this belief is the best feeling. This is a feeling which is much*

greater than sexual joy and pleasure. I regret that I did not maintain my chastity” (24-year-old male, sexually active).

Most of the male and female participants including the sexually active students expressed a negative attitude towards premarital and extramarital sex. They indicated that these sexual relations are religiously forbidden sins and described them as impolite, unacceptable and immoral behaviours. *“Such things should never happen; I wonder how they do that. Students should not do such wrong deeds”* (24-year-old female, abstainer), *“In my opinion, if one fails to control himself when having sexual desire or lust, there will be no difference between him and the animals. However, sometimes it happens to me that I follow my desires and forget the consequences”* (24-year-old male, sexually active).

Despite this negative attitude, sexually active male and female participants shared some perceived advantages of premarital sex, such as responding to the natural drives and enjoying sexual pleasure. However, each group also had their own perceived advantages. Many of the male students disclosed that they practised sex to prove masculinity, adulthood and sexual ability to their peers. A few of them also claimed that having sex would prevent the harmful effects of semen stagnation. Additionally, some male students believed that practising sex during exam times could alleviate academic stress. On the other hand, some female participants pointed to the financial benefits of having sexual practices. However, most of these perceived advantages of sexual practices were deemed immediate but temporal and were usually followed by negative emotions such as regret, *“It is only temporal pleasure and satisfaction that lasts for one or two hours to leave you with sorrow and regret when you start to think about the consequences”* (21-year-old male, sexually active). This was observed among both male and female students.

Regarding the perceived disadvantages of premarital sex, most of the sexually active participants, regardless of their gender, described an association between their sexual practices and mental distress and social stigma: *“the worst thing is the psychological pain of guilt and regret in addition to the continuous thinking about my reaction if one day I find one of my sisters in a similar condition. This fear and stress last for months. I start to cry and cry as I have hundreds and hundreds of questions for which I do not have answers. I feel remorse and become unable to do my daily activities. Even if I do anything, I do it without interest”* (21-year-old male, sexually active). They also talked about physical illnesses, legal consequences and poor academic performance as unfavourable results of their sexual practices.

Socially, many participants believed that sexual practices could spread immoralities, spoil the youth and increase the number of illegal children. Premarital sex was also considered a gateway to alcohol and drug addiction. The abstainers and sexually active participants of both gender discussed the association between premarital sex and the social stigma. However, female participants were more concerned about its profound negative impact on family reputations, *“I know that many people will criticise me if they know that I am practising sex. My family will be affected, as well. Any man who decides to be engaged*

with one of my sisters or with me if he knows that I have sexual relations; indeed, he will change his mind" (21-year-old female, sexually active). Premarital sexual practices were also thought to be associated with criminal problems such as rape crimes, suicidal attempts and illegal abortions.

Physically, both the abstainers and sexually active students talked about the association between premarital sexual practices and HIV and other sexually transmitted infections. One of the male abstainers asserted that premarital sex could cause impotence and infertility.

Academically, some participants described how some girls were prevented from completing their university study, fearing the shame that might be brought to their families because of their sexual practices. Premarital sexual practices also affected some university students' academic performance as declared by a participant, *"Students become very busy with sex. One of my colleagues, whenever I sit with him, he starts to talk about his sexual adventures. He can spend all day talking about sex"* (24-year-old male, abstainer). Most of the expressed disadvantages were universally believed to affect female students more than the males due to the social norms and traditions which look at female virginity as something of great value not only for the girl but also for her family, tribe, society and even her future offspring.

Social influence on sexual behaviour

Most of the participants considered the university community as a major driver for sexual practices among the students. However, both male and female abstainers pointed to the role of their family members, especially parents, who were believed to be the main supporters of abstinence. Their influence was indirect in most of the cases, due to the social norms which prohibited talking openly about sexual issues between family members as participants mentioned. Female abstainers perceived greater family influence on their sexual behaviour since their engagement in sexual practices could affect the whole family reputation and bring shame to them much more than their male partner. This was indicated by one of them who said, *"when I was accepted to join the university, my family talked to me about the university community and the different groups of people there with both good and bad manners. They advised me to select my friends carefully. They also told me to be very serious with any boy who alluded to [sex]"* (18-year-old female, abstainer).

On the other side, most of the sexually active students, especially male students, declared that they were more influenced by their peers than by their families as one of them admitted; *"I am not too close to my father to talk to him frankly about sex but my friends are closer because we are at a similar age. I tell my close friend about many things that happen to me while I cannot do that with my dad or mom. My peers are always persuasive"* (18-year-old male, sexually active). Seniors and sexually active peers were believed to be the main supporters who encouraged new male and female students to practice sex as one of the female participants mentioned, *"my university friends encouraged me a lot to practice sex. We are very much affected by our senior colleagues whom we consider our models"*

(19-year-old female, sexually active). One of the male participants also described how he was pushed by his peers to practice sex saying, *“One day, I was invited by some girls at the university to have sex. When I refused, they started to talk about me with my friends. They questioned my manhood”* (21-year-old male, sexually active). Another one said *“I always listen to my friends talking about sex and the different ways of doing it: vaginal, anal and oral sex. Listening to these things makes me very eager to practice it”* (23-year-old male, sexually active). Many male and female students also pointed to the role of media and internet websites in promoting sexual practices among students. The pornographic movies could be easily accessed and exchanged between students through their smartphones as one of them expressed, *“Many times before, I was about to practice sex. The internet has a great effect. It is one of the most encouraging causes because we can stay hidden from peoples` eyes and search porn websites which raise our lust. It is the easiest way to go astray”* (20-year-old male, abstainer).

Of equal importance, the participants, regardless of their gender or sexual behaviour, pointed to the role of religion and religiosity. All of them believed that religious principles act against premarital sexual behaviours. However, male abstainers more often mentioned to be directly influenced by the religious scholars at mosques who support abstinence and discourage all forms of religiously forbidden sexual relations. One of them said *“The Imam of our mosque gives special care to spiritual and faithful education. He always talks about extramarital sex as a religiously forbidden and immoral behaviour”* (20-year-old male, abstainer). Religion, as implied by some participants, not only supports abstainers to remain so but also makes some sexually active students contemplate changing their sexual behaviour and become abstainers. This role of religion was expressed by one of the sexually active students who said, *“Premarital sex is a sin which Allah warned us not to commit it. I know this very well but sometimes I fail to overcome my desires and I forget. Then I remember again and feel sorrow and regret. The last time I had sex, I listened to Azan [i.e., call for prayers] but did not reply to it because I was busy with sex. When I finished, I felt pangs of remorse and swore never to practice [premarital] sex again”* (21-year-old male, sexually active).

Self-efficacy

Compared with the sexually active participants, abstainers, especially females, seemed to have higher self-efficacy to remain abstinent from sex until marriage. One of the female students expressed her confidence in her ability to stay abstinent and said, *“inside my university, I am so cautious in my relations. I avoid anything that may lead me to practice these behaviours from the start. This is why I have never faced such things”* (19-years-old female, abstainer). Another one added, *“I do not think that I face any difficulty in remaining abstinent as long as I am fully alert”* (19-year-old female, abstainer).

Conversely, many sexually active male and female participants perceived themselves as lacking the capability to resist the problematic situations that encourage them to practice

sex as one of them disclosed, *“To stop having sex is something challenging. Even if I manage to abstain for one month or two, I cannot abstain until marriage. Many times before, I decided to abstain but I failed”* (23-year-old male, sexually active). This lack of confidence was also affirmed by another participant who declared, *“I find it difficult to resist my desires when a partner shows me the attractive parts of his body and arranges a safe place for sex. I have become so addicted to it that I no longer care about the dangers of these relations and the diseases they may cause”* (21-year-old female, sexually active).

The difficult situations affecting both male and female students' self-efficacy to abstain from sex until marriage included watching sexual and pornographic movies, practising masturbation and consuming alcohol and drugs. Having free time and being alone with the partner at home or in isolated hidden places were also believed to increase the chance of engaging in sexual activity. The majority of the male students also described how they were seduced by girls uncovering their hair, exposing some parts of their bodies, using perfume or kissing and hugging each other in front of them. One of them said, *“every day we face exciting things in the university community that push us to do these things. Everybody knows that girls have become very attractive nowadays by the way they dress, walk and talk. We cannot resist their attraction”* (23-year-old male, sexually active). On the other side, the need for money was identified as one of the challenges that mainly affected some female students' ability to abstain. One of the sexually active girls described how she felt it difficult not to have sex whenever she had an urgent need for money. She said, *“I am convinced that I should abstain from premarital sex but I always hesitate and return to sex whenever I need money”* (24-years-old female, sexually active).

Action plans

In their attempts to remain abstinent from sex until marriage, male and female abstainers relied on adherence to religious values, not watching pornographic movies and avoiding potential sexual partners. When asked about his plans to remain abstinent, a male participant replied, *“whenever these ideas come to me, I immediately get rid of it by reading the Holy Quran and religious books. Sometimes I go to my Sheikh to ask him. I know that the problem is in having free time. The more free time we have, the more Satan will lead us astray”* (24-year-old male, abstainer). Additionally, some male abstainers talked about filling their free times practising hobbies to avoid thinking about sex.

Female abstainers also had their own action plans such as avoiding social relations with male students and not sharing *Whatsapp* and *Facebook* groups with them. Moreover, seeking financial support from some charity organisations assisted some of the sexually active girls to abstain as one of them expressed, *“Recently, I have started to abstain from sex. I have been much encouraged by the health education program of an organisation as well as the income-generating project they provided me with”* (24-year-old female, sexually active).

DISCUSSION

The main objective of this study was to explore sexual abstinence, sexual practices and beliefs among university students in Khartoum for which we interviewed 11 sexually active students and 19 students that were not.

Consistent with previous studies in similar Arab countries (Massad et al., 2014; Raheel et al., 2013), the study participants viewed practising (unprotected) sex as a fairly common behaviour among university students. This change in sexual behaviours after starting at the university has also been observed in several studies in different communities (Chanakira, O’Cathain, Goyder, & Freeman, 2014; Farrow & Arnold, 2003; Othero, Aduma, & Opil, 2009). Concerning awareness, some misconceptions about HIV and its transmissions were identified but no marked difference in HIV-related knowledge was observed between the abstainers and sexually active students. However, some abstainers lacked conceptual knowledge about HIV transmission while many sexually active students lacked knowledge about how to protect themselves against HIV. Female students seem to have more comprehensive knowledge and fewer misconceptions about HIV than their male counterparts, which could be attributed to having different sources of knowledge. In contrast, a previous study conducted in Nigeria reported lower HIV knowledge among females than males (Oginni, Adebajo, & A Ahonsi, 2017). Therefore, further evaluation of the gender-related difference in HIV knowledge is needed to identify the educational needs of both male and female students.

Perceptions of HIV susceptibility did not seem to be different between abstainers and sexually active students in this study as well although some previous studies identified HIV risk perception as an important predictor of risky sexual behaviour (Akwara, Madise, & Hinde, 2003; Nkomazana & Maharaj, 2014). Most of the students perceived their increased vulnerability to HIV due to their increased social freedom as university students and increased chances of engaging in sexual behaviours. No difference in the perception of HIV susceptibility was observed between male and female students. However, female students expressed a higher perception of HIV severity. The association between HIV and the forbidden sexual behaviours and the severe social consequences of disclosing females’ premarital sex rather than the impact of HIV on health may justify this difference in perceived seriousness of HIV. Parallel to previous research (Green & Witte, 2006; Tannenbaum et al., 2015), our findings suggested that participants’ experience with people living with HIV/AIDS (PLWHA) could increase their fear of contracting HIV and thus influence their sexual behaviour. This may recommend the use of fear appeals in HIV-prevention messages and the involvement of PLWHA in HIV risk reduction interventions. In contrast, some studies suggested that fear appeals in HIV-prevention messages may not be effective in changing HIV sexual risk behaviour (Albarracin et al., 2005; Earl & Albarracín, 2007). Moreover, it has been suggested that such messages may be harmful as they may increase the stigma and discrimination against PLWHA (Bastien, 2011). However, the influence of fear appeals on sexual risk behaviours is believed to be dependent on different personal factors such as

self-efficacy as well as the social context of the audients (Bastien, 2011). Therefore, more research is needed to explore the influence of such messages on this population.

Regarding students' attitude towards abstinence and premarital sex, the study showed that both abstainers and sexually active students had a positive attitude towards abstinence, with virginity highly valued, especially among female abstainers. Generally, there was agreement about the potential advantages and disadvantages of premarital sexual behaviours among both abstainers and sexually active respondents. However, sexually active students tended also to value the perceived temporary but immediate advantages of practising premarital sex while abstainers considered the long-term physical, mental, social, religious, academic and criminal disadvantages of these sexual practices. Looking at sex as a sign of masculinity and manhood was observed in this study as well as some previous studies (Fleming & Davis, 2018; Fleming, DiClemente, & Barrington, 2016; Massad et al., 2014) and affected many male students' attitude towards premarital sex. Addressing this concept within health communication and promotion interventions using discussions and arguments seems to be important (Eldredge et al., 2016; Mulugeta & Berhane, 2014). Our findings also suggest that communication strategies need to address the feelings of anticipated regret that may occur when refraining from abstinence (Eldredge et al., 2016). Moreover, to build a positive attitude towards abstinence from sex until marriage, some messages should be tailored to address the gender differences in perceived advantages of premarital sex.

Regarding social influence, peer pressure appeared to be very influential in both male and female students' sexual behaviours, especially among the junior students. This finding is consistent with many previous studies (Fearon, Wiggins, Pettifor, & Hargreaves, 2015; Mulugeta et al., 2014; Othero et al., 2009; Tura, Alemseged, & Dejene, 2012). In our study, direct active peer pressure was observed as an important mechanism of peer influence on students' sexual behaviour. The role of peers in young people sexual behaviours is poorly studied in this community but several mechanisms have been identified through research in other communities. These include the perceived peers' norms favouring sex, affiliation with antisocial peers, providing opportunities for meeting potential sexual partners and active peer pressure (Capaldi, Stoolmiller, Clark, & Owen, 2002; Cavanagh, 2004; Van de Bongardt, Reitz, Sandfort, & Dekovic, 2015). Therefore, more investigation is needed to explore the role of the other mechanisms of peer pressure and identify differences between male and female students in this regard. This exploration is fundamental to design effective, tailored interventions to mitigate peer influence (Bingenheimer, Asante, & Ahiadeke, 2015). Also to alleviate peer pressure, students need to be psychologically immunised against pressure and equipped with some skills to resist it (Eldredge et al., 2016).

On the other hand, our study pointed to the role of parents and other family members in supporting abstinence, especially among female students. Our findings also paralleled some previous studies and suggested that the imbalance between moderate family influence and high peer pressure could have a substantial impact on student's sexual practices

(Legesse, 2012; Tan & Gun, 2018). Although the involvement of parents and family members in abstinence-promoting interventions may be beneficial to mitigate peer influence, the feasibility of family involvement in such programs may be questioned. Therefore, reliance on social inoculation and peer resistance methods (Compton, Jackson, & Dimmock, 2016) may be more relevant for university students; methods also tried and shown to be effective in other countries (Parker, Ivanov, & Compton, 2012).

In addition, the study identified the role of religious leaders, as very influential and trustworthy role models, in supporting abstinence until marriage, a conclusion also shared with some previous studies (Abu-Moghli, Nabolsi, Khalaf, & Suliman, 2010; Trintapoli, 2011). Religious leaders can be deeply involved, trained and encouraged to participate in HIV control and abstinence-promoting interventions (Abu-Moghli et al., 2010; Ucheaga & Hartwig, 2010). Their participation may enrich such programs with religious messages to build a positive attitude towards abstinence and enhance self-efficacy to abstain from sex until marriage. Their involvement in designing and implementing such programs could also increase their commitment to HIV prevention and facilitate their use of a common language with public health workers, which will, in turn, create an enabling environment to implement other HIV harm reduction strategies (Barmania et al., 2016; Trintapoli, 2011).

Concerning self-efficacy and in line with some previous studies, our findings identified self-efficacy as an important determinant of sexual behaviour among university students as well (Taffa, Klepp, Sundby, & Bjune, 2002; Viseskul, Fongkaew, Settheekul, & Grimes, 2015). We observed a higher level of self-efficacy to remain abstinent among female students when compared to male students. This observation could explain why females tended to remain abstinent while more male students engaged in sexual practices. Several factors affecting students' self-efficacy to abstain from sex until marriage both positively and negatively were uncovered. Male and female students appeared to be challenged by different difficult situations that reduced their self-efficacy to abstain. Seduction by girls, watching pornographic videos and alcohol affected male students' ability to refrain from premarital sex.

On the other hand, the urgent need for money seemed to have a more significant effect on female students' sexual behaviours as observed in a similar previous study. However, it could be argued that some female students talk about their need for money only to justify their sexual behaviour. Therefore, it is recommended to include socioeconomic evaluation in future research to explore the association between poverty and female students' sexual behaviours, including both commercial and transactional sex (Longo et al., 2017).

Realising strong self-efficacy to cope with such situations is vital in order to provide students with sufficient confidence to be able to refrain from premarital sex. Considering the diversity of factors influencing their self-efficacy to abstain, male and female students should be prompted to list their own barriers, plan their individual coping responses to overcome these barriers and practice these coping responses. Self-monitoring of the behaviour could also be useful where students are encouraged to keep a record of their

sexual behaviour to find out why and when they fail to abstain. Cue altering, changing a stimulus that elicits the behaviour, is also one of the successful methods of overcoming barriers (L.K et al., 2016). This method was also mentioned by some of the participants who described how they changed sexual stimuli by reading the holy Quran or practising their hobbies.

Practice implications

Despite the argument against abstinence promotion programs in many countries, this study highlights the importance of these programs in Islamic communities like Sudan where abstinence from sex until marriage is the norm, sexual practices are commonly followed by social, psychological and legal consequences and condom promotion alone is not yet a feasible and socially acceptable approach to reduce HIV infections. However, to prevent HIV among university students in Sudan, promotion programs with a more comprehensive approach (including both voluntary abstinence and safe sex practices) are needed. Such programs are required to address the different psychosocial determinants identified in this study. Of equal importance and considering the differences in the psychosocial determinants of abstinences and sexual practices between male and female students, these interventions should also be gender-sensitive. Misconceptions about HIV and its transmission must be addressed and risk perception could be raised by encouraging the students and helping them to perform personal risk assessment properly. To build a positive attitude towards abstinence, the promotion program should stress the advantages of abstinence from sex until marriage and help the university students to give higher value to the long-term advantages of abstinence as compared to the temporary advantages of sexual practices. This could be achieved through different behavioural change techniques such as arguments, self-reevaluation and the anticipated regret method (Brewer, DeFrank, & Gilkey, 2016). As revealed by the study, addressing peer influence should be an essential component of the program as well. The program could include training in pressure resistance skills as well as social inoculation methods to mitigate peer pressure. Considering the importance of self-efficacy as a determinant of sexual behaviours among this population, the promotion program should also aim at enhancing students' confidence and ability to overcome the observed abstinence barriers. Suggested self-efficacy enhancement strategies include verbal persuasion, self-monitoring of behaviour, planning coping responses and cue altering. Alternatively, and for those who do not intend to abstain from sex until marriage, stimulation of condom use, for instance, should be addressed through the promotion program as well. It also seems to be essential to involve religious leaders, teachers, nurses and other health professionals in delivering such programs to fill the huge gap in sexual health education in school curriculum.

Strengths and limitations

This is the first study that explores the sensitive issues around sexual behaviours among both male and female university students in Sudan in-depth. The participants felt very much at ease with the interviewers because of the precautions that were taken to protect their identity. Yet, the sample only consisted of 30 university students. Thus, it may not be representative of the Sudanese student population. As the study was qualitative, no statistical inferences can be made regarding the most significant factors. Hence, a follow-up study using a longitudinal quantitative approach is recommended.

CONCLUSION

HIV prevention among university students in Sudan requires comprehensive programs that promote both abstinence from sex until marriage and condom use and other safe sex practices. To promote abstinence from sexual practice until marriage, which is in accordance with the Quran and Islamic values, these programs should stress the advantages of abstaining from premarital sex, offer tools to resist peer pressure and enhance self-efficacy to abstain. At the same time, programs for students who are unwilling or perceiving themselves as incapable of voluntary abstinence may also be needed in order to prevent unwanted pregnancies and sexually transmitted diseases, including HIV. Research is required, however, to investigate how such programs implementation could be facilitated by involving religious leaders and the Islamic values of compassion and prevention of harm and disease.

Declaration of interest statement

The authors declare that they have no conflicts of interest.

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CHAPTER 3

PSYCHOSOCIAL DETERMINANTS OF PREMARITAL SEXUAL PRACTICES AMONG UNIVERSITY STUDENTS IN SUDAN

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ABSTRACT

Sudan is one of the Islamic countries where extramarital sex is religiously forbidden and socially unacceptable. However, increasing numbers of university students become engaged in premarital sex practices, which increases their risk of contracting STIs, including HIV, and puts them into conflicts with their religious beliefs. As little is known about the motivations of abstinence from premarital sex, this study aimed to identify these determinants. Using a cross-sectional design, a sample of 257 students between 18-27 years old was recruited from randomly selected public and private universities in Khartoum. The participants filled out an online questionnaire based on the Integrated Change Model (ICM) to assess their beliefs and practices about abstinence from premarital sex. The analysis of variances (MANOVA) showed that sexually active students differed significantly from abstainers in having more knowledge about HIV/AIDS, higher perception of susceptibility to HIV, more exposure to cues that made them think about sex and a more positive attitude towards premarital sex. The abstainers had a significantly more negative attitude towards premarital sex, higher self-efficacy to abstain from sex until marriage and perceived more peer support and norms favouring abstinence from sex until marriage. These findings suggest that promoting abstinence from sex until marriage among university students in Sudan, which aligns with the Sudanese religious values and social norms, requires health communication messages addressing these psychosocial determinants. However, given that sexual encounters still may occur, health communication messages may profit from a more comprehensive approach by also addressing the need for condom use for those not willing to refrain from sex.

Keywords

Sudan; HIV; premarital sex; university students; I-Change Model

INTRODUCTION

The HIV epidemic in Sudan is classified as a low epidemic as the estimated HIV prevalence among adults aged 15 to 49 is about 0.2% (UNAIDS, 2020). However, HIV still represents a public health problem of high importance in Sudan because of the huge gaps between the current situation and the 90-90-90 targets, which were supposed to be achieved by 2020 according to the 2016 United Nations Political Declaration on Ending AIDS (UNAIDS, 2019). According to recent reports, only less than 40% of people living with HIV/AIDS (PLWHA) know their status, fewer than 15% are receiving treatment and no reports are available about the percentage of those on treatment who achieved viral suppression. The lack of financial resources, civil wars, political instability and increasing poverty had undermined previous efforts and could influence future endeavours to achieve these targets (Ismail, Kari, & Kamarulzaman, 2015).

Several studies in different communities have shown that the university lifestyle is commonly associated with risky behaviours, including engaging in sexual activities (Chi, Yu, & Winter, 2012; Majer et al., 2019; Omoteso, 2006). This association has been attributed to parental guidance's weakening after joining the university in addition to the increased exposure to potential sexual partners (Akibu, Gebresellasie, Zekarias, & Tsegaye, 2017; Farrow & Arnold, 2003). The increase in sexual practices among university students has also been observed in some conservative Islamic countries, including Sudan, despite the religious values and prevailing social norms prohibiting all types of premarital sex (Elshiekh, Hoving, & de Vries, 2020; Hedayati-Moghaddam, Eftekhazadeh-Mashhadi, Fathimoghadam, & Pourafzali, 2015; Massad et al., 2014; Raheel, Mahmood, & BinSaeed, 2013). In a survey conducted by the Sudan National AIDS Program (SNAP) several years ago among university students in Sudan aged 16-25, 12.5 % were sexually active. Male students reported higher sexual activity than their female counterparts did. Condom use during first and last sexual intercourse was reported by only 32% of the sexually active participants (*unpublished report*).

Premarital sex is usually associated with a high risk of HIV and other sexually transmitted infections, as well as unwanted pregnancy (Alo, 2016; Ghebremichael & Finkelman, 2013). Studies suggest that youths who practice sex before marriage are more likely to have multiple sex partners and less likely to use condoms (Alo, 2016; J. S. Santelli et al., 2004). A Sudanese study also found that having the first sexual encounter at a young age was one of the risk factors associated with HIV/AIDS in Sudan (B. A. Mohamed & Mahfouz, 2013). Therefore, university students in Sudan have been identified as an important target group for HIV prevention interventions (Elshiekh, de Vries, & Hoving, 2021; Elshiekh et al., 2020; B. Mohamed, 2014).

HIV prevention among university students in Sudan requires programs that respect the community's religious values and prevailing social norms to gain religious and community leaders' support and facilitate programs implementation (Willems, 2009). Since abstinence

from sex until marriage is a religious obligation and highly valued norm in Muslim communities (Elshiekh, de Vries, et al., 2021; Elshiekh et al., 2020; Horanieh, Macdowall, & Wellings, 2020), discussing this often becomes mandatory for schools in these community. Therefore, HIV prevention interventions incorporating abstinence from sex until marriage are more likely to be implemented in many Muslim communities as in Sudan, and interventions solely focusing on condom use run a risk of becoming rejected as they are regarded as potentially promoting premarital sex (Elshiekh et al., 2020; Kamarulzaman, 2013). Nevertheless, a dilemma is the lack of consensus about the role of abstinence promotion in HIV prevention. Previous review studies did not find scientific evidence that abstinence-only programs could delay the initiation of sexual intercourse among teens in the united states and Canada (D., 2001; Manlove J, 2004; John S. Santelli et al., 2017). However, it could be argued that the studies included in these reviews were conducted among different populations and in different cultures; therefore, their findings may not be generalisable to university students in Sudan. Moreover, these findings contradicted the results of another review study which concluded that abstinence programs could be highly effective in reducing early sexual activity (Rector, 2002).

Given this dilemma and the fact that a significant amount of students may decide not to refrain from sex before marriage, it may be better to adopt a more comprehensive approach by promoting abstinence as long as possible to help those who are not yet sexually active remain abstinent, and promoting consistent condom use to protect those sexually active. A systematic review showed that this abstinence-plus approach effectively promoted both abstinence and condom use and had no undermining effect on any of the behavioural outcomes, including the incidence of sex, frequency of sex, sexual initiation, or condom use (Underhill, Operario, & Montgomery, 2007).

To promote abstinence from sex among university students, it is crucial to identify the most relevant factors that may foster and predict such a choice, including the psychosocial ones. The Integrated Model for Change (the I-Change Model, see figure 3), which integrates several social cognitive theories, is one of the models that has been used successfully to understand and predict health behaviours, including sexual health behaviours (H. De Vries, 2017; H. De Vries et al., 2014; H. De Vries, Mesters, Steeg, & Honing, 2005; Dlamini et al., 2009; S. M. Eggers et al., 2016). According to the I-Change Model, pre-motivational factors, including knowledge about HIV/AIDS, the exposure to cues that may prompt a person about a certain behaviour (i.e., sex and/or abstinence), and risk perceptions determined by susceptibility to and severity of HIV and other social consequences of premarital sex, could influence students' awareness about the need to abstain from premarital sex or delay sex. When aware, students' decision to abstain from premarital sex, as suggested by the I-Change Model, will also be determined by motivational and post-motivational factors, including their attitude towards abstinence, the social influence perceptions (such as social norms and the perceived behaviour of others) on their sexual behaviour and their perceived ability (self-efficacy) to remain abstinent (H. De Vries et al., 2005; Dlamini et al., 2009).

Despite their importance, these psychosocial determinants of sexual behaviours, including abstinence, have been poorly studied among university students in Sudan. A recent cross-sectional study reported serious gaps in comprehensive correct HIV/AIDS knowledge among university students in Sudan, especially among females (Elbadawi & Mirghani, 2016). However, the correlation between poor knowledge and sexual behaviours was not investigated. According to the previous survey conducted in 2010 by SNAP, 19.8% of university students in Sudan reported a high perception of HIV risk, 29.5% had a moderate perception, 19.4 had a low perception and 31% reported not being at risk at all. The association between their HIV risk perception and their sexual behaviours and the importance of other motivational determinants were not tested. A recent study among university students in Iran did identify an association between low HIV-risk perception and sexual activity among university students (Khalajabadi Farahani, Akhondi, Shirzad, & Azin, 2018). Regarding cues, a recent qualitative study alluded to the association between cues, such as watching pornographic movies, and abstinence cues, such as having experience with HIV infected persons, and Sudanese students' decision to engage in or abstain from premarital sex (Elshiekh, de Vries, et al., 2021). However, to the best of our knowledge, this association has never been studied quantitatively in Sudan before. Previous studies among university students in two similar Muslim communities showed that premarital sex was significantly associated with watching pornographic movies (Khalajabadi Farahani et al., 2018; Raheel et al., 2013).

Sudanese university students' attitudes towards abstinence and sexual practices have only been explored in a recent qualitative study. The study suggested that most of the university students in Sudan had a positive attitude towards abstinence. However, sexually active students also perceived some advantages of engaging in sexual practices, such as sexual pleasure and proving adulthood (Elshiekh, de Vries, et al., 2021). Practising sex before marriage is a sin in Islam and the social stigma associated with it could destroy the whole family's reputation in Sudan. Therefore, religious leaders, parents and other family members strongly support abstinence from premarital sex. However, the previous qualitative study suggested that peers had a greater influence on Sudanese students' sexual behaviours (Elshiekh, de Vries, et al., 2021). This contradicted the results of a previous systematic review that found no conclusive evidence about the role of peers in young people sexual behaviour in Sub-Saharan Africa (Fearon, Wiggins, Pettifor, & Hargreaves, 2015). Therefore, a further (quantitative) assessments of the role of peers are highly needed as other international studies also point at the importance of peers in the uptake of sexual behaviour (Uecker, 2015; Wetherill, Neal, & Fromme, 2010).

Self-efficacy and its association with university students' sexual practices have been poorly studied among this population as well despite the accumulated evidence of its importance from several studies in neighbouring African and other countries (Aboussalam, Naudé, Lens, & Esterhuysen, 2016; Rubens et al., 2019; Taffa, Klepp, Sundby, & Bjune, 2002). This necessitates assessing the role of self-efficacy to abstain and identifying the

problematic situations that could weaken the Sudanese students' ability to abstain from sex until marriage.

Consequently, this study aimed to identify the important psychosocial determinants related to sexual abstinence to understand this behaviour better and provide indications for interventions promoting maintenance of abstinence from sex until marriage among this population as long as possible according to the Islam recommendation.

METHODS

Design

This is an online cross-sectional study of the psychosocial determinants of premarital sexual practices among university students in Khartoum. For this study's purpose, the Integrated Change Model, the I-Change Model (figure 3), was used as a theoretical model (H. De Vries, 2017; Hein de Vries, Dijkstra, & Kuhlman, 1988; S. M. Eggers et al., 2016).

Recruitment and procedures

Three public and three private universities were selected randomly from 35 public and private universities in Khartoum state. The inclusion criteria consisted of all undergraduate students in the selected public and private universities in Khartoum who consented to participate through the electronic questionnaire. Postgraduate students were excluded. Initially, to obtain the official approval to conduct the study, the principal researcher met the deans of students' affairs in the selected universities and explained the study's nature and objectives. Following their approvals, 3-5 lecture rooms in each university were selected randomly. The principal researcher explained the study to the students, discussed its objectives and provided them with study information letters. This letter provided a complete description of the study and its objectives and provided the participants with access instructions regarding the online questionnaire. To recruit additional sexually active students, some sexually active students, identified by HIV counselors in Khartoum, were given invitation letters to distribute among their sexually active peers and invite them to participate in the study (snowball recruitment). An anonymous online questionnaire (in Arabic language) was used as a data collection method to collect more valid data because of the sensitivity of sexual behaviours in Sudan's conservative community. In addition to the invitation letter, the introduction part of the questionnaire presented the study and explained its objectives. It was clearly stated in the introduction that participation was voluntary. The participants were then requested to respond to the online questionnaire through their smartphones, laptops or computers and answer all the questions. To preserve students' privacy and confidentiality, participants' identifiers such as their names and phone numbers were not included in the questionnaire.

Measurement

To design the study questionnaire, the findings of a recently conducted qualitative study of sexual behaviours among the university students in Sudan and questionnaires of similar studies were used (H. De Vries et al., 2014; Sander M. Eggers et al., 2017; Elshiekh, de Vries, et al., 2021). The I-Change model was used as a theoretical base for the development of the online questionnaire as well. The questionnaire was designed to measure pre-motivational, motivational and post-motivational determinants of premarital sex. These determinants included knowledge about HIV/AIDS, HIV risk perception, abstinence and premarital sex cues, attitudes towards premarital sex, social influence on sexual behaviour, self-efficacy and intentions to abstain from sex until marriage. A pilot was performed with twenty students other than the study participants and according to its results, no necessary changes were needed. Factor analysis was conducted to assess the validity of the questionnaire for each construct of the I-Change model and Cronbach's alpha was calculated to ensure the internal consistency of each construct items (Akeem, 2015).

Premarital sexual practice and abstinence as behavioural outcome variables were measured by two questions asking the participants if they ever practised vaginal or anal sex (*yes, no*). Those who had never practised vaginal or anal sex were considered abstainers. The students who stated that they had practised vaginal or anal sex were considered sexually active. Accordingly, sexually active participants were coded as (0) and abstainers (1).

To assess participants' knowledge about HIV/AIDS, 16 statements were used (Cronbach's alpha=0.62). These included statements about HIV and how it is transmitted, prevented and treated, such as "*Someone who looks healthy can be infected with HIV*" and "*HIV treatments help HIV infected people to live normally for a longer time*" (Table 2). Participants could respond to each statement with *yes, no* or *not sure*. Participants' responses to knowledge questions were coded as (1) for correct answers and (0) for incorrect or not sure responses. High scores in knowledge items indicated higher knowledge, while low scores indicated poor knowledge about HIV.

To assess cues to sexual behaviours, six statements were included in the questionnaire. These included four statements about cues believed to encourage abstinence and two statements about sex cues. The abstinence cues included experience with PLWHA, such as "*Do you know someone who dies of HIV/AIDS?*" and religious cues, such as "*Do you listen to religious lectures about abstinence?*" Premarital sex cues were assessed using questions such as "*Do you watch pornographic movies and videos?*" (Table 2). Participants could answer with *yes* (1) or *no* (0) for each item. High scores indicated more exposure to the specific cue, while low scores indicated less exposure to that cue. The Cronbach's alpha value for the six cue items was low (0.32). However, these categorical items were treated as an index and were not intended to measure the same dimension.

The questionnaire assessed the participants' perception of HIV severity and susceptibility separately. To assess their perception of HIV severity, four items, such as "*If I would contract HIV, I would suffer from serious psychological distress*", were used ($\alpha =$

0.78) (Table 3). Participants could reply on a five-point Likert scale ranging from -2 (strongly disagree) to +2 (strongly agree). To assess the participants' perception of how susceptible they felt to HIV, three items such as "*How likely that you will get HIV infection if you practice unprotected vaginal intercourse?*" were used ($\alpha = 0.64$) (Table 3). Participants could reply on a five-point Likert scale ranging from -2 (very unlikely) to +2 (very likely). The participants' comparative risk perception was assessed by asking each participant: "*In comparison with other students, how likely is it that you will get infected by HIV?*" Participants could reply on a five-point Likert scale ranging from -2 (much less likely) to +2 (much more likely) (Table 3). High scores indicated high perceptions of HIV severity and susceptibility, while low scores indicated low perceptions.

To assess the perceived advantages of premarital sex (pros), four items such as (*If I practice premarital sexual intercourse, I will gain a lot of sexual skills*) were used ($\alpha = 0.82$) (Table 3). The cons of premarital sex were assessed by five items such as (*If I practice premarital sexual intercourse, I will be exposed to the risk of HIV and other STI*) ($\alpha = 0.63$) (Table 3). Participants could reply on a five-point Likert scale ranging from -2 (strongly disagree) to +2 (strongly agree) for all attitude items. High scores indicated high perceptions of the advantages and disadvantages of premarital sex, while low scores indicated low perceptions.

Social influence on the students' sexual behaviour was assessed with eleven items (Table 3). Based on factor analysis (Beavers et al., 2013), the eleven social influence items were grouped into two categories: five items assessed peers influence, including peer norms, support and modelling ($\alpha = 0.78$) and six items assessed the influence of parents, religious scholars and health professional collectively ($\alpha = 0.91$). The items included statements about social norms such as (*My parents believe that I should abstain from sexual intercourse until marriage*) and statements about social support such as (*Most of my friends support me to abstain from sexual intercourse until marriage*). Participants could reply on a five-point Likert scale ranging from -2 (strongly disagree) to +2 (strongly agree). The influence of social modelling was assessed by asking each participant, "*How many of your friends practice sexual intercourse before marriage?*" The participants could reply on a five-point Likert scale ranging from -2 (none of them) to +2 (all of them). High scores indicated more social influence to abstain from premarital sex, while low scores indicated less social influence.

Self-efficacy to abstain from sex until marriage was assessed with five statements such as (*I would find it difficult not to have sexual intercourse when my sexually active peers challenge me*) ($\alpha = 0.90$) (Table 3). Participants could reply to self-efficacy items on a five-point Likert scale ranging from -2 (strongly agree) to +2 (strongly disagree) so that higher scores indicated higher self-efficacy to abstain from sex until marriage. High scores indicated high self-efficacy to abstain from premarital sex, while low scores indicated low self-efficacy.

The participants' intention to abstain from sex until marriage was assessed with two statements such as "*I have the intention to abstain from premarital sexual intercourse during my university study*" ($\alpha = 0.89$) (Table 3). Participants could reply on a five-point Likert

scale ranging from -2 (strongly disagree) to +2 (strongly agree). High scores indicated high intentions to abstain from premarital sex, while low scores indicated low intentions.

Data Analysis

Data were analysed using SPSS version 24. A descriptive analysis was conducted to describe the study sample. To assess the overall difference between abstainers and sexually active students per each I-Change Model construct, Multivariate analysis of variances (MANOVA) was conducted. MANOVA was also used to identify the significant differences between the two groups regarding each construct item. Results with p values $< .05$ were considered significant.

RESULTS

Description of the sample

Initially, 441 students responded to the online questionnaire. However, 184 participants answered fewer than 75% of the questions; therefore, they were excluded from the study. Two hundred and fifty-seven male and female university students were finally included in the analysis. The participants' age ranged from 18 to 27 (mean age 21.3). The sample included 170 abstainers (66%) and 87 sexually active students (34%). Almost all of the students were Sudanese (98 %) and Muslim (99%). The demographic characteristics of the study participants are summarised in table 1 below.

Pre-motivational determinants

Knowledge about HIV/AIDS

MANOVA results showed a statistically significant difference in the overall knowledge about HIV/AIDS between abstainers and sexually active participants (Hotelling's $T = 0.169$; $F(16,240) = 2.532$; $p < .001$). A higher knowledge score among sexually active as compared to abstaining participants was observed. Significantly more abstainers knew that HIV could not be transmitted by mosquito bites ($p < .05$) or through hugging PLWHA ($p < .001$). More sexually active students, on the other side, knew that HIV could be transmitted by unprotected anal sex ($p < .05$) and its transmission could be reduced by consistent condom use ($p < .001$) and HIV treatments ($p < .05$) (Table 2).

Cues to action

Generally, sexually active students reported higher exposure to sex cues. The overall difference in exposure to sex cues between abstainers and sexually active participants with MANOVA was significant (Hotelling's $T = 0.077$; $F(2,249) = 9.530$; $p < .001$). When looking at the items separately, sexually active participants reported significantly higher exposure to pornographic movies and videos ($p < .001$) and erotic stories ($p < .01$) as compared to the

abstainers. No significant difference in reported exposure to HIV and religious cues was observed between the two groups (Table 2).

Table 1. Demographic Characteristics of the Study Participants (N = 257)

Demographic characteristics	Total N (%)	Abstainers	Sexually active	χ^2	P-value
Sexual behaviour	257 (100%)	170 (66%)	87 (34%)		
Age group					
< 21 years	110 (42.8%)	75 (44.1%)	35 (40.2%)	0.36	0.55
>21 years	147 (57.2%)	95 (55.9%)	52 (59.8%)		
Gender					
Male	131(51%)	76 (44.7%)	55 (63.2%)	7.89	0.005
Female	126 (49%)	94 (55.3%)	32 (36.8%)		
Nationality*					
Sudanese	252 (98%)	165 (97.1 %)	87 (100%)		0.17
Non-Sudanese	5 (2%)	5 (2.9%)	0 (0%)		
Religion*					
Muslims	255 (99%)	169 (99.4%)	86 (98.9 %)		1.0
Non-Muslims	2 (1%)	1 (0.6 %)	1 (1.1%)		
Family income					
Low income	40 (16%)	25 (14.7%)	15 (17.2%)	2.45	0.29
Middle income	201 (78%)	137 (80.6%)	64 (73.6%)		
High income	16 (6%)	8 (4.7%)	8 (9.2%)		
Type of university					
Public university	180 (70%)	123 (72.4%)	57 (65.5%)	1.28	0.26
Private university	77 (30%)	47 (27.6%)	30 (34.5%)		
Academic year					
1 st year	21 (8.2%)	12 (7.1%)	9 (10.3%)	8.81	0.12
2 nd year	54 (21%)	38 (22.4%)	16 (18.4%)		
3 rd year	56 (21.8%)	31 (18.2%)	25 (28.7%)		
4 th year	87 (33.9%)	66 (38.8%)	21 (24.2%)		
5 th year	23 (8.9%)	13 (7.6%)	10 (11.5%)		
6 th year	16 (6.2%)	10 (5.9%)	6 (6.9%)		

* Fisher's exact test was used instead of the Chi-squared test

Risk perception

Regarding the perception of HIV severity, the participants' perceptions were generally high. No difference was observed between the abstainers and sexually active participants in their overall perception of HIV severity using MANOVA (Hotelling's $T= 0.015$; $F(4,252) = 0.957$; $p = .432$). ANOVA also showed no significant difference per HIV severity items (Table 3). Regarding the perception of susceptibility, sexually active participants reported a significantly higher overall perception of susceptibility to HIV when compared to abstainers (Hotelling's $T= 0.175$; $F(3,253) = 14.784$; $p < .001$). Although no significant difference in their perceived HIV risk due to unprotected vaginal sex was observed, ANOVA revealed a significantly higher perception of susceptibility to HIV following unprotected anal sex among the sexually active participants ($p < .05$). They also reported higher personal risk perception as compared to abstainers ($p < .001$); however, personal risk perception was low among both groups (Table 3).

Motivational determinants*Attitude towards premarital sex*

Regarding the perceived disadvantages of premarital sex, MANOVA showed that abstainers reported a higher perception of these disadvantages as compared to sexually active participants (Hotelling's $T= 0.055$; $F(5,251) = 2.757$; $p < .05$). This overall difference could be attributed to the higher perception of the social ($p < .01$) and legal consequences ($p < .05$) of premarital sex among the abstainers, as shown in table 3. MANOVA also showed that sexually active participants reported a significantly higher perception of the premarital sex advantages compared to the abstainers (Hotelling's $T= 0.44$; $F(4,252) = 27.743$; $p < .001$). The sexually active participants believed more than abstainers that premarital sex was associated with enjoying sexual satisfaction ($p < .001$), gaining money ($p < .001$), being more popular among friends ($p < .001$) and gaining sexual skills ($p < .001$) (Table 3).

Social influence

Regarding peer influence on students' sexual behaviours, MANOVA showed that abstainers differed significantly from sexually active students (Hotelling's $T= 0.335$; $F(5,251) = 16.839$; $p < .001$). Abstainers reported a higher perception of their peers' beliefs favouring abstinence from sex until marriage ($p < .01$). They also reported more support by their friends to remain abstinent from sex until marriage ($p < .001$) and had fewer numbers of sexually active friends ($p < .001$). Concerning the influences of parents, health professional and religious leaders, no significant differences concerning their overall influence on students' sexual behaviour were observed between the abstainers and sexually active participants. No differences in their support or norms favouring abstinence from sex until marriage was identified between abstainers and sexually active students (Table 3).

Table 2. Differences between abstainers and sexually active students for knowledge and cues

Knowledge about HIV/AIDS	OVERALL	ABSTAINERS	SEXUALLY ACTIVE	F	P
Anyone can get infected with HIV if he practices condomless vaginal intercourse with infected persons	.87	.86	.89	.343	.559
Anyone can get infected with HIV if he practices condomless anal intercourse with infected persons	.62	.58	.71	4.59	< .05
Anyone can get infected by getting injections with a needle that has already been used by infected persons.	.93	.94	.92	.43	.511
A pregnant woman who is infected with HIV can transmit the virus to her baby.	.70	.68	.76	1.86	.173
Anyone can get infected with HIV from a mosquito bite.	.67	.72	.56	6.81	< .05
Anyone can get infected with HIV through hugging people living with HIV.	.82	.88	.69	15.03	< .001
Someone who looks healthy can be infected with HIV.	.68	.69	.64	.67	.415
You can protect yourself against HIV by abstaining from sexual intercourse before marriage.	.89	.91	.87	.64	.426
You can protect yourself against HIV by using a condom correctly every time you have sexual intercourse.	.58	.50	.74	13.71	< .001
People can reduce the risk of getting HIV by reducing the number of their sexual partners.	.60	.58	.64	.90	.344
Having a sexually transmitted infection put you at higher risk of getting infected with HIV.	.73	.69	.80	3.60	.059
Most people do know they are infected with HIV soon after getting infected	.44	.43	.46	.21	.643
Getting the penis out just before ejaculation, is a safe method of preventing HIV transmission	.37	.38	.37	.02	.893
HIV treatments help HIV infected people to live normally for a longer time.	.51	.48	.57	2.23	.137
HIV infected people on treatment are less likely to transmit HIV to others.	.39	.34	.48	4.91	< .05
Early diagnosis of HIV infection can prevent the development of AIDS.	.52	.48	.60	3.08	.080
HIV cues					
Do you know some people who died of AIDS?	.05	.04	.07	1.49	.224
Have you ever listened to someone living with HIV/AIDS telling his experience of living with HIV?	.11	.10	.14	1.17	.280
Religious cues					
Do you listen to religious lectures about abstinence?	.86	.86	.86	.01	.941

Do you pray at the mosque/church?	.78	.76	.81	.85	.357
Sexual cues					
Do you watch pornographic movies and videos?	.48	.38	.66	18.26	< .001
Do you read erotic stories?	.32	.26	.44	8.43	< .01
Knowledge items: (<i>correct=1, incorrect=0</i>), Cues items: (<i>yes=1, no=0</i>)					

Self-efficacy

Concerning students' self-efficacy to abstain from sex until marriage, abstainers reported higher self-efficacy to abstain as compared to sexually active students (Hotelling's $T = 0.729$; $F(5,251) = 36.602$; $p < .001$). The abstainers reported a higher ability to resist all of the difficult situations that could encourage them to practice premarital sex ($p < .001$) (Table 3).

Intention

MANOVA showed a significant difference in overall intentions to abstain from sex until marriage with higher intentions among the abstainers as compared to the sexually active participants (Hotelling's $T = 0.116$; $F(2,251) = 14.562$; $p < .001$). The abstainers reported significantly higher intentions to continue to abstain from premarital sex during their university study ($p < .001$) and in the next year ($p < .001$) (Table 3).

Table 3. Differences between groups for HIV risk perception, attitude, social influence, self-efficacy and intention

Construct Items	OVERALL MEANS	ABSTAINERS (Mean)	SEXUALLY ACTIVE (Mean)	F	P
Risk perception (severity)					
If I would contract HIV, this would be a serious health problem for me.	1.67	1.65	1.70	.273	.602
If I would contract HIV, I would have serious social problems.	1.57	1.55	1.61	.336	.563
If I would contract HIV, I would suffer from serious psychological distress.	1.66	1.64	1.69	.270	.604
If I would contract HIV, I would suffer from unemployment.	1.01	.92	1.20	3.718	.055
Risk perception (susceptibility)					
How likely that you will get HIV infection if you practice unprotected vaginal intercourse? *	.71	.70	.72	.026	.871
How likely that you will get HIV infection if you practice unprotected anal intercourse? *	.55	.44	.76	4.867	< .05
In comparison with other students, how likely is it that you will get infected by HIV? **	-1.10	-1.41	-.51	38.763	< .001
Attitude (Cons sexual activity)					
If I practice premarital sexual intercourse, I will be disobeying Allah and deserve His punishment.	1.86	1.88	1.83	.785	.376
If I practice premarital sexual intercourse, I will be exposed to the risk of HIV and other STI.	1.65	1.66	1.63	.079	.779
If I practice premarital sexual intercourse, I will not be accepted for marriage in the future.	.81	.98	.46	10.476	< .01
If I practice premarital sexual intercourse, I will be exposed to punishment for illegal sex practice	1.35	1.44	1.17	4.684	< .05
If I practice premarital sexual intercourse, it will affect my academic performance at the university	.03	.13	-.16	2.719	.100
Attitude (Pros sexual activity)					
If I practice premarital sexual intercourse, I will enjoy sexual satisfaction.	-.48	-.88	.29	46.635	< .001
If I practice premarital sexual intercourse, I will gain money.	-1.18	-1.59	-.38	76.691	< .001
If I practice premarital sexual intercourse, I will be more popular among my friends.	-1.39	-1.72	-.76	72.417	< .001
If I practice premarital sexual intercourse, I will gain a lot of sexual skills.	-.69	-1.12	.16	63.354	< .001
Social influence (Peer influence)					
Most of my friends believe that I should abstain from sexual intercourse until marriage.	.96	1.13	.62	10.165	< .01

Most of my sexual partners believe that I should abstain from sexual intercourse until marriage.	.28	.41	.02	4.729	< .05
Most of my friends support me to abstain from sexual intercourse until marriage	1.02	1.24	.60	16.074	< .001
Most of my sexual partners support me to abstain from sexual intercourse until marriage	.28	.46	-.08	8.780	< .01
How many of your friends practice sexual intercourse before marriage? ***	-1.19	-1.57	-.46	83.345	< .001
Social influence (Others influence)					
My parents believe that I should abstain from sexual intercourse until marriage.	1.58	1.64	1.45	2.777	.097
The health professionals believe that I should abstain from sexual intercourse until marriage.	1.53	1.58	1.43	1.899	.169
The preachers and religious scholars believe that I should abstain from sexual intercourse until marriage.	1.67	1.74	1.53	3.800	.052
My parents support me to abstain from sexual intercourse until marriage	1.51	1.56	1.41	1.399	.238
The health professionals support me to abstain from sexual intercourse until marriage	1.42	1.45	1.34	.734	.392
The preachers and religious scholars support me to abstain from sexual intercourse until marriage.	1.53	1.55	1.51	.103	.749
Self-efficacy to abstain					
I would find it difficult not to have sexual intercourse when seduced by my partner.	.27	.86	-.90	111.041	< .001
I would find it difficult not to have sexual intercourse after watching pornographic movies or videos.	.32	.79	-.59	65.155	< .001
I would find it difficult not to have sexual intercourse when I have an urgent need for money.	1.11	1.61	.15	100.530	< .001
I would find it difficult not to have sexual intercourse if my partner begs me to have sex.	.41	1.02	-.78	118.728	< .001
I would find it difficult not to have sexual intercourse when my sexually active peers challenge me.	1.01	1.41	.24	58.031	< .001
Intentions to abstain					
I have the intention to abstain from premarital sexual intercourse during my university study	1.36	1.59	.92	28.995	< .001
I have the intention to abstain from premarital sexual intercourse in the next year	1.27	1.45	.92	15.868	< .001

Risk perception (severity), Attitude, social influence and intentions items: (-2 (totally disagree) to +2 (totally agree)),

Self-efficacy items: (-2 (totally agree) to +2 (totally disagree)).

* -2 (very unlikely) to +2 (very likely),

** -2 (much less likely) to +2 (much more likely),

*** -2 (none of them) to +2 (all of them)

DISCUSSION

This study aimed to identify the psychosocial determinants of premarital sexual practices among university students in Khartoum, using the I-Change Model as a theoretical framework. According to the findings of the analyses of variances, sexually active students differed significantly from abstainers in having more knowledge about HIV/AIDS and a higher perception of susceptibility to HIV. They also reported significantly higher exposure to cues related to sexual activities and had a more positive attitude towards premarital sex. On the other hand, abstainers had a significantly more negative attitude towards premarital sex and higher self-efficacy to abstain from sex until marriage. Besides, they reported being more influenced by their peers' support and norms favouring abstinence from sex until marriage. These findings suggest that promoting abstinence from sex until marriage among university students in Sudan requires addressing these psychosocial determinants.

Regarding the pre-motivational determinants of premarital sex, sexual cues were significantly associated with sexual behaviours among the study population. The observed association between the exposure to specific sex cues, such as watching pornographic movies or videos and reading erotic stories and sexual practices, was reported by other previous cross-sectional studies as well (Akter Hossen & Quddus, 2021; Bogale & Seme, 2014; Mulugeta & Berhane, 2014; Raheel et al., 2013). Nevertheless, longitudinal studies are needed to identify how reducing the exposure to these sex cues or mitigating their influence could influence students' sexual behaviours. This could inform future interventions and help design more effective programs aiming to delay sex and promote abstinence until marriage. In contrast to some previous studies' findings (Elshiekh, de Vries, et al., 2021; Muhammad, Shamsuddin, Sulaiman, Amin, & Omar, 2017; Odimegwu, 2005), this study found no association between the religious cues such as praying at the mosque and listening to religious lectures about abstinence on the one hand and students' sexual abstinence at the other hand. However, this finding should be interpreted cautiously because praying at the mosque is a religious obligation and common practice in Sudan. Exposure to religious lectures advocating abstinence from extramarital sex is also widespread through both public and social media. Therefore, it is recommended to conduct further research to identify other influential religious cues, such as the frequency of religious attendance which was previously identified as a significant predictor of sexual behaviour among college students (Lefkowitz, Gillen, Shearer, & Boone, 2004; Penhollow, Young, & Denny, 2005).

Besides, other factors such as the language and messages used by religious scholars could potentially affect the influence of their religious lectures on students' sexual behaviour; we did not measure this, which may be an area for further research. One potential reason for the low exposure and lack of association between HIV-related cues, such as knowing someone who died of AIDS, and sexual abstinence, could be the high level of stigma against PLWHA in Sudan, which prevents disclosure of HIV status (B. A. Mohamed & Mahfouz, 2013)

Concerning the motivational determinants and similar to previous research (Cha, Doswell, Kim, Charron-Prochownik, & Patrick, 2007; Elshiekh, de Vries, et al., 2021; Rasberry & Goodson, 2009; Salameh et al., 2016), our study identified attitude towards premarital sex as an important determinant of sexual abstinence. The study findings also suggested that the students' perceptions of the social and legal consequences of practising sex before marriage, rather than health-associated consequences, could influence their decision to abstain from premarital sex. This could be explained by the highly conservative nature of the Muslim community in Sudan (Elshiekh, de Vries, et al., 2021). Hence, addressing this finding in future interventions aiming to promote sexual abstinence might be necessary. Besides, our study revealed an overall low perception of the negative impact of sexual activity on students' academic performance, although several previous studies identified this association (Lanari, Mangiavacchi, & Pasqualini, 2020; Sabia & Rees, 2009; Schvaneveldt, Miller, Berry, & Lee, 2001). Therefore, attempts to raise students' attention to this disadvantage may help promote sexual abstinence or delay sexual debut.

A recent qualitative study revealed that females had a more negative attitude towards premarital sex than male students due to the prevailing social norms that look at female virginity at marriage as a virtue (Elshiekh, de Vries, et al., 2021). This may also explain why significantly more female students reported being adherent to abstinence than male students in this study. The qualitative study also suggested that female students were more likely to practice sex for money than male students; in the same study, sexually active students reported a higher perception of the financial advantages of practising sex than their abstinent peers, suggesting that they have heard of or experienced financial advantages (Elshiekh, de Vries, et al., 2021). Therefore, further exploration of these gender-specific differences in attitude towards abstinence and premarital sex with a greater sample size may be needed.

Regarding social influence on university students' sexual behaviours, peer influences, including peer support, norms and modelling, were strongly associated with university students' sexual behaviour. This finding was also reported by several previous studies (Akter Hossen & Quddus, 2021; Mulugeta & Berhane, 2014; Tura, Alemseged, & Dejene, 2012). It implies that interventions seeking to promote abstinence from sex until marriage or delaying sex among university students may consider strategies that enhance favourable peer influence and mitigate peer pressure to practice sex. Considering the observed strong influence of peers, peer education interventions, which have been widely used to influence the sexual behaviours among youth (Medley, Kennedy, O'Reilly, & Sweat, 2009; Miller et al., 2008), could be a suitable strategy to promote abstinence from sex or delay sex among university students in Sudan. A previous review study of the effectiveness of these interventions for HIV prevention in developing countries pointed to the importance of considering factors that could increase their effectiveness. These included the proper selection of the peer educators, quality of peer educators training and supervision, peer educators' compensation, and retention of trained peer educators (Medley et al., 2009).

In addition, our study showed that community members, including parents, had less influence on students' sexual behaviours than peers did. Oppositely, previous studies among similar age groups in two sub-Saharan countries demonstrated parents and other family members' role in youth sexual abstinence and attitudes towards sex (Ajayi & Okeke, 2019; Alhassan & Doodoo, 2020). This contradiction could be attributed to cultural differences. Due to the Sudanese community's conservative nature and the prevailing norms that prohibit the open discussion about sex, parents rarely engage in face to face interactions about sex-related issues with their sons and daughters (Elshiekh, de Vries, et al., 2021). A recent study among young adults in Malaysia has identified comfort, information and value as important family sexual communication dimensions associated with sexual behaviour and attitude. According to that study, these dimensions of family sexual communication are associated with delayed sexual initiation, safe sex behaviours and less open-minded sexual attitudes (Tan & Gun, 2018). Therefore, providing parents with accurate information about sex and teaching them how to communicate effectively with their sons and daughters about their sexual behaviours could be a valuable component of future interventions to delay sexual initiation and promote sexual abstinence among university students.

Likewise, religious leaders had no influential role in students' sexual behaviours in this study, although previous studies among African youth suggested the opposite (Somefun, 2019; Trinitapoli, 2009). However, our study assessed only the students' perceptions of their religious leaders' support and norms favouring abstinence from sex until marriage, which is considered a religious obligation. Besides, the denominational differences and the individual differences between religious leaders and their approaches to addressing youth sexual behaviours could affect their influence (Trinitapoli, 2009; Ucheaga & Hartwig, 2010). In conclusion, further research is required to identify which roles and activities can be relevant for religious leaders in Sudan in promoting abstinence and delaying sexual onset to prevent HIV transmission (Trinitapoli, 2011).

Self-efficacy to abstain from premarital sex was one of the important determinants of university students' sexual abstinence. A similar finding was reported by Cha *et al.* (Cha *et al.*, 2007), who identified abstinence self-efficacy as one of the predictors of the intention to abstain from premarital sex among Korean university students. In another study among 15-17 years old adolescents in Iran, students' self-efficacy was also associated with their intention to remain sexually inactive (Mohtasham *et al.*, 2009). A previous longitudinal study also concluded that to promote abstinence from premarital sex, interventions should not only increase self-efficacy to abstain at baseline but also lower its reduction over time by continuous boosting (Wang, Cheng, & Chou, 2009). However, this study was conducted among a younger age group and may not be generalisable to our study population. Therefore, replication of that study with university students may be recommended. Our study also revealed that the conditions challenging students' self-efficacy to abstain from sex are diverse. Several emotional factors could affect students' self-efficacy to abstain; however, the need for money and being challenged by sexually active peers have also been identified

as difficult situations influencing students' self-efficacy. According to a recent qualitative study, the need for money as a barrier to sexual abstinence was reported by female students, while practising sex to prove adulthood in response to peers challenges was reported by male students (Elshiekh, de Vries, et al., 2021). This implies that interventions aiming to enhance students' self-efficacy to abstain should be both comprehensive and tailored to address these diverse and gender-sensitive factors.

Strengths and limitations

This study has focused mainly on the psychosocial determinants of premarital sexual behaviours among university students that have not been thoroughly investigated in Sudan before. Using the I-Change Model as a theoretical framework is one of the study's strengths, as it facilitated the comprehensive exploration of premarital sex psychosocial determinants. In addition, using an online questionnaire encouraged many students to participate in this study and made it possible to collect sensitive data about their sexual practices and beliefs. However, the study sample size was relatively small and this prevented gender-analysis of data that could identify some gender-specific determinants. Additionally, some of the participants were recruited through snowballing; therefore, the study result may not be generalisable. Despite these limitations, this study represents a valuable source of information for future HIV interventions in Sudan. Furthermore, we did not assess factors pertaining to the action phase, such as action plans consisting of preparation plans and coping plans, which can be helpful in the translation of intention into behaviour (H. de Vries, Mesters, Riet, Willems, & Reubsaet, 2006; Reinwand et al., 2016). Future research needs to identify which action plans may be helpful for our target population to translate their intentions into action.

CONCLUSION

Exposure to certain cues, having a positive attitude towards premarital sex, peer influence and low self-efficacy were all associated with engaging in premarital sex. To promote abstinence from sex until marriage among university students, as a part of a more comprehensive approach to prevent HIV transmission among them, interventions should address these determinants. However, other preventive strategies such as consistent condom use by sexually active students are to be promoted as well.

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Conflict of Interest

The authors have no conflicts of interest to declare.

Ethical Approval

Ethical approval was obtained from the Directorate of Research, MOH, Khartoum State in July 2017. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Informed consent

This was obtained from all individual participants included in the study. All participants were informed that their participation in the study was voluntary and they had the right to withdraw without any consequences. They were also informed that their names, address, phone numbers, or universities were not included in the questionnaire to maintain their privacy and confidentiality.

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CHAPTER 4

EXPLORING DETERMINANTS OF CONDOM USE AMONG UNIVERSITY STUDENTS IN SUDAN

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ABSTRACT

Increasing numbers of university students in Sudan are at risk of contracting HIV because of their engagement in condomless sex. A comprehensive and culturally accepted condom promotion program could potentially reduce this threat substantially. However, little is known about the socio-cognitive determinants of condom use in this population; information that is required to develop such HIV prevention programs. Therefore, in August 2014, we conducted 30 semi-structured individual interviews with male and female students (both currently sexually active and non-active) to explore determinants of condom use based on the I-Change Model. Data were analysed using Nvivo 10. The result suggests that barriers to condom use among university students include misconceptions about condoms use, negative attitudes towards condom use, lack of social support, low self-efficacy to use condoms and poor action planning. Sexual health promotion should, therefore, address these aspects to successfully promote condom use among sexually active students and subsequently reduce the risk of HIV transmission.

Keywords:

Sudan; HIV; condom use; university students; I-Change Model

INTRODUCTION

Since 2001, the annual number of new HIV cases and AIDS-related deaths has declined globally. However, many countries in the Middle East and North Africa (MENA) region are still suffering from the rising trends in new HIV infections due to slow response to the HIV epidemic and reluctance to address culturally sensitive issues, such as sex practices before marriage (Gökengin, Doroudi, Tohme, Collins, & Madani, 2016).

Sudan is one of the largest African countries in the MENA region. Following the separation of South Sudan in 2011, the total population in Sudan has become around 34 million; mostly Islamic with an almost equal gender distribution. Adolescents and young adults (10 – 35 years) represent almost half of the population. It is estimated that about 46% of the population lives below the poverty line. In addition, having military conflicts, substantial subsequent population movement, and being bordered by countries with high HIV prevalence put the Sudanese population at increased risk of HIV infection (Sudan National AIDS Program [SNAP], 2014).

Like in the other Islamic countries in the MENA region, male circumcision is universal and abstinence from sex until marriage is a religious obligation. These facts had previously contributed to preventing HIV spread in Sudan. However, more young people in Sudan become involved in premarital sex because of the delayed marriage due to poverty. A study among female sex workers (FSW) in Sudan has also shown that most of them entered sex work to support their dependent family members and only few of them had jobs other than sex. Of them, 71% were married, 51% were married before the age of 18 and only 36% of them reported using condoms consistently (Abdelrahim, 2010). Intimate partner violence (IPV) as an important risk factor for HIV is recognised as a growing problem in the MENA region (Dworkin, Kambou, Sutherland, Moalla, & Kapoor, 2009). However, no official national data about its prevalence in Sudan is available. Coverage with HIV care services is still very low in Sudan. It has been estimated that less than 40% of people living with HIV/AIDS know their status and less than 15% of them are on treatment (UNAIDS, 2018).

In 2016, it was estimated that 56 000 [34 000–87 000] people were living with HIV in Sudan and the estimated number of new HIV infections in the same year was 5000 [1900–9400]. HIV prevalence among sex workers (FSW) and men practising sex with men (MSM) was 1.3% and 1.4%, respectively (UNAIDS, 2017). The most commonly reported mode of HIV transmission in Sudan was unsafe heterosexual sex practices (Gökengin et al., 2016), such as having sex without using a condom.

Previous surveys conducted in 2002 by the Sudan National AIDS Control Program (SNAP) revealed that HIV prevalence among university students was 1.1%, (SNAP, 2002). Furthermore, sexual activity among university students in Sudan increased from 6.5% to 12.5% between 2002 and 2010 (SNAP, 2002, 2010). However, condom use as a primary preventive measure against HIV infection is still very low among this population. In 2010,

only 20% and 32% of the sampled university students reported using condoms during their first-ever and latest sexual intercourse, respectively (SNAP, 2010).

As sexual practices are considered sensitive issues that are not openly discussed in the conservative community of Sudan (Mohamed & Mahfouz, 2013), little is known about the individual determinants of condom use among university students within this community. A recent study identified knowledge about AIDS transmission, education, type of sexual partners and experiencing condom problems such as tear as main predictors of condom use among visitors to voluntary counselling and testing (VCT) centres in Khartoum (Mohamed, 2014). However, visitors to VCT centres may not represent other university students. Moreover, the study only addressed a limited number of, mostly distal, socio-cognitive determinants of condom use (e.g., knowledge). Recently, condom promotion interventions based on behavioural change theories have succeeded in promoting condom use in similar African communities (Mmbaga et al., 2017). This implies that further identification and understanding of the socio-cognitive determinants of condom use are needed by public health workers to develop health communication materials for sexually active students or those at risk of becoming sexually active about condom use and HIV prevention. Therefore, this study aimed to explore the socio-cognitive determinants of condom use among students, both currently sexually active and abstainers.

To investigate the impact of socio-cognitive determinants on condom use, we used the Integrated Model for Change (the I-Change Model, see figure 3) as a theoretical framework. This model integrates several social cognitive theories such as the Theory of Planned Behaviour, Bandura's Social Cognitive and Prochaska's Transtheoretical Model, the Health Belief Model, and Implementation and Goal setting theories (Broekhuizen, van Poppel, Koppes, Brug, & van Mechelen, 2010) and has been successful in predicting health behaviours, including sexual health behaviours (De Vries, 2017; De Vries et al., 2014; De Vries, Mesters, Steeg, & Honing, 2005; Dlamini et al., 2009; Eggers et al., 2016; Huver, Engels, & de Vries, 2006). According to the I-Change Model, the behavioural change process has three phases: awareness, motivation and action. Each of these three phases has its relevant determinants. In relation to this study, the model assumes that condom use pre-motivational awareness phase is determined by a person's cognisance of his/her sexual behaviour, accurate knowledge about HIV and condom use, and a person's risk perceptions of how serious HIV is and how likely it is to get HIV if practised condomless sex. This phase is also determined by the cues that prompt a person to use condoms consistently such the death of a relative with AIDS. According to the I-Change Model, the motivational phase has three determinants: attitude, social influence and self-efficacy. In relation to this study, a person's attitude towards condom use is his or her perception of the cognitive and emotional advantages and disadvantages of using condoms consistently. The social influence on a person's behaviour includes social support, norms and modelling. In relation to this study, social norm concerns an individual's perception of what others in his community believe about condom use, social modelling is the individual perception of

condom use behaviour among the community members, and social support concerns the support in favour of healthy sexual behaviour received from others. Self-efficacy is defined as the person's perception of his capability to use condoms consistently and how difficult a person regards realising the desired healthy behaviour. The post-motivational action phase consists of action plans such as the plans required to prepare oneself and initiate condom use and the coping plans needed to overcome barriers. This phase is also determined by a person's self-efficacy, skills and barriers. As assumed by the I-Change Model, these motivational processes are determined by predisposing biological (e.g., sex), psychological (e.g., personality), social (e.g., condoms availability) and information factors (e.g., messages quality and channels) (De Vries et al., 2005).

METHOD

Design

To obtain an in-depth understanding of students' condom use and the socio-cognitive determinants of this practice, we conducted semi-structured individual interviews (Nshindano & Maharaj, 2008). Due to the sensitive nature of the study topic and the likelihood of refusal to participate due to religious or social reasons, focus groups were deemed unsuitable.

Recruitment and Participant Selection

Thirty male and female university students from six different universities were interviewed in this study. Initially, a purposive heterogeneous sample of 15 university students was invited by the HIV counsellors working at these universities to participate in the study. Because of the sensitivity of talking about sexual behaviours among this population, those who agreed to be interviewed were asked if they would know other students that would be willing to participate in the study. Students thus approached other students and invited them to be interviewed (snowball recruitment). Interviews continued until saturation was reached (Kitzinger, 1995).

Data Collection

Measurement

The I-Change Model served as the theoretical framework for the study. Therefore, a deductive approach was used to guide the development of the semi-structured interview guide (Elo & Kyngäs, 2008). The interview guide was designed to facilitate the exploration of condom use behaviour and its pre-motivational, motivational and post-motivational determinants, including knowledge, risk perception, cues to action, attitude, social influence, self-efficacy and action plans. To put the respondents at ease and build rapport, the interviews started with the easy guide questions, and then the interviewers probed and encouraged the

Table 1: Summary of the study interview guide

A. General personal and demographic data	Age	
	Gender	
	Marital status	
	Type of university	
	Field of study	
	Family residence	
	Current condom use practices	
B. Exploring participant's behaviours and beliefs about condom use	Knowledge	B.1. What do you know about condoms and consistent condom use in general?
	Risk perception	B.2. What are/could be the risks if you practise sex without condoms?
		B.3.1. What are/could be for you the advantages of using condoms during sexual practices?
	Attitude	B.3.2. What are/could be for you the disadvantages of using condoms during sexual practices?
		B.3.3. What role – if any – could consistent condom use play to protect you from getting HIV and other STIs?
	Social influence	B.4.1. Who would support you to use condoms during sexual practices?
		B.4.2. Who would be against you using condoms during sexual practices?
	Self-efficacy	B.5. When will it be difficult for you to use condoms during sexual practices?
	Other factors	B.6.1. What are the other factors which encourage you to use condoms during sexual practices?
		B.6.2. What are the other factors which prevent you from using condoms during sexual practices?

participants to talk about the more sensitive issues around their sexual behaviour (Gill, Stewart, Treasure, & Chadwick, 2008). Table 1 summarises the interview guide that was used during interviews. A pilot was undertaken with five university students other than those who participated in the study, and according to its results, minor linguistic changes were made in the interview guide.

Procedure

The individual interviews were conducted in August 2014 by either the principal researcher or one of two well-trained HIV counsellors (a male and a female counsellor). Most of the interviews (n= 21) were conducted inside the universities in private counselling rooms at the voluntary counselling and testing (VCT) centres. The remaining interviews took place at the students' current residences (i.e., hostels). Each interview lasted between 50 to 75 minutes. The interviews were audio-recorded following written informed consent from each participant. However, most female participants refused to record their interviews, and detailed written notes were taken for those interviews instead. The interviews were conducted in Arabic, and all the audio-recorded interviews were transcribed verbatim before starting the data analysis.

Data Analysis

Initially, the transcribed interview data and written notes were revised by the research team. Based on the interview questions and the transcribed data, an initial coding scheme was developed by the principal researcher and the research assistants. Next, the transcripts were coded using Nvivo version 10. Additional subcodes were added to the coding scheme during the coding procedure. To check the validity of the coding process, two transcripts were fully coded by the principal researcher and one of the research assistants. Then all transcripts were coded for a selection of codes (n=5) by both of them (double coding). The results showed agreement percentage of 98.6 (94.3 -100) and Kappa of 0.81(0.28- 1), which indicates good inter-coder reliability. Important themes identified were supported by quotes from the participants' interviews.

Ethical Consideration

All procedures performed in the study involving human participants were in accordance with the ethical standards of the national research committee and with the 1964 Helsinki declaration and its later amendments. Ethical approval was obtained from the Directorate of Research, Ministry of Health, Khartoum State in July 2014. Informed consent was obtained from all respondents included in the study before participation. Students were informed that their participation was voluntary and their confidentiality was assured throughout the interviews. To maintain the privacy and confidentiality of the participants, only the gender and age of the participants were linked to their quotes. Other identifiers such as their names, address or universities were removed during verbal transcription of the recorded interviews.

In addition, the recorded interviews will be destroyed five years after the completion of the study.

RESULTS

Description of the Sample

The sample included 16 male and 14 female students studying at six different universities in Khartoum state (Sudan). They varied in their sexual histories, socio-economic statuses, backgrounds (rural or urban), fields of study, current academic year and the type of their universities. Their age ranged from 18 to 24 years (mean age 19). Eleven reported being currently sexually active (six males and five females) (Table 2).

Table 2: Characteristics of study participants

Characteristic	Number	Percentage
Gender		
Male	16	53%
Female	14	47%
Age		
18 -20 years	13	43%
21-24 years	17	57%
Family Residence		
Khartoum state	20	67%
Other states	10	33%
Type of university		
Public	12	40%
Private	18	60%
Field of study		
Medical faculty	15	50%
Education and Arts	15	50%
Sexual activity		
Sexually active	11	37%
Abstainers	19	63%

Condom Use among University Students

The majority of the sexually active male and female participants reported that most of their sexual practices were unprotected. Only a few of them were using condoms consistently. Compared to the students who had never attended HIV educational programs, those who did stated that they were more likely to use condoms consistently.

“I have attended training about HIV held by an organisation in which we were told that condom use prevents HIV. I became more convinced when I started using condoms consistently” (21-year-old male, sexually active).

Pre-motivational Determinants

Knowledge and Misconceptions About HIV and Condom Use

To explore their knowledge about HIV and condom use, the participants were asked what they knew about HIV and its transmission and prevention. They were also asked what they knew about condoms and whether they knew how to use condoms correctly. No knowledge difference was observed between male and female students. All of the participants knew that HIV could be transmitted sexually and more than half of them were aware that condom use could prevent both HIV transmission and acquisition. However, the majority had the only superficial knowledge, if any, about how to use condoms and only those participants who attended HIV education programs seemed to know how to use condoms correctly. The majority of the sexually active participants gained detailed knowledge about condom use several years after they had started practising sex.

“The first time I heard about the condom was three years ago. I started practising sex many years before that, but I did not have enough knowledge about using condoms” (24-year-old male, sexually active).

Peers were the main source of knowledge about condom use among both male and female participants.

Misconceptions about condoms and their use were prevalent among male and female students, including both the sexually active and abstainers. Few participants questioned the protective role of condoms.

“The first time I heard about the condom was during my secondary school study. I used to believe that it prevents HIV transmission and I used to argue with my friends who do not use it. Now, I believe that condoms only prevent pregnancy and have no other advantage. It is quite possible to get HIV even if you use condoms. I came to this conclusion after discussions with my peers and logical thinking” (21-year-old male, sexually active). “Condoms protect only men against sexual diseases” (21-year-old female, sexually active).

A few male participants also had the misconception that condom use could be associated with physical harm to both sex partners.

“When you ejaculate, the penis will not have a space to ejaculate the semen since the condom will block the opening. Semen will remain inside the penis and cause harm. The condom also affects the muscles of the penis, and it may slip during sex and remain inside the vagina and cause health problems” (18-year-old male, abstainer).

Risk Perception

The participants were initially asked about any risks they will be exposed to if they practised sex without condoms. To explore their perception of susceptibility to HIV, they were asked how likely they believed they would contract HIV if they practiced condomless sex. They were also asked how serious HIV is to explore their perception of severity. Most of the male and female participants perceived the high risk of getting HIV if they practised condomless sex. Almost all of them also indicated that HIV is a serious disease that not only kills but also destroys the social life of infected people.

“These practices are associated with the risk of getting AIDS. We, as university students, are more exposed to this risk because these practices are more common in our university community and some students may be infected” (18-year-old female, abstainer).

Despite this, the majority of the sexually active participants still practised condomless sex, especially during spontaneous practices.

“One day I met a girl whom I know well that she practises sex with many people and might be infected. She was so lovely, and I was so excited that I had sex with her without a condom” (23-year-old male, sexually active).

In addition to the risk of getting HIV, the majority of the participants were also concerned about the risk of getting pregnant. Females and condom users reported higher pregnancy risk perception than males and non-users. They also perceived the serious social consequences of illegal pregnancy.

“I always remember pregnancy and its social and legal consequences. It is better for me to spend money to buy condoms to avoid pregnancy” (21-year-old male, sexually active).

Cues to Action

When asked about the cues that encouraged them to use condoms consistently, consistent condom users reported different cues. About half of them mentioned having previous experience with people living with HIV/AIDS.

“The first time I saw an HIV patient was in a health education activity. He looked very ill, and I was scared when I saw him. Since that time, I have become more careful and never practised sex without a condom” (24-year-old male, sexually active).

A few participants also explained how having easy access to condoms encouraged them to use condoms consistently.

“The main thing that encourages me to use condoms is that it is always easy for me to get condoms from the pharmacy where my close friend is working” (19-year-old male, sexually active).

Motivational Determinants

Attitude towards Condom Use

Participants' attitudes towards condom use were explored by asking them what they believed concerning the advantages and disadvantages of using condoms. The students' attitudes toward condom use were quite variable. The majority of the sexually active participants who were consistent condom users had a positive attitude toward condom use. Most of the male students focused on the role of condoms in the protection against HIV and other sexually transmitted diseases. For most of the female students and a few male students, the most crucial advantage was preventing unwanted pregnancy.

"It alleviates my fears of becoming pregnant." (18-year-old female, sexually active).

"When I use condoms, I can get rid of the fears of having illegal pregnancies, especially if I know that the girl has relations with other boys. I may be accused of a pregnancy caused by someone else [if I practise sex without condoms]" (23-year-old male, sexually active).

A few male participants also affirmed that using condoms helped them to engage in new sexual relations with those girls who preferred protected sex.

"It helps me to gain new relations with girls. Those girls who are keen to have sex only with those who always use condoms will prefer me to other students [who are not using condoms]" (21-year-old male, sexually active).

On the other hand, the majority of the sexually active students who were not consistent condom users expressed a negative attitude towards condom use. Both male and female participants perceived some common physical and emotional disadvantages of condom use. However, it was observed that most of the male students were more concerned about the perceived physical disadvantages of condom use.

"I used to hear that condoms negatively affect sexual pleasure and decrease the size of the penis. My friends also told me that using condoms for a long time could affect masculinity and weaken ejaculation. They can also cause ulcers in the penis" (24-year-old male, sexually active).

In contrast, the majority of the female participants seemed to be more concerned about the emotional disadvantages of using condoms. They believed that condom use could be interpreted as a lack of trust in the partner, hence, affecting their emotional relationship. They also attributed condom use to causing discomfort and reducing sexual satisfaction.

"Some of my sexual partners feel that condoms minimise sexual pleasure. Therefore, I feel discomfort with it" (19-year-old female, sexually active).

In addition to this, a minority of the participants believed that condoms are costly and their use could provide a false sense of protection if misused.

Almost all of the male and female abstainers expressed a negative attitude toward condom use and talked about several religious, social and moral disadvantages. As they believed, condom promotion and distribution would justify and encourage sexual practices,

destroy morality and spoil the youth. They considered premarital sexual practices more harmful than HIV itself.

“They claim that condoms prevent AIDS. The problem is that even if we stop AIDS by using condoms, we will destroy the morals of young people. There is no benefit in preventing the spread of AIDS if this causes the spread of another disease; the moral decay and disintegration of families” (20-year-old male, abstainer).

Social Influence on Condom Use

To study social influences on condom use, social norms, social pressure and support and social modelling were explored.

Social norms

The participants were asked about the prevailing norms associated with sexual practices and condom use and how these norms influenced their condom use behaviour. In Sudan, the prevailing social norms prohibit the open discussion of sex and sex-related issues. All of the participants agreed that condom use was rarely discussed in public media. As expressed by most of the participants, virginity at the time of marriage remains a virtue in Sudan and any type of sex outside marriage is considered sinful. Females' extramarital sex was believed to be associated with a social stigma and a negative impact on their family reputations.

“Everybody will criticise me if they know that I have sexual relations. I am not the only one who will be affected but also the whole of my family. Even in the future, anyone will hesitate to become engaged with me or even with anyone of my sisters if he knows that I used to have sexual relations” (21-year-old female, sexually active).

In addition, all of the participants talked about religion and religiosity and believed that religious principles act against premarital sexual behaviours.

“These practices take me away from Allah because they are not allowed in Islam. Allah will not be satisfied with us. When I avoid sexual practices, I will maintain my dignity and preserve my family's reputation” (24-year-old female, abstainer).

Because of these social norms and religious values prohibiting sex outside marriage, both sexually active male and female students experienced difficulty in getting condoms. Both of them also declared that they could not use condoms consistently because keeping condoms with them would indicate their intention to practise sex. Female students were also affected by the prevailing social norm prohibiting their negotiation about sex and condom use.

“It is the norm. If I ask for the condom, my partners will refuse just because they are men” (23-year-old female, sexually active).

According to the prevailing concept of “natural love,” practising sex without condoms was viewed as evidence of faithfulness to the partner.

“Sometimes, I feel that it is more trusting to practise sex with my partner naturally and without a barrier” (21-year-old male, sexually active).

Social support and pressure

Social support and pressure were explored by asking the participants who supported them to use condoms during sexual practices and who discouraged them. Regarding the influence of parents and other family members on condom use, almost all of the students agreed that parents and other family members support and advocate only abstinence and never discuss using condoms during sexual practices.

“I cannot talk with my dad or mom about sex because they are not as close to me as my friends” (18-year-old male, sexually active).

Politicians and policymakers were believed to be against condom use and resist condom distribution programs at universities. One of the participants pointed to the argument about condom promotion and distribution in the parliament of one of the provinces of Sudan saying:

“Condom distribution among university students was discussed in the parliament of the Eastern Province one month ago. One of the members strongly resisted this and criticised the minister of health who suggested condom distribution as a solution to the problem of HIV among university students. People believe that distributing condoms will legalise its use [in extramarital sexual practices] and will send an encouraging message. The minister then denied his statement as I read in the newspaper” (20-year-old male, abstainer).

Regarding the influence of religious leaders, all of the participants agreed that religious scholars were the main opponents of condom use and condom distribution because they believed that this would encourage students to practise extramarital sex.

“Our imam says that calling the youth to use condoms will spoil them and destroy the community and nothing will be gained from that” (24-year-old male, abstainer).

HIV Counsellors and other health care workers were considered the main and sometimes only supporters of condom use. Many sexually active students described how they encouraged them to use condoms whenever they practise sex.

“One day, I talked to a counsellor who asked me about my sexual behaviour. When I told him that I intend to practice sex, he advised me not to do that before marriage. He also advised me to use condoms if I practice sex so as to avoid many risks such as AIDS” (21-year-old male, sexually active).

Peers and sexual partners seemed to be very influential. Most of the participants stated that they were not able to discuss any sexual issues with anybody other than their friends and sexual partners.

“I usually talk to my close friends because we are at a similar age. I tell them about many things that happen to me and listen to them. My peers are always persuasive” (18-year-old male, sexually active).

Most of the consistent condom users indicated that they were encouraged to use condoms by their sexually active peers and sexual partners.

“My friends and I are very close to each other. We share our secrets. Most of them use condoms consistently and keep condoms in their pockets so they may have a chance to practise sex at any time. They encourage me to use condoms, but nobody else talks to me about that” (21-year-old male, sexually active).

On the other hand, those participants who did not use condoms explained that they were discouraged by his peers and sexual partners who never use condoms.

“My friends always tell me that sex is more pleasurable without condoms. They call it natural love. Most of my sexual partners also discourage me from using condoms as they believe that it reduces pleasure” (19-year-old male, sexually active).

Social modelling

All of the female students who reported using condoms consistently and most of the male condom users believed that condom use was common among the students.

“University students are well educated. Most of them use condoms consistently to prevent HIV and unwanted pregnancy” (21-year-old female, sexually active).

In contrast, those who did not use condoms and the abstainers looked at condom use as a rare practice among university students

“Only a very small minority of them (university students) uses a condom during sex” (20-year-old male, abstainer).

Post-motivational Determinants

Self-efficacy

To explore the students' self-efficacy, they were asked about the difficult situations associated with condom use and their confidence in their ability to use condoms consistently even if they were confronted by impediments. It was observed that male and female students faced different challenges. The majority of the male students narrated how they failed to resist their lust when condoms were not available or refused by their sexual partner.

“Although I was afraid of pregnancy, the first time I practised sex I did not use a condom because I did not have one at that time. It is my nature that when I come to do anything while I am excited; I fail to do it the proper way. We were in another family's house, and I was afraid of being caught there” (19-year-old male, sexually active).

“One day, I arranged with a girl to have sex. I prepared everything and kept a condom in my pocket. When I came to put it on, she refused. I tried my best to persuade her but failed. She was so sexy that I could not resist my desires” (23-year-old male, sexually active).

At the same time, most of the female students asserted that it was difficult for them to negotiate condom use with their intimate partners.

“I sometimes find it difficult to resist having sex without condoms when my intimate partner refuses to use it because he will think that I do not trust him” (18-year-old female, sexually active).

Concerning students` self-efficacy and confidence, generally female students appeared to consistently have lower self-efficacy to use condoms than male students, especially when they needed to negotiate its use. Students who reported using condoms consistently were more confident in their ability to use condoms and persuade any sexual partner to use it.

“I will never think of having sex without condoms as I know the danger of practising sex without it. I always put AIDS in front of my eyes. We were told in a workshop that AIDS patients might look healthy and since that time, I have never practised sex without condoms” (24-year-old male, sexually active).

Action Plans

The participants were asked how they planned to overcome difficulties and barriers to consistent condom use such as obtaining condoms, resisting sexual desire when excited and confronting sexual partner`s refusal. The majority of both male and female participants indicated to lack any action or coping plans to overcome these barriers. Only few of them had planned to buy condoms from remote pharmacies or ask their married friends to buy condoms for them. Few female students also talked about keeping condoms hidden.

“I am very keen to keep condoms hidden in my handbag all the time to use them whenever I practise sex” (19-year-old female, sexually active).

Another participant described how he avoided condomless sex when he lacked condoms saying:

“Sometimes when I do not have condoms, I start with foreplay, but finally I give my partner any reason to avoid full sex like telling her that I have an appointment with somebody” (24-year-old male, sexually active).

DISCUSSION

HIV prevention and control in any community requires the implementation of a combination of different interventions such as HIV testing, condom use, male circumcision, behavioural risk reduction, treatment of sexually transmitted infections and the use of antiretroviral medications (Kurth, Celum, Baeten, Vermund, & Wasserheit, 2011). This study focused on condom use as one of the effective HIV prevention interventions and sought to explore the socio-cognitive determinants of condom use among university students in Khartoum using the I-Change Model as a theoretical framework.

Pre-motivational Determinants

Several knowledge gaps and misconceptions about condom use were identified, such as causing physical harm to the user, being ineffective in preventing HIV and only protecting men against HIV. A previous study among dental students in Khartoum also showed that only 50% of the participants believed that condom use could prevent HIV (Nasir, Åstrøm, David, & Ali, 2008). These misconceptions seemed to influence condom use among students. The observed lack of knowledge about how to use condoms properly is another significant finding as recent research among this population has shown that experiencing problems with condom use such as condom breakage, slippage and fit is a predictor of condom use (Mohamed, 2014).

Regarding risk perception, high level of perception of HIV severity was observed among both condom users and non-condom users. Additionally, no difference in perception of susceptibility to HIV was observed between the two groups or between male and female students. However, a study among university students in Zimbabwe highlighted the importance of differentiating between students' personal risk perception and their perception of HIV risk of their fellow students (Nkomazana & Maharaj, 2014). Compared with the perceived health risk, the results also suggested that the perceived social risk of practicing premarital sex could be more influential on some students' sexual behaviours. Perceiving the risk of pregnancy and its severe social, legal and religious consequences seemed to be associated with consistent condom use among the study population, especially female students. This association was also observed in some previous studies (Maharaj, 2006; Pleck, Sonenstein, & Ku, 1991). This indicates that the students' perception of susceptibility and severity of unwanted pregnancy could be exploited to promote condom use for dual protection among this population. However, HIV prevention must be stressed as a distinct goal to avoid misinterpretation by those using other contraceptive methods (Steiner, Liddon, Swartzendruber, Pazol, & Sales, 2018).

The study suggested that having previous exposure to HIV infected persons could have a role as an important cue for consistent condom use among both male and female students. This finding parallels a recent longitudinal study which has documented that knowing someone infected with AIDS or had died from it strongly predicted condom use among visitors to VCT centres in Khartoum (Mohamed, 2014). The death of a family member or knowing someone with AIDS also increases the perceived HIV severity, resulting in consistent condom use (Palekar, Pettifor, Behets, & MacPhail, 2008).

Motivational Determinants

Regarding students' attitudes towards condom use, both condom users and non-condom users believed that using condoms had the advantage of protecting them against HIV and preventing unwanted pregnancy. Consistent condom users also talked about feeling more relaxed during sex and expressed that using condoms would provide opportunities for having new sexual relations with condom using sex partners. However, non-condom

users perceived several disadvantages associated with condom use as well. Parallel to a previous study among college students (Randolph, Pinkerton, Bogart, Cecil, & Abramson, 2007), non-condom users believed that condoms reduce sexual pleasure. The perceived disadvantages also included being costly, affecting emotional relations and causing physical harm. The diverse nature of perceived advantages and disadvantages of condom use among this population indicates that to build positive attitudes towards condom use students need to be encouraged to combine both cognitive and affective assessment of the behaviour. Although the findings suggested that male and female students perceived different physical and emotional disadvantages of condom use, further research with a larger sample is required to explore this difference. This will help in developing more gender-sensitive and specific messages to build positive attitudes towards condom use.

It was also observed that some sexually active participants were not consistent condom users despite believing in their role in preventing HIV and pregnancy. This observation may indicate that attitudes towards condoms are not the sole or most important determinants of condom use among this sample. This finding has also been observed in previous studies in other African settings showing that social norms and self-efficacy are also strong predictors of condom use (Eggers et al., 2016; Taffa, Klepp, Sundby, & Bjune, 2002).

Regarding social influence, several social norms seem to have a substantial negative impact on condom use among university students. These norms include the social norms prohibiting the open discussion about sex and sex-related issues. They also include the popular concept of natural sex among sexually active students and the gendered power relations preventing female students from negotiating condom use with their partners.

The strong influence of social norms in communities more anchored in family ties like Sudan has also been observed in some previous studies (Eggers et al., 2016; Guan et al., 2016; Sarkar, 2008). These social norms may have a significant influence as they interact with the other psychosocial determinants of behaviour, resulting in low condom use among university students. For instance, sexual health education (SHE) is difficult to implement as it is considered against modesty and believed to promote premarital sex. This prevented the dissemination of knowledge about safe sex among those who are already sexually active. Lacking credible sources of knowledge opens the door for misconceptions to prevail, leading to low condom use.

Social norms, in addition to the religious values against extramarital sex, also influence students' attitudes towards condom use. The participants who expressed negative attitudes towards condom use believed that condom use encourages the illegal extramarital sexual practices. Cultural norms affect students' self-efficacy as well since many students find it difficult to buy or keep condoms for use. Although in some communities, carrying condoms indicates caring about oneself, it is perceived as a sign of intentions to commit a sin among this population. Despite all of these challenges, recent research among a similar population has suggested that using suitable language and observing the sexual norms of the community as a part of SHE can reduce resistance (Latifnejad Roudsari, Javadnoori, Hasanpour, Hazavehei,

& Taghipour, 2013) and mitigate the negative impact of these social norms against condom use.

Islamic religious values prohibit all types of extramarital sex. Therefore, Muslim religious leaders in Sudan were viewed as the leading opponents of condom use. However, in some Muslim communities, like Uganda and Indonesia, religious leaders do participate in HIV prevention and advocate condom use, for those unable to abstain, through the teachings of Quran and Hadith calling for compassion and prevention of harm and disease (Hasnain, 2005). Similar to several previous studies (Bosompra, 2001; Diclemente, 1991; Zhang, Jemmott, & Heeren, 2017), our study also identified peer influence as an important determinant of condom use among sexually active students. In addition to the effect of subjective peer norms, peers are the only social group among this population with whom sexual practices are discussed. Condom users were encouraged and supported by their condom-using peers and sexual partners who acted as role models and provided them with condoms. On the other hand, non-condom users were discouraged by those peers and sexual partners who had misconceptions and negative attitude towards condom use. Therefore, peers may be considered essential stakeholders in condom promotion programs among university students, and their involvement may facilitate the implementation and maximise the benefits of these programs.

On the other hand, and consistent with previous research (Mola et al., 2006; L. Zhang et al., 2017), HIV counsellors were believed to play a significant role in supporting and promoting condom use among university students. There are a few VCT centres located at some universities in Khartoum where HIV counsellors can promote consistent condom use among the sexually active students visiting these centres through behavioural change counselling and condom provision.

Post-motivational Determinants

Self-efficacy as an important motivational and post-motivational determinant of condom use was explored, and several situations that respondents perceived as difficult to use condoms were identified. The observed difference in self-efficacy levels between consistent condom users and non-users suggested a possible association between condom use and self-efficacy among both male and female participants in this study. This association has been observed in previous quantitative studies as well (Baele, Dusseldorp, & Maes, 2001; Opong Asante, Osafo, & Doku, 2016).

Among the perceived barriers to condom use, participants mentioned having sex with the intimate partner, partner refusal to use condoms, embarrassment associated with purchasing condoms, having no money to purchase condoms and not having condoms available when needed. Also in line with some previous studies (Nesoff, Kristin, & Delia, 2016), lacking the skills to negotiate condom use was a significant perceived barrier to condom use, especially among female students because of the prevailing social norms in Sudan prohibiting condom use negotiation by female partners. Recent research has also

shown that women who practice sex for money are less likely to be able to negotiate condom use with their sexual partners. Therefore, it has been suggested that HIV prevention programs should also be structural (i.e. economic) to produce changes in the context in which condom negotiations take place (Dworkin et al., 2009).

Although a few participants described how they coped with barriers and difficult situations, most of them lacked coping plans to overcome condom use barriers. Having no coping plans seemed to be associated with lower condom use among this study population. A previous study suggests that to promote condom use, it is crucial to address these perceived barriers and enhance self-efficacy (Kaneko, 2007).

Practice Implications

Considering the observed diversity of condom use determinants and barriers among this population, a comprehensive and culturally consistent behavioural change program is required. For such a program to be successful, it should be gender-specific in order to deal with observed differences between male and female students (Dworkin et al., 2009).

In addition to addressing misconceptions, risk perception and attitude, such a program should focus on peer influence and self-efficacy to promote condom use as they seem to be important determinants of condom use among university students.

Regarding peer influence on condom use behaviour, the sexually active students could be provided with data about the percentage of the students who use condoms consistently, which is likely to be much higher than their expectations. Providing sexually active students with effective peer pressure resistance skills could also help them to resist peer pressure against condom use. Female students could be trained and encouraged to use assertive condom negotiation strategies such as direct request and withholding sex (French & Holland, 2013). To address the peer norms that look at practicing condomless sex as a sign of manhood and masculinity, male students should be convinced that consistent condom use is a healthy attribute of masculinity (Shai, Jewkes, Nduna, & Dunkle, 2012).

To enhance the student's self-efficacy, different behavioural change methods could be incorporated such as verbal persuasion, reattribution training, self-monitoring and goal setting methods (L.K et al., 2016). These methods have been tested and found to be successful in changing behaviours and could be used to promote condom use. The verbal persuasion method relies on using messages suggesting that the participant possesses the capability to use condoms consistently. This method requires a credible source such as VCT counsellors to convey these messages. In the reattribution training method, participants are helped to interpret previous failures to use condoms in terms of unstable attributions, while previous successes are interpreted in terms of stable attributions. The self-monitoring method prompts the participants to keep a record of their condom use practices and encourages them to interpret and use the recorded data to find out when and why they fail to use condoms. Another useful method is goal setting where a participant makes a plan to assist him or her to become a consistent condom user. The participants must be

committed to these goals in order to change their behaviour (L.K et al., 2016). In addition to these cognitive skills, a previous study has suggested that focusing more on affect regulation skills can have a significant impact on condom use (Brown et al., 2012). Such skills include getting away from triggers for strong emotions either physically (Situation modification) or cognitively (Attentional deployment) (Houck et al., 2016).

Since our study looked only at the psychosocial determinants of condom use and did not take into account many other important factors such as poverty, violence and poor access to prevention services, future research also needs to pay attention to these factors and explore how they interact with these psychosocial determinants to influence students' beliefs and sexual behaviours.

Strengths and Limitations

This is the first qualitative study that deeply explores the determinants of condom use among both male and female university students in Sudan. Using the I-Change model as a theoretical framework facilitated the exploration of the important socio-cognitive determinants of condom use. Furthermore, the lengthy interviews and the semi-structured interview guide with open-ended questions enabled the participants to talk freely about their behaviours and provide in-depth details. In addition, the sample included a heterogeneous group of students in terms of sexual histories, socio-economic statuses, backgrounds (rural or urban), fields of study, current academic year and the type of their universities. However, the number of participants in the study was only 30 and some of them were recruited through snowball sampling, which means that this is not a representative sample and thus one cannot generalise the results to all university students in Sudan. Having both male and female and both sexually active and non-sexually active students in a sample of 30 participants challenged the thematic analysis and rendered it more difficult to identify subthemes because of the limited number of participants in each of these subgroups. Therefore, further research may be needed to assess the commonalities and differences in other regions and among the subgroups. Also no distinction was made in this study between male condoms, which are usually assumed, and female condoms. Therefore, a more explicit study on female condoms may be required. In addition, other relevant stakeholders were not included in the study, such as HIV counsellors, parents, religious leaders and policymakers. Therefore, future research should involve these additional groups before program development.

CONCLUSION

Promoting condom use is a big challenge in Sudan. Lack of knowledge, negative attitudes, lack of social support, low self-efficacy and poor action planning seem to be important factors in explaining the lack of condom use among this population. Therefore, a comprehensive

behaviour change program addressing all of these factors is urgently needed to promote condom use among sexually active university students. However, gender-analysis of these factors with further quantitative studies is highly needed to develop gender-specific HIV prevention programs.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no conflicts of interest.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval was obtained from the Directorate of Research, Ministry of Health, Khartoum State in July 2014.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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CHAPTER 5

PSYCHOSOCIAL DETERMINANTS OF CONSISTENT CONDOM USE AMONG UNIVERSITY STUDENTS IN SUDAN: FINDINGS FROM A STUDY USING THE INTEGRATED CHANGE MODEL

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ABSTRACT

Unprotected sex is common among university students in Sudan, thus increasing risks for STDs and HIV. As little is known about the psychosocial determinants of consistent condom use among this population, this study was designed to identify them. The Integrated Change Model (ICM) was applied in a cross-sectional design to identify in 218 students (aged 18-25 years) from Khartoum which items distinguish condom users from non-condom users. Condom users differed significantly from non-condom users in having more HIV and condom use-related knowledge, higher perception of susceptibility to HIV, reporting more exposure to condom use cues, having a less negative attitude towards condom use (attitude cons), experiencing social support and norms favouring condom use and having higher condom use self-efficacy. Binary logistic regression showed that peer norms favouring condom use in addition to HIV-related knowledge, condom use cues, negative attitude and self-efficacy were the factors uniquely associated with consistent condom use among university students in Sudan. Interventions seeking to promote consistent condom use among sexually active students could benefit from increasing knowledge about HIV transmission and prevention, raising HIV-risk perception, using condom use cues, addressing perceived condom disadvantages and enhancing students' self-efficacy to avoid unprotected sex. Moreover, such interventions should raise students' perceptions of their peers' beliefs and behaviours favouring condom use and seek health care professionals and religious scholars support for condom use.

Keywords:

Sudan; HIV; condom use; university students; I-Change Model

INTRODUCTION

In 2010, the global HIV response was aimed to achieve three zeros by 2030; zero new HIV infections, zero AIDS-related deaths and zero discrimination against people living with HIV/AIDS (PLWHA). To achieve these goals, measurable targets were set and interim 2020 milestones were articulated by the United Nations (UN) General Assembly in the 2016 Political Declaration on Ending AIDS. These milestones included reducing new HIV infections to fewer than 500,000 by 2020 through ensuring access to combination prevention options, including pre-exposure prophylaxis, voluntary medical male circumcision, harm reduction and condom promotion. However, the progress towards these goals is off track in the Middle East and North Africa (MENA), where HIV infections have increased by 22% since 2010 (UNAIDS). Sudan is among the countries with the highest HIV prevalence in MENA. In 2013, it was estimated that around 21% of PLHIV in MENA were from Sudan (UNAIDS).

Sudan has a total population of about 35 million people. The number of people living with HIV in Sudan in 2019 was estimated at 46,000 and the estimated HIV prevalence was 0.2% (UNAIDS). Although this is considered a low prevalence compared to the generalised epidemic in some sub-Saharan countries such as South Sudan (2.5%) (UNAIDS), the prevailing lack of knowledge, increasing poverty and political instability in the country raise the concerns as they could further fuel the epidemic in Sudan (Ismail, Kari, & Kamarulzaman, 2015). The HIV epidemic in Sudan is spread mainly via unprotected heterosexual and homosexual sex (Nasirian et al., 2020).

University students are targeted by HIV prevention interventions in many countries because they are believed to be at a higher risk of acquiring HIV compared to the general population in these countries (Lalo, Theodhosi, & Breshanaj, 2020; Moh Khotibul, Monthana, & Kanokwan, 2017; Ndabarora & McHunu, 2014). This has also been observed in many countries in the MENA region, where increasing numbers of university students become involved in risky sexual behaviours (Haroun et al., 2016; Hedayati-Moghaddam, Eftekhazadeh-Mashhadi, Fathimoghdam, & Pourafzali, 2015; Salameh et al., 2016). Engagement of university students in sexual risk behaviours can be attributed to several factors, including the university lifestyle with diminished parental control and monitoring and the poor comprehensive knowledge about HIV/AIDS (Born, Wolvaardt, & McIntosh, 2015; Elshiekh, Hoving, & de Vries, 2020; Khalid & Frah, 2013). In addition, poor access to HIV counselling and sexual health services is also a determinant of high-risk sexual behaviours among this population (Chanakira, O’Cathain, Goyder, & Freeman, 2014). Alcohol and drug use among university students are also associated with increased high-risk behaviours, including unprotected sex with multiple sex partners (Chanakira et al., 2014; Rubens et al., 2019).

Similarly, university students in Sudan are at high risk of contracting HIV because of a relatively high prevalence of engagement in condomless sex. Based on a survey conducted by the Sudan National AIDS Program (SNAP) in 2002, it was estimated that about 6.5% of

university students in Sudan were sexually active (*unpublished report*). In 2010, a study conducted by SNAP among higher education institutions' students and staff in Sudan revealed an increase in sexual activity among university students to more than 12.5%. Moreover, only 20% of the sampled university students reported using condoms during their first-ever and only 32% of them used a condom during their latest sexual intercourse (*unpublished report*). In another study conducted among visitors to voluntary counselling and testing (VCT) centres in Khartoum, only 12% of the respondents reported using condoms consistently, 41.5% used them sporadically and 46.3% were nonusers. According to this study, knowledge about AIDS transmission, knowing someone 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 (B. A. Mohamed, 2014). However, this study included only male participants.

Considering the importance of the psychosocial determinants of condom use, several behavioural change theories have been used to promote condom use through addressing these determinants (Protogerou, Johnson, & Hagger, 2018; Whiting, Pharr, Buttner, & Lough, 2019). The Integrated Change Model (I-Change Model) is one of these theories used to explain a variety of types of health behaviour, including consistent condom use (De Vries, Mesters, Steeg, & Honing, 2005; S. M. Eggers, L. E. Aarø, A. E. Bos, C. Mathews, & H. de Vries, 2014). The I-Change Model, which is derived from the Attitude – Social influence – Self-Efficacy Model, integrates the ideas of Ajzen's Theory of Planned Behaviour, Bandura's Social Cognitive Theory, Prochaska's Transtheoretical Model, the Health Belief Model, and goal setting theories (De Vries, 2017). The I-Change Model distinguishes three phases in the process of behavioural change: a pre-motivational (awareness), motivational and post-motivational (action) phase. Each of these three phases has its relevant determinants (de Vries et al., 2003). The pre-motivational or awareness phase is determined by knowledge, risk perceptions, cues to action and cognisance about one's own behaviour. In relation to this study, the model assumes that condom use pre-motivational awareness phase is determined by a person's cognisance of his/her sexual behaviour and whether it meets the recommendations, accurate knowledge about HIV and condom use, and a person's perception of the seriousness of HIV (risk severity) and how likely it is to get HIV if practised condomless sex (risk susceptibility). This phase is also determined by the cues that prompt a person to use condoms consistently, such as the death of a relative with AIDS. Once they become aware of the health problem (HIV) and its risk behaviours (condomless sex), individuals can proceed to the motivational phase in which they will consider taking up a health-promoting behaviour (e.g., consistent condom use). According to the I-Change Model, the determinants of this motivational phase include attitude, social influence and self-efficacy. In relation to this study, a person's attitude towards condom use is his or her perception of the cognitive and emotional advantages and disadvantages of using condoms consistently (De Vries et al., 2005). The social influence on an individual's condom use behaviour refers to the support that he or she receives from others to use condoms (social support), the perception of

what others in his community believe about condom use (social norm) and the individual's perception of condom use behaviour among the community members (social modelling) (de Vries et al., 1994). Self-efficacy refers to a person's perception of his capability to carry out a type of behaviour (consistent condom use) in a variety of situations and how difficult a person regards realising the desired healthy behaviour (de Vries, Dijkstra, & Kuhlman, 1988). These motivational factors together are assumed to predict the intention to use condoms consistently. The translation of this intention into behaviour is the third and post-motivational phase which is determined by a person's level of intention, action plans such as the plans required to prepare oneself and initiate condom use and the coping plans needed to overcome barriers and plan enactment. This phase is also determined by a person's self-efficacy, skills and the level of barriers that are encountered (Sander M. Eggers et al., 2017). Finally, as a psycho-social-ecological model, the I-Change model indicates that these factors are influenced by predisposing factors such as psychological factors (e.g. personality), behavioural factors (e.g. lifestyles), social and cultural factors (e.g. policies, cultural norms, religion), biological factors (e.g. gender, genetic predisposition) and information factors (the quality of messages, channels and sources used) (De Vries et al., 2005).

The above-described determinants have been poorly studied in Sudan. To the best of our knowledge, these determinants have been only recently explored by a qualitative study we have conducted among university students in Khartoum using the I-Change Model. Regarding the pre-motivational determinants, the study revealed several misconceptions about condoms and their use among male and female students and most of the participants reported a lack of knowledge about how to use condoms. Regarding risk perception, most of the participants perceived the high risk of getting HIV if they practised condomless sex. They also reported a high perception of HIV severity and indicated that HIV is a serious disease with severe impacts on health and social life. The cues reported by the consistent condom users as encouraging cues included having previous experience with PLWHA and having easy access to condoms. Concerning the motivational determinants, the findings suggested that negative attitude was a determinant of condom use as non-condom users of both sexes perceived several physical and emotional disadvantages associated with condom use. Regarding the role of social influence on the students' condom use, the study suggested that lack of social support was a barrier and pointed to the role of religious values and social norms against condom use. Most of the participants also pointed to the influential role of their peers in their condom use behaviour. Low self-efficacy was also identified as a possible determinant of condom use as most of the consistent users reported higher confidence in their ability to overcome the challenging situation than non-condom users. Finally, regarding the post-motivational determinants, the study suggested that poor action planning was a barrier as most of the participants reported a lack of action and coping plans (Elshiekh et al., 2020).

Although the previous study provided important insights into the psychosocial determinants of consistent condom use among university students in Sudan, the study was limited by

its qualitative design and the small sample of only 30 students. Therefore, this study was conducted to complement the previous study and further assess these determinants quantitatively. For this purpose, the I-CHANGE model (figure 3) was used as a theoretical framework.

METHOD

Design

A quantitative cross-sectional study was used among university students in Khartoum.

Recruitment and Participant Selection

The target group of this study was the sexually active undergraduate university students in Khartoum state. From a list of 35 universities in Khartoum, including 16 public and 19 private universities, three public and three private universities were randomly selected. The deans of students' affairs in these selected universities were visited by the principal researcher to explain the objectives of the study and seek their approval. Following approvals, invitation letters were distributed among the students in randomly selected lecture rooms in each university. The invitation letters provided to the students described the study and its objectives and shared how to access the study questionnaire online. Additionally, some sexually active students identified by the HIV counsellors were asked to invite their sexually active friends, who were also university students, to fill out the online questionnaire (snowball recruitment).

Procedures

As it is culturally sensitive to talk about sexual behaviour outside marriage in Sudan openly, data collection occurred online. The online questionnaire was in Arabic and accessible by smartphones, laptops and computers. The questionnaire started with an introduction presenting the study and explaining its objectives. This was followed by a section to inform the students that their participation was voluntary, and their confidentiality and privacy were assured. Participants' identifiers such as their names, address, phone numbers or universities were not included in the questionnaire.

Measurement

Questionnaire development was inspired using findings of an earlier qualitative study (Elshiekh et al., 2020) and previous studies about sexual health behaviours using the I-Change Model (De Vries et al., 2014; Sander M. Eggers et al., 2017). The instrument was piloted with ten university students other than those who participated in the study; no extensive changes were required. To assess the validity of the questionnaire for each construct of the

I-Change model, factor analysis was conducted. Cronbach's alpha was calculated to ensure the internal consistency of each construct items (Akeem, 2015).

Knowledge

Knowledge was assessed by 16 statements about HIV, its transmission, prevention and treatment and five statements about condom use such as "*condoms have expiry dates*" and "*condoms could affect the muscles of the penis*". Participants could respond to each statement with *yes*, *no* or *not sure*. Participants' responses to knowledge questions were coded as (1) for correct answers and (0) for incorrect or not sure responses.

Cues to action

Cues to consistent condom use were assessed by five items; knowing someone infected with or died of HIV, previously attending a talk regarding living with HIV/AIDS, previously attending a peer education program about HIV and knowing someone who could provide condoms. Participants could answer with *yes* (1) or *no* (0) for each item. All of these factors were combined together as cues to consistent condom use.

Risk perception

Risk perception was assessed by five items. Three items assessed the participants' perception of the risk of severe HIV-related health problems, social problems and psychological distress (-2 (totally disagree) to +2 (totally agree); Cronbach's alpha=0.74). To assess participants' perception of susceptibility to HIV, they were asked how likely they would be infected with HIV if they practised unprotected vaginal and how likely they would be infected with HIV if they practised unprotected anal sex (-2 (very unlikely) to +2 (very likely); Cronbach's alpha=0.83).

Attitude

To assess attitude towards condom use, five items were used for the advantages (pros) of using condoms such as "*If I use condoms during sexual intercourse, I will be protected against HIV and other STIs*" and another five items for the disadvantages (cons) of using condom such as "*If I use condoms during sexual intercourse, this will indicate that I do not trust my partner.*" (Cronbach's alpha=0.64 and 0.78, respectively). Response options for all attitude items ranged from -2 (totally disagree) to +2 (totally agree).

Social influence

Social influence was assessed with eleven items such as "*Most of my friends believe that I should use condoms during sexual intercourse*" and "*Most of my sexual partners support me to use condoms during sexual intercourse.*" For all social influence items, participants could reply on a five-point Likert scale ranging from -2 (totally disagree) to +2 (totally agree). Based on factor analysis, the social influence 11 items were grouped into three categories:

peer norm (two items; Cronbach's alpha = 0.68), peer support and modelling (three items; Cronbach's alpha = 0.71) and others (parents, religious scholars and health professional) influence (six items; Cronbach's alpha = 0.82).

Self-efficacy

Self-efficacy was assessed with six statements such as "*I would find it difficult to use condoms if my sexual partners refuse it*". Participants could reply to self-efficacy items on a five-point Likert scale ranging from -2 (totally agree) to +2 (totally disagree). (Cronbach's alpha = 0.78).

Intention

Intention to use condoms consistently was assessed with three statements using a five-point Likert scale regarding respondents' intention to use condoms during the subsequent sexual intercourse, to use it consistently during future sexual intercourse and to discuss condom use with the sexual partner during the following sexual intercourse (-2 (totally disagree) to +2 (totally agree); Cronbach's alpha = 0.84).

Consistent condom use

Consistent condom use as a behavioural outcome variable was measured by asking the participants whether they used a condom during their last sexual intercourse (*yes, no*) and how frequently they use condoms during sexual intercourse (*always, often, sometimes, rarely, never*). Only those who stated that they used condoms during their last sexual activity and always used condoms during sex were considered consistent condom users. Accordingly, non-consistent condom users were coded as (0) and consistent condom users (1).

Data Analysis

Data analysis was performed in SPSS version 24. A descriptive analysis was undertaken to describe the study sample. Multivariate analysis of variances (MANOVA) was conducted to assess the difference between consistent and non-consistent condom users per psychosocial construct and for each individual construct item. Finally, forward binary logistic regression analysis (forward LR) was performed to identify the potential predictors of consistent condom use. Results with p values < .05 were considered significant.

Ethical Consideration

All procedures performed in the study involving human participants were in accordance with the ethical standards of the national research committee and with the 1964 Helsinki declaration and its later amendments. Ethical approval was obtained from the Directorate of Research, Ministry of Health, Khartoum State in July 2016. Informed consent was obtained from all respondents included in the study before participation. Students were informed that their participation was voluntary. To maintain the privacy and confidentiality of the

participants, they were asked to report only their gender and age. Other identifiers such as their names, address or universities were not requested.

RESULTS

Description of the sample

Initially, about 415 students responded, but only 304 of them completed the whole questionnaire. The remaining 111 participants answered less than 70% of the questions; therefore, they were excluded from the study. Among those who completed the online questionnaire, 98 were sexually active. An additional 120 sexually active participants were recruited by some sexually active students (snowball recruitment). Two hundred and eighteen sexually active male and female university students were included in the study. The sample included 76 consistent condom users (35%). Most participants were Sudanese (94.5%) and Muslim (94%). Table 1 below summarises the demographic characteristics of the study participants.

Pre-motivational determinants

Knowledge about HIV/AIDS

The overall percentage of correct answers to each of the 16 items used to assess knowledge about HIV/AIDS ranged between 27-85%. The vast majority of the participants correctly answered items on HIV transmission. Nevertheless, misconceptions existed among the students. Many of them believed that HIV could be transmitted by mosquito bites or through hugging people living with HIV/AIDS (PLWHA) (43% and 45% respectively). More than 70% of them also believed that HIV transmission could be prevented by pre-ejaculation withdrawal. Additionally, more than 60% had the misconception that most people know they are infected with HIV soon after being infected.

MANOVA results showed that the overall knowledge about HIV/AIDS (the total score of all knowledge items) was higher among consistent condom users as compared to non-consistent condom users (Hotelling's $T = 0.282$; $F(16,201) = 3.539$; $p < .001$). When looking at the separate HIV knowledge items, significant differences were observed between consistent and non-consistent condom users with higher knowledge about HIV/AIDS among consistent condom users in almost all items, as shown in table 2.

Knowledge about condom use

The results reveal several misconceptions about condoms and their use prevalent among the total study population. For example, the majority of the students believed that consistent condom use could affect the muscles of the penis and cause loss of sexual desire (68% and 73%, respectively). In addition, about 59% also underestimated the protective role of consistent condom use against HIV transmission. Besides, 39% of the participants believed

Table 1. Description of the study sample (N = 218)

Characteristics	Total N (%)	Non-consistent condom users	Consistent Condom users	χ^2	P-value
Consistent condom use	218 (100%)	142 (65%)	76 (35%)		
Age (range 18-25)	Mean	21.1	21		
Age group					
< 20 years	80 (37%)	50 (62.5%)	30 (37.5%)	0.39	0.53
< 20 years	138 (63%)	92 (66.7%)	46 (33.3%)		
Gender					
Male	137 (63%)	93 (67.9%)	44 (32.1%)	1.22	0.27
Female	81 (37%)	49 (60.5%)	32 (39.5%)		
Nationality group*					
Sudanese	206 (94%)	134 (65%)	72 (35%)		1.0
Non-Sudanese	12 (6%)	8 (66.7%)	4 (33.3%)		
Religious group*					
Muslims	205 (94%)	131 (63.9%)	74 (36.1%)		0.23
Non-Muslims	13 (6%)	11 (84.6%)	2 (15.4%)		
Family income					
Low income	51 (24%)	28 (54.9%)	23 (45.1%)	3.09	0.21
Middle income	99 (45 %)	68 (68.7%)	31 (31.3%)		
High income	68 (31%)	46 (67.6%)	22 (32.4%)		
Type of university					
Public university	118 (54%)	76 (64.4%)	42 (35.6%)	0.06	0.81
Private university	100 (46%)	66 (66%)	34 (34%)		
Academic year*					
Early academic years (1 st - 3 rd years)	106 (49%)	66(62%)	40 (38%)	0.75	0.39
Late academic years (4 th - 6 th years)	112 (51%)	76 (68%)	36 (32%)		

* Fisher's exact test was used instead of Chi-squared test

that condoms protect only male partners against HIV and sexually transmitted infections (STI).

When comparing consistent and non-consistent condom users using MANOVA, overall knowledge about condom use was higher among consistent condom users (Hotelling's $T=0.163$; $F(5,212) = 6.927$; $p < .001$) with significantly higher knowledge about condom use among consistent condom users in almost all items (Table 2).

Cues to action

The participants reported low exposure to the cues about condom use. Less than 20% of them knew someone infected or who had died of HIV/AIDS. Only 31% had attended a peer education program about HIV prevention and only 36% of them knew somebody who could provide them with condoms confidentially. Generally, consistent condom users reported higher exposure to condom use cues than non-consistent condom users (Hotelling's $T=0.550$; $F(5,212) = 23.307$; $p < .001$). When looking at the items separately, consistent condom users had significantly higher exposure to all of these cues than non-consistent users (Table 2).

Risk perception

The participants generally had high perceptions of the severe health, social and psychological consequences of HIV infection. MANOVA showed no overall difference between the two groups in their perception of HIV severity (Hotelling's $T=0.019$; $F(3,214) = 1.382$; $p=.249$). In contrast, the perception of susceptibility to HIV was relatively low among the study participants; however, consistent condom users scored significantly higher to the overall perception of susceptibility than non-consistent condom users (Hotelling's $T=0.086$; $F(5,212) = 9.245$; $p < .001$). In addition, compared to non-consistent condom users, consistent users showed higher perceptions of susceptibility to HIV if they practised unprotected vaginal ($p < .01$) and anal sex ($p < .001$), as shown in table 3.

Motivational determinants

Attitude

The comparison between consistent and non-consistent condom users in their perception of the advantages of using condoms revealed no significant difference (Hotelling's $T=0.026$; $F(5,212) = 1.121$; $p=.350$). Among the items that assessed the positive attitude towards condom use (condom use pros), protection against pregnancy, prevention of HIV/STIs and indicating caring about partner's health were the most important perceived advantages of consistent condom use among the study population.

On the other hand, a high perception of condom use disadvantages (condom use cons) was observed, with a significantly higher perception of condom use disadvantages among non-consistent users (Hotelling's $T=0.608$; $F(5,212) = 25.795$; $p < .001$). For instance, non-consistent condom users were more convinced than consistent condom users that condom

Table 2. Differences between groups for knowledge and cues

Knowledge about HIV/AIDS	Overall mean	Non- consistent condom users	Consistent Condom users	F	P
Anyone can get infected with HIV if he practices condomless vaginal intercourse with infected persons	.83	.75	.96	15.66	<.001
Anyone can get infected with HIV if he practices condomless anal intercourse with infected persons	.78	.72	.91	10.95	<.01
Anyone can get infected by getting injections with a needle that has already been used by infected persons.	.84	.81	.89	2.65	.105
A pregnant woman who is infected with HIV can transmit the virus to her baby.	.71	.65	.80	5.29	<.05
Anyone can get infected with HIV from a mosquito bite.	.53	.47	.63	5.14	<.05
Anyone can get infected with HIV through hugging with people living with HIV.	.55	.44	.75	21.35	<.001
Someone who looks healthy can be infected with HIV.	.68	.63	.78	5.15	<.05
You can protect yourself against HIV by abstaining from sexual intercourse before marriage.	.85	.82	.91	3.21	.075
You can protect yourself against HIV by using a condom correctly every time you have sexual intercourse.	.77	.68	.95	22.56	<.001
People can reduce the risk of getting HIV by reducing the number of their sexual partners.	.66	.56	.83	16.50	<.001
Having sexually transmitted infection put you at higher risk of getting infected with HIV.	.71	.63	.86	12.38	<.01
Most people do know they are infected with HIV soon after getting infected	.32	.26	.42	6.00	<.05
Getting the penis out just before ejaculation, is a safe method of preventing HIV transmission	.27	.26	.28	.06	.803
HIV treatments help HIV infected people to live normally for longer time.	.61	.56	.71	5.02	<.05
HIV infected people on treatment are less likely to transmit HIV to others.	.56	.47	.74	14.98	<.001
Early diagnosis of HIV infection can prevent development of AIDS.	.66	.62	.72	2.38	.125
Knowledge about condom use					
Condoms could affect the muscles of the penis	.37	.29	.53	12.55	<.01
Condoms protect only male partner against HIV and sexually transmitted infections (STI)	.61	.57	.68	2.70	.102
Consistent use of condoms can cause loss of sexual desire.	.29	.20	.46	16.74	<.001
Consistent condom use provides only 50% protection against HIV	.41	.32	.58	14.01	<.001
Condoms have expiry dates	.80	.75	.91	8.39	<.01

Condom use cues						
Do you know someone who is infected with HIV/AIDS	.18	.13	.26	5.74	< .05	
Do you know someone who died of AIDS	.14	.10	.21	5.31	< .05	
Have you ever listened to someone living with HIV/AIDS telling his experience of living with HIV	.21	.11	.39	26.29	< .001	
Have you attended any peer-education program on HIV prevention	.31	.17	.58	46.71	< .001	
Do you know somebody who can provide you with condoms confidentially	.36	.15	.75	115.83	< .001	
Knowledge items: (<i>correct=1, incorrect=0</i>), Cues items: (<i>yes=1, no=0</i>)						

use would decrease sexual pleasure ($p < .001$) and lead to sex addiction ($p < .01$). The perceptions that consistent condom use would indicate a lack of trust in the sexual partner, cause semen stagnation or feel unnatural were all very low among both consistent and non-consistent condom users with no significant differences between the two groups (Table 3).

Social influence

Generally, the participants had a very low perception of peer norms favouring consistent condom use. Consistent condom users had a relatively higher perception of friends and sexual partners' norms favouring consistent condom use; however, this difference was not statistically significant ($p = .062$ and $.053$, respectively). In addition, no difference in overall peer norm influence was identified between consistent and non-consistent condom users (Hotelling's $T = 0.022$; $F(2,215) = 2.403$; $p = .093$). Overall, consistent condom users reported more peers to use and support condom use (Hotelling's $T = 0.102$; $F(3,214) = 7.3$; $p < .001$). In-depth analysis revealed that most of the participants received little support from their friends and sex partners, but consistent condom users did report relatively more support from their friends ($p < .001$) and sexual partners ($p < .001$). They also believed that condoms were more commonly used by their peers as compared to non-consistent condom users ($p < .01$).

Consistent condom users also reported to experience more influence from parents, religious leaders and health professionals than non-consistent condom users (Hotelling's $T = 0.111$; $F(6,211) = 3.901$; $p = .001$). When looking at the items separately, consistent condom users were more convinced that health professionals ($p < .01$) and religious leaders ($p < .01$) favoured consistent condom use than non-consistent condom users. Consistent condom users also perceived greater support to use condoms consistently from health professionals ($p < .001$) and religious leaders ($p < .01$) than non-consistent condom users. Both groups perceived greater support from health professionals than religious leaders. Parents' influence on consistent condom use, including both parents' support and norms, was not statistically significant (Table 3).

Self-efficacy

Students' self-efficacy to use condoms consistently was generally very low. Partner refusal to use condoms, practising sex with steady partners and facing difficulty in obtaining condoms were the most difficult barriers affecting students' self-efficacy. Overall, consistent condom users reported higher self-efficacy than non-consistent condom users (Hotelling's $T = 0.182$; $F(6,211) = 6.388$; $p < .001$). In-depth analysis reveals that consistent condom users showed significantly higher self-efficacy for most difficult situations except when practising sex with steady partners (Table 3).

Intention

In general, participants had a slightly positive intention to use condoms during the following sexual intercourse, use it consistently during future sexual intercourse and discuss condom use with their sexual partners the next time they have sex (overall mean scores 0.93, 0.86 and 1.06, respectively). These intentions to use condom were significantly higher for consistent users compared to non-consistent condom users (Hotelling's $T = 0.081$; $F(3,214) = 5.783$; $p < .01$). Consistent condom users had significantly higher intentions to use condoms during the next sexual intercourse ($p < .01$) and to use it consistently during future sexual intercourse ($p < .01$). They also had higher intentions to discuss condom use with their sexual partners the next time they had sex ($p < .001$) (Table 3).

Regression analysis

Table 4 summarises the results of the forward binary logistic regression, which showed that HIV knowledge, condom use cues, attitude cons, peer norms and self-efficacy were all uniquely associated with consistent condom use. The odds of consistent condom use were higher among those with higher HIV knowledge (OR: 1.27, 95% CI: 1.22, 1.44, $p < .001$), higher exposure to condom use cues (OR: 1.74, 95% CI: 1.38, 2.19, $p < .001$) and higher perception of peer norms favoring consistent condom use (OR: 1.65, 95% CI: 1.099, 2.47, $p < .05$). Conversely, the odds of consistent condom use were much lower among those with a higher perception of condom use disadvantages (attitude cons) (OR: 0.15, 95% CI: 0.07, 0.32, $p < .001$). Self-efficacy was found to be strongly associated with consistent condom use. The odds of consistent condom use were more than two times more among those with higher self-efficacy (OR: 2.115, CI: 1.255, 3.566, $p = .005$). The logistic regression model was statistically significant, $\chi^2(5, N=218) = 111.691$, $p < .001$. The model explained 55.3% (Nagelkerke R^2) of the variance in consistent condom use and correctly classified 81.2% of cases.

Table 3. Differences between groups for HIV risk perception, attitude, social influence, self-efficacy and intention

Construct items	Overall mean	Non-consistent condom users (Mean score)	Consistent Condom users (Mean score)	F	P
Risk perception (Risk severity)					
If I would contract HIV, this would be a serious health problem for me.	1.58	1.51	1.72	4.090	< .05
If I would contract HIV, I would have serious social problems.	1.59	1.54	1.67	1.430	.233
If I would contract HIV, I would suffer from serious psychological distress.	1.51	1.46	1.59	1.022	.313
Risk perception (Risk susceptibility)					
How likely that you will get HIV infection if you practice unprotected vaginal intercourse.	.45	.30	.72	6.883	< .01
How likely that you will get HIV infection if you practice unprotected anal intercourse.	.43	.18	.88	18.294	< .001
Attitude (pros condom use) if I use condoms during sexual intercourse:					
I will be protected against HIV and other STIs	1.24	1.23	1.26	.102	.750
This will indicate that I care about my partner's health.	1.15	1.18	1.11	.268	.605
I don't have to worry about pregnancy	1.32	1.37	1.21	1.707	.193
This will help me to have more sexual partners.	-.05	-.14	.12	2.557	.111
It will delay ejaculation and let me enjoy sex	.66	.63	.72	.517	.473
Attitude (cons condom use) if I use condoms during sexual intercourse:					
This will indicate that I do not trust my partner.	-.42	-.32	-.61	2.737	.100
It will decrease sexual pleasure	.22	.77	-.80	114.946	< .001
I will have health problems due to semen stagnation	.13	.23	-.05	3.573	.060
I will become sex addicted	.47	.62	.18	9.182	< .01
It will feel unnatural to me	-.51	-.43	-.66	1.923	.167
Social influence (Peer norm)					
Most of my friends believe that I should use condoms during sexual intercourse.	.27	.16	.47	3.507	.062
Most of my sexual partners believe that I should use condoms during sexual intercourse	-.08	-.18	.12	3.780	.053

Social influence (Peer support & modelling)					
Most of my friends support me to use condoms during sexual intercourse	.18	-.05	.62	15.652	< .001
Most of my sexual partners support me to use condoms during sexual intercourse	-.16	-.38	.25	15.986	< .001
How many of your friends use condoms during sexual intercourse?	-.15	-.30	.12	8.282	< .01
Social influence (Others influence)					
My parents believe that I should use condoms during sexual intercourse	.32	.30	.36	.113	.737
Health professionals believe that I should use condoms during sexual intercourse	.85	.73	1.09	9.676	< .01
Religious scholars believe that I should use condoms during sexual intercourse.	.41	.27	.67	7.209	< .01
My parents support me to use condoms during sexual intercourse.	.37	.32	.45	.702	.403
Health professionals support me to use condoms during sexual intercourse.	.85	.68	1.16	15.771	< .001
Religious scholars support me to use condoms during sexual intercourse.	.39	.25	.64	7.429	< .01
Self-efficacy					
I would find it difficult to use condoms if my sexual partners refuse it.	-.76	-.91	-.47	9.325	< .01
I would find it difficult to use condoms in case of high sexual arousal.	-.38	-.65	.13	23.447	< .001
I would find it difficult to use condoms because it is difficult for me to get it.	-.50	-.68	-.17	10.180	< .01
I would find it difficult to use condoms when I feel that it reduces pleasure.	-.44	-.63	-.09	11.651	< .01
I would find it difficult to use condoms with my steady partner.	-.64	-.72	-.48	2.019	.157
I would find it difficult to use condoms since I do not know how to use it properly.	.27	.06	.66	16.490	< .001
Intentions					
I have the intention to use condoms during the next sexual intercourse	.93	.80	1.17	8.763	< .01
I have the intention to use condoms consistently during future sexual intercourse	.86	.73	1.11	9.002	< .01
I have the intention to discuss condoms use with my sexual partner the next time I have sex	1.06	.89	1.38	16.771	< .001
Risk perception (severity), Attitude, social influence and intentions items: (-2 (totally disagree) to +2 (totally agree))					
Risk perception (susceptibility) items: (-2 (very unlikely) to +2 (very likely)); Self-efficacy items: (-2 (totally agree) to +2 (totally disagree)).					

Table 4. Binary logistic regression analysis for condom use

Variables in the equation	Odds ratio	95% confidence interval		Sig.	
		Lower	Upper		
BLOCK 2	Step 1 Condom use cues	1.822	1.498	2.216	< .001
	Knowledge about HIV/AIDS	1.281	1.143	1.436	< .001
	Step 2 Condom use cues	1.747	1.422	2.147	< .001
BLOCK 3	Step 1 Knowledge about HIV/AIDS	1.282	1.135	1.449	< .001
	Condom use cues	1.789	1.432	2.237	< .001
	Attitude cons	.198	.101	.386	< .001
BLOCK 3	Step 1 Knowledge about HIV/AIDS	1.278	1.130	1.446	< .001
	Condom use cues	1.708	1.362	2.142	< .001
	Attitude cons	.181	.089	.368	< .001
	Self-efficacy	2.188	1.308	3.660	< .01
	Step 2 Knowledge about HIV/AIDS	1.271	1.122	1.440	< .001
	Condom use cues	1.738	1.378	2.191	< .001
BLOCK 3	Step 3 Attitude cons	.150	.070	.320	< .001
	Peer norm	1.648	1.099	2.470	< .05
	Self-efficacy	2.115	1.255	3.566	< .01

**In block 1, both included variables (age and gender) were not retained in the equation*

DISCUSSION

This study aimed to identify the psychosocial determinants of condom use among university students in Khartoum, using the I-Change Model as a theoretical framework. The findings of the analyses of variance clearly indicated that condom users differed significantly from non-condom users in having more HIV and condom use-related knowledge, higher perception of susceptibility to HIV, reporting more exposure to condom use cues, having a less negative attitude towards condom use (attitude cons), experiencing social support and norms favouring condom use and having higher condom use self-efficacy. These outcomes suggest that, in order to promote condom use, these items should be clearly addressed in condom promotion programs among this at-risk population in Sudan.

The results of the regression analysis also supported the importance of knowledge about HIV/AIDS as a factor uniquely related to consistent condom use among the study population, a finding consistent with the results of previous studies (S. M. Eggers, L. E. Aarø, A. E. R. Bos, C. Mathews, & H. de Vries, 2014; Hosseini Hooshyar et al., 2018; B. A. Mohamed, 2014; Sun et al., 2013). Despite being university students, serious knowledge gaps and misconceptions about HIV transmission and prevention as well as condom use misconceptions were revealed by this study. Hence, it is important to design health education messages to address these misconceptions and fill the knowledge gaps. However, holding mass educational campaigns to promote condom use among university students in Sudan is challenging. A recent study has also identified peers as the main source of knowledge about HIV and condom use for university students in Sudan (Elshiekh et al., 2020). Therefore, it is essential to select the most appropriate channels to deliver these messages to disseminate HIV knowledge among the students.

The perception of HIV severity was not associated with consistent HIV condom use among this study's participants, which contradicts the findings of some previous studies (Calaguas, 2020; Katikiro & Njau, 2012; Regan & Morisky, 2013). This lack of association could be explained by the high level of social stigma associated with HIV in Sudan that led all the students to perceive the severe social and psychological consequences of contracting HIV as observed in this study and previously reported (Elshiekh et al., 2020). However, an association between the perception of susceptibility to HIV and consistent condom use was revealed by this study as well as several previous studies (Calaguas, 2020; Fauk et al., 2018; Elvis Enowbeyang Tarkang & Pencille, 2018). The regression analysis of our study data showed no unique association between HIV-risk perception and consistent condom use. This may be explained by the fact that the influence of risk perception as a pre-motivational factor on behaviour may be mediated by motivational factors as assumed by the I-Change model (Kasten, van Osch, Candel, & de Vries, 2019). Previous match-mismatch studies indicated that people in the pre-motivational phase benefit more from interventions that target their current motivational status (Dijkstra, Conijn, & De Vries, 2006; Kim, Hwang,

& Yoo, 2004). Therefore, it seems important to address HIV-risk perception in condom promotion intervention to raise the awareness of those in the pre-motivational phase.

Regarding the cues to condom use and similar to what was observed in some previous studies (Elshiekh et al., 2020; B. A. Mohamed, 2014; Palekar, Pettifor, Behets, & MacPhail, 2008), knowing someone who was infected with HIV or who died of AIDS was associated with consistent condom use. However, some conditions need to be considered before including this cue in future interventions aiming to promote consistent condom use. Firstly, students' exposure to such cues may be limited since HIV infected persons in Sudan tend to hide their infection due to the high social stigma and discrimination against PLWHA (Badreldin Abdelrhman Mohamed & Mahfouz, 2013). Secondly, it has been suggested that fear appeal messages may increase the stigma and discrimination against PLWHA (Bastien, 2011). Besides, previous research suggested that using fear appeal to change the high-risk behaviours among people with low self-efficacy may result in a defensive behaviour to avoid the fear appeal messages (Kok, Bartholomew, Parcel, Gottlieb, & Fernández, 2014). Our study also found an association between knowing somebody who could provide condoms confidentially and consistent condom use, which was also found by previous studies that identified purchase embarrassment as a barrier to consistent condom use (Hasnain, 2005; B. A. Mohamed, 2014; Moore et al., 2008). In a conservative community like Sudan, purchasing condoms is usually associated with embarrassment because of the social stigma associated with premarital sex. To cope with this embarrassment, some sexually active students used to ask someone they knew to buy condoms for them or go to pharmacies in remote areas to purchase condoms (Elshiekh et al., 2020; B. A. Mohamed, 2014).

Concerning the attitude towards condom use, our study revealed that the participants' perception of condom disadvantages (cons) was uniquely associated with consistent condom use. Similar to previous research (Higgins & Wang, 2015; Randolph, Pinkerton, Bogart, Cecil, & Abramson, 2007), the perceived negative effect of condom use on sexual pleasure was associated with inconsistent condom use among this study population. It should be acknowledged that latex condoms represent mechanical barriers that reduce sensation and physical contact, which could affect sexual pleasure and this represents an important barrier to consistent condom use (Conley & Collins, 2005; Randolph et al., 2007). However, the effect of condoms on sexual pleasure could be minimised by promoting the use of high-quality condoms and emphasising the pleasure-enhancing aspects of condom use (Randolph et al., 2007).

Regarding social influence on condom use, our study highlighted some important contextual differences between the Islamic and non-Islamic communities that should be considered. According to our study participants, parents' norms and support seemed to play no role in condom use in Sudan due to the Islamic religious values and prevailing social norms prohibiting all types of extramarital sex and discouraging open discussions about sex among family members (Elshiekh et al., 2020). This finding contradicts results obtained from study findings from some non-Islamic cultures (Dilorio, McCarty, Resnicow, Lehr, &

Denzmore, 2007; Hadley et al., 2009; Elvis E. Tarkang, 2014), but may be explained by the fact that our participants were university students and thus had or wanted to become less dependent from their dependents. More qualitative in-depth research on this matter may be wanted to understand this finding better. Our study pointed to an interesting result regarding the positive role of Islamic religious scholars in promoting and supporting condom use by sexually active students. Again, this result is not in line with findings from previous studies identifying Islamic religious leaders as opponents to condom use (Elshiekh et al., 2020; Sarkar, 2008). Nevertheless, other studies also revealed that religious scholars might support condom use by sexually active Muslims considering the Islamic values of preventing harm and disease (Maulana, Krumeich, & Van Den Borne, 2009; Trinitapoli, 2011). Although peer support, modelling and norms favouring consistent condom use were all associated with consistent condom use, only peer norms were uniquely associated with consistent condom use in this study. The importance of peer norms favouring condom use was also reported in other studies (Hartman, 2019; Martens et al., 2006). A recent study has identified peers as the only social group among this population with whom sexual practices are discussed and recommended their involvement in condom promotion interventions to facilitate their implementation and maximise their benefits (Elshiekh et al., 2020).

Self-efficacy was identified by the regression analysis as an important factor with a unique association with consistent condom use in this study, which is in agreement with what has been suggested by a recent qualitative study among the same populations (Elshiekh et al., 2020), and previous studies (Baele, Dusseldorp, & Maes, 2001; S. M. Eggers et al., 2016; Opong Asante, Osafo, & Doku, 2016). Condom use self-efficacy is a multidimensional construct (Baele et al., 2001). Previous research reported some gender-specific differences in these self-efficacy dimensions (Joffe & Radius, 1993), which may necessitate further research to identify such differences among this population to facilitate the design of more gender-specific condom promotion interventions.

Practice implications

Promoting consistent condom use requires comprehensive interventions that address the different barriers. This study identified the salient psychosocial determinants of consistent condom use to be considered in future condom promotion interventions in Sudan and provided some suggestions on how to deliver such interventions.

HIV-related knowledge, especially HIV transmission and prevention, should be raised. The study identified some of the prevalent misconceptions and HIV-knowledge gaps to be targeted. Videos of HIV infected persons talking about their experience could be used as cues to promote condom use among those with high self-efficacy provided that carefully designed non-discriminatory messages are used. Suitable cue -reminders can also be used to complement interventions and augment their effectiveness (Dal Cin, MacDonald, Fong, Zanna, & Elton-Marshall, 2006). Condom promotion interventions should also address the negative perceptions and emphasise the pleasure-enhancing aspects of condom use. This

could be achieved by combining both emotional and factual messages (Warner & Forward, 2016).

Moreover, interventions should aim to change students' perception of their peers' beliefs (peer norm) and how they behave (modelling) concerning condom use. Norm-based interventions with strategies such as social norms marketing, personalised normative feedback and focus group discussions could be used for this purpose (Miller & Prentice, 2016). Finally, enhancing the students' self-efficacy to use condoms consistently is of paramount importance. All dimensions of condom use self-efficacy must be enhanced using the appropriate techniques such as verbal persuasion, condom use skills, condom negotiation and affect regulation skills (Bartholomew Eldredge et al., 2016; Brown et al., 2012; Houck et al., 2016).

A recent randomised control trial has shown that internet-based interventions are effective in behavioural change programs targeting HIV risk behaviour, including condomless sex (Anand et al., 2020). This approach has several advantages: maintaining participants' privacy, message tailoring, reaching the most at-risk population (MARPs) and saving time and resources (Noar, Black, & Pierce, 2009). Our study pointed to the suitability, feasibility and acceptability of this approach among university students in Sudan. However, RCT studies to investigate the effectiveness of web-based HIV interventions among this population are highly needed.

Strengths and limitations

This is the first study focusing mainly on the psychosocial determinants of condom use among university students in Sudan. To the best of our knowledge, it is also the first study that used an online questionnaire to collect data about the sensitive issues around sexual practices among youth in the conservative community of Sudan. This was expected to be more comfortable and popular among university students and assumed to enable researchers to collect more valid data. Using a behavioural change theory, the I-Change model, as a theoretical framework for the study is also one of the strengths as this could help understand the students' condom use behaviour and identify its psychosocial determinants. Despite these strengths, the study is not free of limitations. Firstly, being a cross-sectional study, a cause-effect relationship could not be established. Secondly, some of the participants were recruited through snowball sampling, which may question the representativeness of the sample and generalizability of the study results. Thirdly, the role of action planning and plan enactment as post-motivational mediators of the association between intention and behaviour was not assessed because it is better assessed with longitudinal studies rather than cross-sectional studies (Hassan, Shiu, & Shaw, 2014). Finally, the limited number of participants prevented the gender analysis of the data to identify differences between male and female students to develop more gender-sensitive interventions.

CONCLUSION

Unprotected sex is common among university students despite the attempts to promote condom use in Sudan. HIV-related knowledge, exposure to condom use cues, attitude towards condom use, peer norms favouring condom use and condom use self-efficacy are all associated with consistent condom use among university students in Sudan. Interventions seeking to promote consistent condom use among sexually active students should increase knowledge about HIV transmission and prevention, address perceived condom disadvantages and foster peer norms favouring condom use. Moreover, such interventions should enhance students' self-efficacy to avoid unprotected sex. Increasing students' exposure to condom use cues may also help them use condoms consistently.

Compliance with ethical standards

Funding: No funds, grants, or other support was received.

Conflict of interest: The authors declare that they have no conflicts of interest.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval was obtained from the Directorate of Research, Ministry of Health, Khartoum State.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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CHAPTER 6

GENERAL DISCUSSION

GENERAL DISCUSSION

The aim of this dissertation was to identify the psychosocial determinants of two important HIV-related behaviours: premarital sexual practices and consistent condom use, among university students in Sudan, where HIV is predominantly transmitted through heterosexual practices. It is now widely believed that no single HIV prevention intervention could be sufficient to control the pandemic because each of the currently used HIV prevention methods, including both the biomedical and behavioural, has its barriers and limitation (1-3). Therefore, multi-component packages of evidence-based behavioural, biomedical, social and structural interventions are required to control the epidemic. Previous studies also showed that combining several partially protective strategies together might have additive or synergistic effects. (1-4). An example of such combination to be implemented in a population with a generalised heterosexual epidemic would include promoting abstinence and safer sex HIV risk-reduction strategies (5) or offering male medical circumcision (MMC), antiretroviral therapy (ART) rollout and behaviour change interventions to reduce risk behaviours and increase adherence to ART (6). However, several success factors should be considered before designing these prevention packages. For instance, the combination HIV prevention should be appropriate, acceptable and deliverable to the target population.

Considering all of these factors, the current studies suggest that, within the context of the Islamic communities, a combined abstinence-plus intervention that promotes sexual abstinence but also encourages university students to use condoms and adopt other safer-sex strategies if they do decide to be sexually active (7, 8) may successfully prevent HIV transmission among this target group. Previous studies also showed that abstinence-plus interventions successfully promoted both abstinence and safe sex practices (9-12) and had no undermining effect on any of the behavioural outcomes, including abstinence and condom use (7). In Sudan, where previous attempts to promote condom use were opposed by the religious and community leaders who looked at it as attempts to promote promiscuity (13), this combined approach could have a higher potential for successful implementation of condom promotion among sexually active students as it respects the Sudanese religious values and social norms favouring abstinence. However, the development of such an effective and culturally adapted abstinence-plus intervention requires exploring the premarital sexual practices and condom use behaviours and identifying their psychosocial determinants among the Sudanese university students (14). For this purpose, a mixed research methodology with sequential qualitative-quantitative research was used (15). In this context, a theory-driven approach was adopted for a better understanding of these behaviours and their determinants. The Integrated Change Model (16) was used as a theoretical framework for all the studies.

This final chapter discusses the main findings concerning the psychosocial determinants of premarital sexual practices and consistent condom use (Part 1). Next, the methodological strengths and limitations of the conducted studies are presented in part 2, followed by

recommendations for future research and implications for intervention development and implementation (Part 3). Finally, general recommendations about HIV prevention among university students in Sudan are provided.

PART 1. SUMMARY OF THE MAIN FINDINGS

Psychosocial determinants of abstinence from premarital sex

To identify the psychosocial determinants of abstinence from premarital sex to inform future interventions about the potential beliefs that should be addressed to optimise motivation for abstinence as a part of a combined abstinence-plus intervention, we attempted to assess the students' premarital sexual practices qualitatively and quantitatively as described in chapters 2 and 3, respectively. The outcomes of these studies identified cues to sexual practices, attitude towards premarital sex, peer influence and self-efficacy to abstain as the most salient determinants of premarital sexual practices among university students.

Knowledge

Some HIV-knowledge gaps were identified among the students in both studies. In the qualitative study, unprotected premarital sex, multiple partners and anal sex were all identified as risky sexual behaviours and no marked difference in HIV-knowledge was observed between the abstainers and sexually active students. However, our quantitative study reported significantly higher overall knowledge about HIV/AIDS transmission and prevention among the sexually active participants than the abstainers. This difference between abstainers and non-abstainers was also observed in some previous studies among youth in India and Sub-Saharan Africa (17, 18) and could imply that increasing HIV knowledge alone is unlikely to result in reducing premarital sex among university students. However, knowledge as a pre-motivational factor could influence behaviours via motivational factors (19); therefore, further longitudinal studies may be required to reveal such a distal role.

Risk perception

The two dimensions of risk perception, perception of severity and perception of susceptibility, were explored and assessed in both studies. Regarding the perception of HIV severity, the two studies showed no difference between the abstainers and the sexually active students. Regarding the perception of susceptibility to HIV following unprotected sex, no difference was observed in the qualitative study between the two groups. However, the quantitative study revealed that the sexually active students perceived higher HIV risk following unprotected anal sex than the abstainers. The observed poor knowledge and low perception of the HIV risk associated with anal sex among some university students warrant attention as anal sex is considered one of the very high-risk behaviours (20, 21). Overall, the two studies did not reveal any evidence to support overreliance on raising students'

perceptions of HIV susceptibility or severity to promote abstinence from premarital sex. However, further research may be needed to investigate if HIV-risk perception plays any distal role in the students' sexual behaviour (19).

Cues to sexual practices

During the qualitative interviews, cues that were believed to influence the students' tendency to remain abstinent or become sexually active were identified. These cues and their association with abstinence and premarital sex were then studied quantitatively. Similar to several studies among university students in other countries (22-25), watching pornographic movies and reading erotic books were identified as important determinants to premarital sex in both studies. In spite of the previously reported association between religiosity and university students' sexual behaviours (26-28), no association between the selected religious cues and abstinence from premarital sex was revealed by our quantitative study. However, considering the qualitative study findings that strongly suggested a role for the religious cues in promoting abstinence among this population, it was recommended to do further research to identify which religious cues to consider before excluding their inclusion in future interventions. Also, in contrast with some previous studies (29, 30) as well as in contrast with our qualitative study results, the findings from the quantitative study revealed that exposure to certain HIV-related cues, such as knowing someone who died of HIV/AIDS, was not significantly associated with abstinence from sex among our study population. Moreover, the students' experience with people living with HIV/AIDS (PLWHA) was low, which may be the result of a high level of social stigma against PLWHA in Sudan that prevents them from knowing people with an HIV infection (31). Although in the qualitative study, fear appeals were mentioned as a potentially effective strategy to promote abstinence, as also observed in some previous studies (32, 33), the quantitative study did not support this.

Attitude towards premarital sex

The qualitative study was instrumental in exploring students' attitudes towards premarital sex and helped identify the most salient advantages and disadvantages of premarital sex among them. The reported advantages of premarital sex included enjoying sexual pleasure, proving adulthood and masculinity, popularity among peers, alleviating academic stress during exam times and gaining money through transactional sex. On the other side, the most commonly reported disadvantages of premarital sex included failure to adhere to religious beliefs and values, mental distress, social stigma, physical illnesses, legal consequences and poor academic performance. When the differences between the abstainers and the sexually active students in their perceptions of these advantages and disadvantages were investigated quantitatively, the results supported the qualitative findings. The abstainers had a significantly higher perception of the disadvantages of premarital sex, while the sexually active reported a much higher perception of the advantages of premarital sex. In conclusion,

both studies highlighted the importance of attitude towards premarital sex as a determinant of students' sexual behaviour, which is in line with several previous studies (34-36).

In addition, two important findings that are worth mentioning were observed in the qualitative study. Firstly, the students' perceptions of the social and legal consequences seemed to be more influential on their sexual behaviours than HIV and physical illness. This was also reflected in the quantitative study results and needed to be considered in future interventions. Secondly, most of the sexually active participants reported that the perceived advantages of sexual practices were deemed immediate but temporal and were usually followed by negative emotions such as regret; hence, communication strategies may benefit from addressing the feelings of anticipated regret that may occur when refraining from abstinence (37).

Peer influence

Peers are very influential on students' behaviours, as narrated by one of the sexually active students during our qualitative interviews. Consistent with the qualitative findings and similar to several previous studies (24, 25, 38), the quantitative study identified peer influence as an important determinant of students' sexual behaviours. Peer norms, support and modelling were all significantly associated with sexual behaviours. The two studies also suggested that both the abstainers and the sexually active are influenced by their peer norms and support favouring their adopted behaviours. This implies that interventions seeking to promote abstinence from sex until marriage or delaying sex among university students may consider strategies that enhance favourable peer influence and mitigate peer pressure (39).

Self-efficacy to abstain

Self-efficacy to abstain from sex until marriage was identified as an important determinant of the university students' sexual behaviours. In both studies, the abstainers reported higher self-efficacy to refrain from premarital sex than the sexually active students did. This finding was also observed in previous cross-sectional and longitudinal studies among university students in other countries (40-42). Moreover, our studies explored and revealed the difficult situations that challenged the students' self-efficacy to abstain and pushed them to practice sex. Watching pornographic movies, peer challenge and the need for money were identified as important factors affecting students' ability to remain abstinent.

Psychosocial determinants of consistent condom use

To inform the development of the condom promotion component of a combined abstinence-plus intervention, the psychosocial determinants of consistent condom use were assessed both qualitatively and quantitatively as described in chapters 4 and 5, respectively. The outcomes of these studies identified HIV-related knowledge, exposure to condom use cues, attitude towards condom use, peer influence and condom use self-efficacy as important determinants of consistent condom use among university students in Sudan.

HIV-related knowledge

Both qualitative and quantitative studies identified serious knowledge gaps about HIV transmission and prevention. Misconceptions around condom use and underestimation of its protective role were also prevalent among university students in Sudan, as previously reported (43). Also, in consistence with previous studies in Sudan and other countries (44-46), HIV knowledge was identified as a determinant of consistent condom use and the regression analysis also revealed that HIV knowledge was uniquely associated with consistent condom use. In addition, three findings from the qualitative study are worth mentioning and require further quantitative evaluation as they may have implications on future interventions that aim to promote consistent condom use among university students. Firstly, the majority of the sexually active participants reported gaining detailed knowledge about condom use several years after they had started practising sex. Secondly, most of them had the only superficial knowledge, if any, about how to use condoms and only those participants who attended HIV education programs seemed to know how to use condoms correctly. Thirdly, peers were identified as the primary source of knowledge about condom use among both male and female participants.

Risk perception

The associations between the students` perception of HIV severity and susceptibility and condom use were assessed both qualitatively and quantitatively. Regarding the perception of HIV severity, the participants in both studies reported a high perception of the severe physical, social and psychological consequences of HIV infection. However, opposite to previous research findings among different at-risk population groups in other countries (47-49), no significant association between the perception of HIV severity and consistent condom use was observed in both studies. In contrast, the perception of susceptibility to HIV was relatively low in both studies. Besides, the consistent condom users had a significantly higher perception of HIV susceptibility than non-users, although no unique association between their perceived susceptibility to HIV and consistent condom use was revealed by the regression analysis. However, the influence of risk perception, as a pre-motivational factor, on behaviour may be mediated by motivational factors as assumed by the I-Change model (19). Therefore, further longitudinal studies may be needed to reveal such an association.

Cues to condom use

Several cues to condom use were identified during the qualitative interviews. Similar to previous research findings (29, 44), having previous experience with people living with HIV/AIDS was significantly associated with consistent condom use. Also, in line with previous research findings that identified purchase embarrassment as a barrier to consistent condom use (44, 50), easy access to condoms was associated with consistent condom use. Although the participants reported low exposure to all of these cues because of the high level of

stigma associated with HIV/AIDS and the prevailing religious values and social norms that prohibit all types of premarital sexual practices, the quantitative study showed a significant association between the exposure to cues and consistent condom use. Generally, consistent condom users reported higher exposure to all cues than non-consistent condom users. In addition, the logistic regression analysis showed a unique association between cues and consistent condom use, as the odds of consistent condom use were higher among those with higher exposure to condom use cues.

Attitude towards condom use

The students' perceptions of the advantages of using condoms (condom use pros) were generally high in both studies. During the qualitative interviews, no difference was observed between the consistent condom users and non-users in their perceived advantages of condom use and the quantitative study showed no significant difference between the two groups with this regard. On the other side, the perception of condom disadvantages (condom use cons) seemed to be a relevant determinant of consistent condom use. Similar to previous research findings, the quantitative study showed that non-consistent condom users had a higher perception of condom disadvantages as compared to the consistent users. Similarly, previous studies identified the perceived negative effect of condom use on sexual pleasure as a predictor of inconsistent condom use (51, 52). This was also confirmed by the regression analysis in which the odds of consistent condom use were much less among those with a higher perception of condom use disadvantages.

Peer influence

In consistence with previous studies (53-55), peer influence was identified as a relevant determinant of consistent condom use. The two studies concluded that the different dimensions of peer influence, including peer norms, support, pressure and modelling, influenced students' consistent condom use. During the qualitative interviews, most of the consistent condom users indicated that they were encouraged to use condoms by their sexually active peers and sexual partners, while those who did not use condoms reported that they were discouraged by their peers and sexual partners who never use condoms. Most of the participants also stated that they could not discuss any sexual issues with anybody other than their friends and sexual partners because it is not culturally unacceptable, which justifies paying more attention to the role of peers in future condom promotion interventions.

Condom use self-efficacy

Students' self-efficacy to use condoms consistently was generally very low in both studies. However, self-efficacy was identified as one of the determinants of consistent condom use as observed in previous studies among adolescents as well as university students (56-58). Overall, consistent condom users reported higher self-efficacy than non-consistent condom

users. The regression analysis also showed that the odds of consistent condom use were more than two times more among those with higher self-efficacy. As observed in several previous studies (44, 59, 60), purchase embarrassment and condom negotiation with an intimate partner were important challenges that influenced students' self-efficacy.

Gender differences in behavioural determinants

In addition to the previous findings, several gender differences in the psychosocial determinants of premarital sexual practices were observed during the qualitative interviews. For instance, female students seemed to have higher HIV knowledge than male students, although the opposite was reported in a previous study done among Arab university students in United Arab Emirates (61). Moreover, the qualitative study suggested gender differences in the students' perception of HIV severity, although previous studies in other countries did not report such differences (62, 63). This contradiction could be due to cultural variations as the observed higher perception of HIV severity among Sudanese female students could be attributed to their fear of the stigma associated with premarital sexual practices and the severe social consequences of discovering their engagement in premarital sex.

Besides, female students seemed to be more influenced in their sexual behaviours by their parents and family members, while male students were more influenced by their peers. Gender difference in parents' influence has also been reported among the youth of similar age groups in Malaysia, where females reported a higher perception of parents' influence as well (64). Furthermore, differences between male and female students in their perceived advantages and disadvantages of premarital sex were also observed. This has also been reported in a recent study among university students in Bangladesh (25). Also consistent with a previous review of 25 studies (65), our qualitative study suggested gender differences in self-efficacy as female participants seemed to perceive higher self-efficacy to remain abstinent from premarital sex than male participants. The troublesome situations influencing the students' self-efficacy to abstain also varied between male and female students. For instance, seduction by women, watching pornographic videos, alcohol and peer challenges were more influential on male students' ability to refrain from premarital sex, whereas the urgent need for money and partner's insistence to practice sex seemed to have a more significant effect on female students' self-efficacy to remain abstinent from sex until marriage.

Likewise, differences between male and female students in their psychosocial determinants of consistent condom use were observed. For example, the qualitative study alluded to gender differences in the perceived disadvantage of condom use, which was previously reported (66). For instance, our qualitative findings suggested that female students seemed to be more concerned about the emotional disadvantages of condom use, such as the lack of trust in the sexual partner, whereas males reported a higher perception of the physical disadvantages of its use, such as reducing the size of the penis and weakening the ejaculation. In addition, the qualitative study suggested that generally, female students

appeared to consistently have lower self-efficacy to use condoms than male students, especially when they needed to negotiate its use. Gender differences in condom use self-efficacy and the factors challenging it were previously reported among entering college freshmen (67).

The gender differences observed in these studies may reflect the contextual differences between the conservative community in Sudan and other liberal communities. Although these gender differences could have many implications for future research directions, intervention development and implementation, it was not feasible to assess these in our quantitative studies due to the limited sample size.

Parents` influence across students` sexual behaviours

Previous studies in different countries concluded that adequate parents` support and living with both parents were associated with protective sexual behaviours among their family members (68-72); therefore, the influence of parents across the students` sexual behaviours was studied. Regarding parents` influence on the students` sexual behaviours, the qualitative study showed a high perception of parents` support for abstinence from premarital sex. However, no statistically significant difference was observed between the abstainers and the sexually active students in their perceived parents` support or norms favouring abstinence from premarital sex. Observing no difference between the two groups in their perceived parents` influence also contradicts previous studies among similar age groups in two sub-Saharan countries (71, 72). However, the qualitative study provided two possible explanations for this inconsistency. Firstly, due to the conservative nature of the local community in Sudan and the prevailing norms that prohibit the open discussion about sex and sex-related issues, parents rarely engage in face-to-face interactions about sex-related issues with their sons and daughters, as reported by some participants during the qualitative interviews. These communication barriers may reduce the parents` influence on their sons` and daughters` sexual behaviours (73). Secondly, the qualitative study suggested that parents were more likely to influence their daughters` sexual behaviours than their sons`. The quantitative study results were not stratified by gender. Gender difference in parents` influence has also been reported among youth of similar age groups in Malaysia, where females reported a higher perception of parents` influence as well (64); therefore, it needs to be further investigated because of its implications on future practice.

Concerning the role of parents and family members in promoting consistent condom use, many participants asserted that virginity at the time of marriage remains a virtue in Sudan and any type of sex outside marriage is considered sinful. Therefore, almost all of the students agreed that parents and other family members support and advocate only abstinence and never discuss using condoms during sexual practices. This may also justify why parents were found to play no significant role in promoting condom use among university students in the quantitative study. Although studies in other communities pointed to positive roles that parents could play and how they could be encouraged to promote

condom use (68-70), the current studies concluded that this might not be the case in a conservative Islamic community like Sudan.

Religious leaders` influence on students` sexual behaviours

Religious scholars are believed to have an influential role in university students` sexual behaviours and beliefs, as reported by almost all of the participants as well as some previous studies (74, 75). Concerning their role in promoting abstinence, a high perception of religious leaders` support and norms favouring abstinence from premarital sex as a religious obligation was observed. Nevertheless, no significant difference was observed between the sexually active and the abstainers quantitatively. However, it was argued that the studies assessed only the students` perceptions of their religious leaders` support and norms favouring abstinence from sex until marriage, which is considered a religious obligation, and ignored the denominational differences and the individual differences between religious leaders and their approaches to addressing youth sexual behaviours (76, 77). For example, a previous study in Malawi found that religious leaders who regularly spoke out about AIDS were more influential on almost all HIV prevention activities than their counterparts that did not do so (75). Therefore, further research may identify which Sudanese religious leaders` approaches, messages and activities could influence students` sexual behaviours and promote abstinence.

Concerning consistent condom use, religious leaders were identified as strong opponents to condom use during the qualitative interviews, a finding also reported in some previous studies (77-79). Almost all participants agreed that religious scholars were the leading opponents of condom use and condom distribution because they believed this would encourage students to practice extramarital sex. However, the quantitative study showed that consistent condom users perceived greater support to use condoms consistently from religious leaders than non-consistent condom users. Although it was the first time to report such a role for Sudanese religious leaders in promoting condom use, this finding was in line with previous studies in other Muslim communities, which reported that religious leaders could play a role in promoting condom use among youth through the Islamic values of compassion and prevention of harm and disease (75, 80). The suggested role of religious leaders in promoting consistent condom use among sexually active students in Sudan could have several implications for future research and practice.

PART 2. STRENGTHS AND LIMITATIONS

Methodological strengths

Although premarital sexual practices and condom use among youth in Sudan were previously studied, to the best of our knowledge, this is the first study that focuses on the psychosocial determinants associated with these behaviours. Therefore, the results of the current studies

are expected to fill important gaps and inform future abstinence-plus programs in Sudan. There are three major methodological strengths in the approach that was adopted to study these important and sensitive research areas.

Firstly, the combined sequential qualitative-quantitative approach used to explore students' sexual behaviours was helpful to compensate for their mutual and overlapping weaknesses and overcome the limitations of each method (15). For instance, the limited number of participants involved in the qualitative studies were not highly representative and no statistical significance could be inferred from their results. However, the data obtained from the unstructured interviews helped contextualise premarital sexual practices and condom use and explored in-depth the influence of the religious and social values on these behaviours and their determinants. On the other side, the quantitative studies, which involved a larger sample size, enabled testing the significance of relevant factors as suggested by the qualitative interviews.

Secondly, using the I-Change model, which integrates several behavioural change theories constructs and assumptions rather than simply combining them, provided an added theory-based value and facilitated a deep understanding of the students' sexual behaviours and their determinants (16).

Thirdly, despite the high level of stigma associated with premarital sexual practices in Sudan and the social and legal consequences of disclosing these behaviours, taking strong precautions to protect the student's identity during qualitative interviews, inviting well-trained HIV counsellors to conduct the interviews and using the online questionnaire in the quantitative studies made it possible to collect sensitive and meaningful data about the university students' sexual behaviours and beliefs.

Methodological limitations

In spite of the strengths mentioned above, some limitations are worth mentioning. Firstly, given the qualitative and cross-sectional methodologies used in our studies, no cause-effect relationship could be inferred and further longitudinal studies are required. Secondly, having some participants recruited through snowballing may affect the representativeness and generalizability of the research findings of the quantitative studies in this dissertation. Thirdly, the relatively small sample size of the quantitative studies rendered it impossible to stratify the results by gender to identify the most salient gender-sensitive determinants of the students' premarital sexual practices and consistent condom use.

Fourthly, despite the importance of action planning in translating intention into behaviour (81, 82), the role of action plans, including preparation plans and coping plans, was not assessed quantitatively as this factor is better assessed by longitudinal studies. However, the role of action plans was explored in the qualitative studies, which showed their potential influence on both abstinence and consistent condom use. Therefore, longitudinal studies are required to identify which preparatory and coping plans to be included in future abstinence-plus interventions.

Fifthly, our studies focused only on the students' perceptions and did not include the perceptions of the other stakeholders at the meso (e.g. parents and family members) and macro levels (e.g. religious leaders and public media) (83), who are very influential on university students' sexual behaviours. Finally, although previous studies showed significant differences in condom use predictors among students with stable relations compared to those without a stable relationship (84), no distinction was made between the two groups in our studies. Therefore, future research may also investigate the existence of such a difference among Sudanese university students and assess the need to address it in future interventions.

In spite of these limitations, the current studies together represent a valuable source of information for future HIV interventions targeting university students in Sudan.

PART 3. RECOMMENDATIONS

Recommendation for future research

As a result of the current studies, some important research questions and knowledge gaps were identified. Firstly, some gender differences were observed during the qualitative interviews regarding the determinants of premarital sexual practices and consistent condom use, such as the differences in the students' attitude towards premarital sex, peer and parents' influence on their sexual behaviours, their self-efficacy to abstain, their perceived condoms disadvantages and condom use self-efficacy. Considering the importance of addressing these differences in future interventions (85), further quantitative research with a larger sample is recommended.

Secondly, religiosity and religious cues seemed to be very influential on students' sexual behaviours as reported by many participants during qualitative interviews; however, the religious cues (praying at the mosque and attending religious lectures about abstinence) were not significantly associated with abstinence. It was argued that this could be attributed to some limitations associated with the selected religious cues and how they were measured. For instance, praying at the mosque, which has been selected as a cue, is a religious obligation for men and almost all Muslim males pray at the mosque at least once per week. Therefore, the frequency of praying at the mosque might have been a better predictor of adherence to religious values. The frequency of religious attendance was previously identified as a significant predictor of sexual behaviour among college students (86, 87).

Thirdly, further research is also needed to assess and characterise the role of religious leaders, as important stakeholders, in promoting consistent condom use. Such research might seek to identify the differences in attributes, perceptions and beliefs of the religious leaders who support condom promotion and those who oppose it. For instance, a previous study revealed a positive association between religious leaders' perception of the AIDS problem and their support of condom promotion in Malawi (75). Focus group discussions

involving religious leaders may also reveal the religiously based messages, arguments and texts used by the supporters of condom promotion, such as the Islamic teachings calling for the prevention of harm and disease, as these could be used to design more socially acceptable programs (80).

Fourthly, the current studies focused only on the psychosocial determinants of premarital sexual practices and consistent condom use and did not take into account many other important factors influencing these behaviours that were highlighted during our qualitative studies as well as previous research (44, 84, 88, 89) such as poverty, violence, alcohol consumption, and poor access to prevention services. Therefore, further qualitative and quantitative research may be needed to explore the influence of the most salient of these factors (poverty and poor access to condoms) to see how they interact with these psychosocial determinants to influence students' beliefs and behaviours.

Finally, although the students' perceptions and beliefs regarding premarital sexual practices and consistent condom use were carefully studied, further research is needed to explore the perceptions and beliefs of the other stakeholders at the meso and macro levels as proposed by the intervention mapping approach (90). Conducting focus group discussions and qualitative interviews with representatives from the Sudan National AIDS Program (SNAP), the ministry of higher education, public media and non-governmental organisations (NGO) could facilitate effective intervention development, cultural adaptation, implementation and evaluation as reported in a study recently conducted to explore stakeholders' perceptions in Malawi. In this study, the stakeholders provided important recommendations for improving the intervention by highlighting the importance of including an economic empowerment component to target the underlying root causes of HIV risk in Malawi. Besides, they suggested involving the traditional leaders, parents and religious leaders in the intervention scale-up (91).

Implications for intervention development

The results of the studies in this dissertation have several practice implications. Although public health interventions are not commonly based solely on findings from cross-sectional studies (92), the lack of HIV prevention programs in the ground targeting this highly vulnerable population calls for using the results of our studies, which are also strongly supported by findings in the literature, to urgently develop a behavioural change intervention. By identifying the psychosocial determinants of premarital sexual practices and consistent condom use, both components of an effective abstinence-plus intervention could be developed. In addition, contextualising these behaviours and their determinants could inform the cultural adaptation of such an intervention to increase its effectiveness and facilitate its adoption and implementation. Besides, the findings of our studies suggested the need for tailoring the intervention to meet the different needs of the university students in Sudan.

Developing the abstinence promotion component

To promote abstinence from premarital sex, as the main component of the abstinence-plus intervention, cues to sexual practices, attitude towards premarital sex, peer influence and self-efficacy to abstain need to be addressed.

Cues to sexual practices, such as watching pornographic movies and reading erotic stories, were identified as important determinants of sexual practices among university students. Therefore, future interventions may attempt to reduce the exposure to these sex cues or mitigate their influence on students' sexual behaviours. This could be achieved by training the students to list these cues and encouraging them to identify strategies for avoiding them or through the cue altering method in which the student will be taught to change the stimulus, either consciously or unconsciously perceived, that signals sexual behaviours (90). For instance, the students could be prompted to read the holy Quran or practice their favourable hobbies, as narrated by some participants, whenever they feel the urge to watch pornographic movies. As strategies that could be used to alter the cues or avoid them work best when selected by the individuals themselves (93), behavioural change interventions might benefit from including educational information to instruct and encourage combining multiple clearly defined cues and using trial and error to identify the most effective approaches for that specific student (93).

If abstinence is the norm to be promoted in countries such as Sudan, with religious values and social norms favouring abstinence, the current studies suggest that abstinence promotion programs should build a positive attitude towards abstinence from sex until marriage. To achieve this goal, future interventions should stress the advantages of abstinence and encourage the students to give higher value to the long-term advantages of abstinence compared to the temporary advantages of premarital sexual practices. Besides, future interventions should consider enhancing the students' perceptions of the social and legal consequences of practising sex before marriage in addition to the health-associated consequences. Although different behavioural change techniques could be used to change students' attitudes, such as arguments and self-re-evaluation, our studies alluded to the potential benefits of using the anticipated regret method (90). A previous meta-analysis included 81 longitudinal and cross-sectional studies of the role of anticipated regret on health outcomes, including sexual behaviours. The meta-analysis revealed that greater anticipated regret from engaging in a behaviour (e.g. premarital sex) predicted weaker intentions (to engage in premarital sex) and behaviour (94). Our studies also suggest that suitable regret messages could encompass religious messages in addition to health-related messages.

Peer influences, including peer support, norms and modelling, were strongly associated with university students' sexual behaviour. This implies that interventions seeking to promote abstinence from sex until marriage among university students may consider strategies that enhance favourable peer influence and mitigate peer pressure to practice sex. A previous review concluded that such an approach could delay sex and reduce sexual

risk among adolescents (39). Such interventions could include training in pressure resistance skills and social inoculation methods to mitigate peer pressure (90). Peer education has been suggested as a suitable strategy to deliver such programs in Sudan as it has been used widely and successfully used to influence the sexual behaviours among youth in other developing countries (95, 96).

Self-efficacy to abstain from premarital sex was found to be strongly associated with students' sexual behaviours. Hence, abstinence promotion programs should aim at enhancing students' self-efficacy to overcome the observed barriers to abstinence. Considering the gender differences in the students' self-efficacy and the diversity of the conditions challenging it, our studies recommended a comprehensive and tailored approach to enhance the students' self-efficacy to abstain (97, 98). Different strategies could be used to enhance the students' self-efficacy to abstain from premarital sex, such as verbal persuasion, self-monitoring of behaviour, and planning coping responses. In the planning coping responses strategy, students could be prompted to list the potential barriers and identify how to overcome them (90). This strategy has been used successfully to improve university students' self-efficacy (99).

Developing the condom use component

Promoting consistent condom use among university students in Sudan is a big challenge because of some structural barriers, such as condom cost and availability in addition to the cultural barriers. However, addressing the identified psychosocial determinants, including HIV-related knowledge, exposure to condom use cues, attitude towards condom use, peer influence and condom use self-efficacy, within the abstinence-plus intervention, could increase consistent condom use among the sexually active university students.

Knowledge about HIV and condom use was identified as a premotivational determinant of consistent condom use. Serious knowledge gaps and misconceptions about HIV transmission and prevention, as well as condom use misconceptions, were revealed by our studies. Hence, it is important to design health education messages to address these misconceptions and fill the knowledge gaps. Besides, our qualitative findings indicated that the educational material should include knowledge about how to use condoms properly in addition to conceptual knowledge. Recent research has also identified experiencing problems with condom use, such as condom breakage, slippage and fit as a predictor of condom use among this population (100). Considering the social norms which challenge public campaigns to promote condom use, it is also essential to select the most appropriate channels to deliver these messages and disseminate this knowledge among the students. Our findings suggested peer education as a suitable choice because peers were the main source of knowledge about HIV and condom use among the university students (13).

Some cues to condom use were associated with consistent condom use among university students, such as listening to an infected person describing their experience with HIV. Therefore, future interventions might benefit from increasing the students' exposure to

these cues. As the observed very low exposure to these cues in our studies was previously attributed to the high level of stigma against PLWHA in Sudan, which prevents disclosure of HIV status (31), videos of HIV infected volunteers talking about their experience could be disseminated among the university students to increase their exposure to this cue. However, some conditions need to be considered before including such cues in future interventions aiming to promote consistent condom use. Firstly, it has been suggested that fear appeal messages may increase the stigma and discrimination against PLWHA (101). Besides, previous research suggested that using fear appeal to change the high-risk behaviours among people with low self-efficacy may result in a defensive behaviour to avoid the fear appeal messages (102). Therefore, the best approach to incorporate fear appeals in future interventions aiming at promoting consistent condom use in Sudan could be through tailoring so that carefully designed non-discriminatory fear appeal messages will be provided only to the students who show high levels of self-efficacy to use condoms. Suitable cue -reminders can also be used to complement interventions and augment their effectiveness (103).

A negative attitude towards condom use was associated with a lack of consistent condom use among this population. Therefore, interventions seeking to promote consistent condom use among sexually active students should address the perceived condom disadvantages. The prevalent perception that condoms reduce sexual pleasure could be addressed by emphasising the pleasure-enhancing aspects of condom use, which could be achieved by combining both emotional and factual messages (104). The effect of condoms on sexual pleasure could also be minimised by promoting the use of high-quality condoms (52). Our studies also highlighted the importance of the appropriate selection of the messages to address the gender difference in the perceived disadvantages of condom use. For instance, it was suggested that female students might benefit more from strategies that address feelings such as the anticipated regret (90), while male students' negative attitudes are more likely to be changed by persuasion (105) and arguments addressing their misconceptions about the physical disadvantage of condom use.

Concerning peer influence as a determinant of condom use, our studies concluded that the different dimensions of their influence, including peer norms, support, pressure and modelling, influenced students' consistent condom use. In addition, peers were the only social group among this population with whom sexual practices were discussed. Therefore, peers may be considered important stakeholders of condom promotion programs among university students, and their involvement may facilitate the implementation and maximise the benefits of these programs. Our findings also suggested that different strategies are needed to address the different dimensions of peer influence. For example, the students could be provided with an estimate of the prevalence of condom use among university students, which is likely to be much higher than their expectations (37). Besides, providing training in effective peer pressure resistance skills could also help them to resist peer pressure against condom use. To address the peer norms that look at practicing condomless sex as a sign of manhood and masculinity, male students should be made aware that consistent

condom use can be a healthy attribute of masculinity (106). In addition, female students could be trained and encouraged to use assertive condom negotiation strategies such as direct request and withholding sex (107).

Low self-efficacy was associated with a lack of condom use among university students. Therefore, future interventions should enhance students' self-efficacy to avoid unprotected sex. Our studies also highlighted the importance of targeting two significant barriers influencing students' self-efficacy in future interventions: purchase embarrassment and condom negotiation. In a conservative community like Sudan, purchasing condoms is usually associated with embarrassment because of the social stigma associated with premarital sexual practices. Therefore, the students could be prompted to develop suitable plans to cope with this embarrassment, such as asking someone they know to buy condoms for them or to purchase condoms from pharmacies in remote areas, are reported by some participants (13, 44). Also, in line with some previous studies (108), lacking the skills to negotiate condom use was a significant barrier to consistent condom use, especially among female students because of the prevailing social norms in Sudan prohibiting condom use negotiation by female partners. Therefore, interventions should encompass training on condom negotiation skills. Besides, different behavioural change methods could be incorporated, such as verbal persuasion, reattribution training, self-monitoring and goal setting methods (37). These methods have been tested and found to be successful in changing behaviours and could be used to promote condom use. In addition to these cognitive skills, a previous study has suggested that focusing more on affect regulation skills can have a significant impact on condom use (109). Such skills include getting away from triggers for strong emotions either physically (Situation modification) or cognitively (Attentional deployment) (110).

Considering the importance of action planning, including both preparatory and coping plans, in promoting consistent condom use (111, 112), it was also recommended to include action planning in future interventions to help the students translate their intentions into healthy behaviours. For instance, the students could be prompted to list the potential barriers to condom use, such as the partner's refusal to use a condom, and select one or more strategies to overcome these barriers using communicative coping plans (e.g., discussion with the partner) or non-communicative coping plans (e.g., avoidance) (113).

Cultural adaptation of the intervention

Health is commonly influenced by culture-related behaviours. Therefore, it is widely believed that health-behaviour interventions must be culture-sensitive and responsive to their target population's cultural practices and beliefs (114, 115). The studies included in this dissertation showed the significant influence of the prevailing cultures and social norms on the students' sexual behaviours, including abstinence and consistent condom use. Therefore, it is crucial to consider cultural sensitivity in future interventions. To develop culturally sensitive interventions, two different dimensions of culture sensitivity should

be considered: surface and deep structure. The surface structure aims to increase the acceptance of the intervention messages by using material and messages that match the superficial characteristics of the target groups, such as using their preferred language and communication channels. For instance, our studies suggested the potential benefits of using messages about the Islamic values of compassion and prevention of harm and disease to promote condom use and highlighted the threats associated with involving the public media as a communication channel for this purpose. On the other side, the deep structure aims to exert a behavioural change among the target group by addressing the cultural, social and psychological factors influencing their health behaviour (114), such as addressing the stigma and discrimination against PLWHA and combating the identified cultural taboos that prevent parents from communicating sexual issues with their sons and daughters.

Although different approaches could be followed to develop a culturally sensitive intervention, cultural adaptations of evidence-based interventions is one of the approaches commonly adopted for HIV prevention. It has been defined as “the systematic modification of an evidence-based treatment (EBT) or intervention protocol to consider language, culture, and the context in such a way that it is compatible with the client’s cultural patterns, meanings, and values” (116). For instance, if anticipated regret as a previously used evidence-based method is selected to change the Sudanese students’ attitude towards premarital sex, our findings suggested that cultural adaptation could involve adding religious messages containing verses from the Quran or the words of the prophet Mohammed (peace be upon him). Besides, using animations to demonstrate the proper use of condoms use could be more socially accepted than videos. A previous meta-analysis of 38 randomised controlled trials of HIV interventions for heterosexual African Americans identified cultural adaptation as a factor associated with intervention efficacy (117).

Tailoring the intervention

Tailoring a health promotion intervention was defined by Kreuter et al. as “Any combination of information or change strategies intended to reach one specific person, based on characteristics that are unique to that person, related to the outcome of interest, and have been derived from an individual assessment” (118). Hawkins and his colleagues also defined tailoring as “creating communications in which information about a given individual is used to determine what specific content he or she will receive, the contexts or frames surrounding the content, by whom it will be presented and even through which channels it will be delivered” (119). Previous systematic reviews and meta-analyses have provided evidence to suggest that tailored interventions were more effective than non-tailored interventions for smoking, physical activity, dietary behaviours and condom use (120-123). Considering the individual differences in the psychosocial determinants of premarital sex and condom use that have been uncovered by the studies in this dissertation, tailoring the intervention might be needed to address the differences in individuals’ needs. For example, our studies suggested that students’ attitude towards condom use was more influenced by

their perceived physical disadvantage of condom use while others were more concerned about the emotional disadvantages; therefore, different messages are needed. Similarly, the students' self-efficacy to abstain from premarital sex was challenged by a diversity of barriers, such as the urgent need for money, seduction by girls and peer challenge; hence, different strategies and coping plans may be needed to enhance their self-efficacy to abstain. Moreover, tailoring facilitates the use of a specific behavioural change strategy for only those who may benefit from it (e.g., fear appeals for those with high self-efficacy). To provide tailored messages, using computer-tailored interventions may be recommended as they have many advantages, including high acceptability, flexible dissemination channels, low cost to deliver and ease of contents customisation (123, 124).

Implications for intervention adoption and implementation

In addition to the previously mentioned implications for the development of the abstinence-plus intervention, the studies provided some insight into the best strategies to implement the intervention among the target group.

Abstinence-plus interventions previously implemented in high income and liberal countries entail educating the non-sexually active participants about condom use to minimise the chance of acquiring HIV once they become sexually active (7, 8). Although promoting condom use among the sexually active is becoming more acceptable in many Islamic communities (76, 125, 126), educating the non-sexually active about condom use may still be challenging as many believe it may promote promiscuity among the youth (125, 127). However, postponing the education about condom use until a student becomes sexually active carries the risk of acquiring HIV, STI and pregnancy. Besides, previous research identified using a condom during the first sexual act as a predictor of consistent condom use among university students (88). Our findings suggested an alternative strategy to facilitate the implementation. This entails using a more tailored approach by looking at a person's intention. While the liberal model of abstinence-plus interventions calls for providing education about condom use to all adolescents and the conservative model accepts educating only the sexually active students about condom use, a new model could encompass tailoring the intervention to provide condom use educational messages on the basis of the students' intentions to practice sex rather than their actual sexual behaviours. Given this dilemma, further discussion with the religious scholars, community leaders and other stakeholders is urgently needed, as well as research to identify the potential of this alternative tailored strategy.

Regarding the target age for implementing the intervention, our studies revealed that many university students acquired detailed knowledge about condom use several years after becoming sexually active. This implies that selecting the appropriate age group for implementing interventions is critical. Although in liberal communities, such programs could be incorporated into sex education curricula and provided during early adolescence (128), this may not be suitable in many Islamic communities (129). However, such interventions

should be made available for university students soon after joining the university to minimise the chance of HIV transmission.

Regarding how to deliver the intervention, our findings suggested two possible communication channels. Firstly, peers were very influential in the current studies and for many students, they were the only source of sex-related knowledge. Therefore, peer education programs (130) could be a very useful communication channel through which the intervention could be delivered to university students. However, the peer education program should be carefully designed with consideration of the important factors that could increase their effectiveness. A previous review study identified these factors as the proper selection of the peer educators, the quality of peer educators' training and supervision, peer educators' compensation, and the retention of trained peer educators (95). Secondly, considering the stigma associated with premarital sexual practices in Sudan, delivering the intervention as a web-based program could be a suitable choice. This approach has several advantages (123). Firstly, it helps maintain the participants' privacy; therefore, it seems to be an appropriate strategy to discuss sexual behaviours and convey behavioural change messages in such a conservative community where sexual behaviours could not be easily discussed. Secondly, web-based interventions could facilitate reaching the most at-risk population (MARPs), such as the sexually active students who may not seek medical counselling to minimise the risk associated with their sexual behaviours. Thirdly, such web-based messages could easily be tailored to address the special needs of individuals, which will increase the chances of behavioural change. Fourthly, web-based interventions save both time and resources; therefore, they may be very useful in poor settings like Sudan (123). Finally, a recent randomised control trial has shown that internet-based interventions are effective in behavioural change programs targeting HIV risk behaviour such as condomless sex (131). However, careful needs assessment to identify the preferred communication channels among this population is urgently required. Besides, RCT studies to investigate the effectiveness of such web-based interventions in Sudan are highly needed.

Finally, the current studies identified some of the important stakeholders who may contribute to developing and implementing the abstinence-plus intervention. The current studies uncovered the possible role of religious leaders in promoting consistent condom use as previously reported in neighbouring countries (75, 79, 80). Identifying a role for the Muslim religious leaders in promoting condom use in Sudan could lead to a shift in paradigm that opens the door for their involvement, as a trustworthy model, in designing abstinence-plus interventions, which might improve the cultural adaptation of the interventions, facilitate their implementation and maximise their effectiveness (129). In addition, the current studies highlighted the important role of health professionals, especially HIV counsellors, in supporting consistent condom use, as reported in Mozambique (132). Therefore, they should be encouraged to participate effectively in the program implementation.

To conclude, university students in Sudan are in urgent need of a well-designed HIV prevention package to address the specific risk factors and modes of HIV transmission

among the target population. To be successful, such combined intervention should address the salient psychosocial determinants of the HIV-risk behaviours among the students using evidence-based strategies. Besides, the cultural adaptation of the intervention content, tailoring its messages to address the individual needs and the appropriate selection of the communication channels are required to facilitate the implementation of the intervention and maximise its benefit. Finally, the careful selection of cost-effective interventions to include in the package and the efficient use of the available resources is also crucial, especially in resource-poor countries like Sudan.

IMPACT PARAGRAPH

HIV importance in Sudan

Sudan has been suffering from civil wars, political instability and poverty for several decades. These conditions had devastating effects on the health systems and health promotion programs, including HIV prevention, as reflected in the Sudan National AIDS Program (SNAP) and the country progress reports. These factors contributed to the spread of HIV in Sudan, the country with the highest HIV prevalence in the MENA region. Therefore, HIV is currently considered an important public health threat in Sudan that requires immediate actions because of its physical, mental and social consequences on the infected individuals and the burden of the disease on the weak health system and poor economy.

University students as an important target group

University students in Sudan have long been considered an important target audience for HIV prevention due to the observed increase in unprotected sexual practices. Previous surveys revealed a higher HIV prevalence among them than the general population, with a predominant heterosexual transmission. The community in Sudan is highly conservative and the prevailing religious values and social norms strictly prohibit all types of extramarital sexual practices; hence, promoting many HIV prevention strategies, such as condom use, is a challenge. These facts, in addition to the lack of targeted HIV prevention programs and sex education curricula in Sudan, call for the urgent development of culturally adapted HIV interventions targeting university students. Therefore, the studies of this dissertation have been conducted to inform the design and implementation of such interventions.

Understanding University students` sexual behaviours

As proposed by the intervention mapping approach (IM), understanding the behaviour and its determinants are essential prerequisites for developing an effective behaviour change intervention. Given the paucity of research about the psychosocial determinants of Sudanese students` sexual behaviours, including abstinence from premarital and consistent condom use, these determinants were the focus of the studies in this dissertation. Regarding abstinence, the current studies concluded that exposure to specific cues, having a positive attitude towards premarital sex, peer influence and low self-efficacy to abstain from premarital sex were all associated with engaging in premarital sex. On the other side, HIV-related knowledge, exposure to condom use cues, attitude towards condom use, peer influence and condom use self-efficacy were the important determinants of consistent condom use among university students in Sudan.

Besides, the studies identified important gender differences in these determinants that warrant further exploration. In addition, our studies uncovered the critical role that religious leaders could play in promoting consistent condom use among sexually active students.

The relevance of our findings

Although the sexual behaviours among Sudanese university students were previously studied, the current studies differed from the previous ones in several aspects. Firstly, these are the first studies that focus solely on the psychosocial determinants of sexual behaviours, thus filling an important research gap. Secondly, it is the first time including a qualitative approach to deeply explore Sudanese university students' sexual behaviours. Thirdly, the current studies have the advantage of using a theoretical framework (I-Change Model) to identify the psychosocial determinants, which enables the better characterisation of these determinants and the translation of the findings into effective prevention programs. Finally, the current studies explored how these determinants are influenced by the prevailing religious values and cultural norms. This is believed to facilitate the cultural adaptation of any future interventions within the Sudanese context, which is essential for the successful implementation and maximum benefit.

Based on these characteristics, our studies managed to highlight the importance of targeting the psychosocial determinants of the students' sexual behaviours to reduce the HIV risk and promote healthy behaviours. We also concluded that a combined HIV prevention strategy could be more successful in preventing HIV transmission among university students. Furthermore, the current studies provided suggestions and answers to some important questions, such as what determinants to address in this proposed intervention and which behavioural change strategies could be used to address them. Besides, the studies suggested who should participate in the program development and how it could be implemented.

Practical relevance

The findings of our studies may represent a solid foundation for the development of future HIV interventions targeting this important at-risk population. Our findings also pointed to the importance of adopting a combined HIV prevention approach to tackle this public health problem. Based on the findings, abstinence-plus intervention has been recommended as a suitable choice because abstinence-plus programs aim to promote abstinence from sex until marriage, which is in line with the prevailing religious values and social norms, but also seek to promote consistent condom use among the sexually active single students.

The findings of the current studies could help maximise the benefits of future behavioural change interventions by identifying the most salient psychosocial determinants to be addressed. In addition, these findings could inform the selection of the most appropriate behavioural change strategies to address these determinants. Moreover, the results of these studies provided insight into the important attributes of the intervention that could facilitate its implementation and increase its effectiveness. Given the observed influence of the religious values and cultural norms in the conservative community in Sudan, cultural adaptation of the messages and other contents should be considered to increase the acceptance of the intervention among the target group as well as the community. In addition, the studies highlighted the need for tailoring the intervention to address the

observed individual differences and needs. Tailoring will also make it possible to provide condom use educational messages on the basis of the students' intentions to practice sex rather than their actual sexual behaviours. Finally, it was revealed that in a conservative community like Sudan, where the acknowledgement of having sex out of wedlock might tarnish one's reputation and could lead to legal consequences, preserving the individuals' privacy is by far the most critical success factor. Therefore, using the internet, where individuals' privacy and confidentiality are commonly preserved, to deliver the intervention might be advisable. Using online questionnaires in the current studies also revealed the feasibility and acceptability of using the internet to deliver future behavioural change interventions to university students.

Besides, developing and implementing HIV interventions for university students in Sudan is challenging because of the structural, financial and technical constraints that have been reflected in the poor record of health promotion programs in Sudan (133). Therefore, our studies could inspire the development of theory and evidence-based health promotion intervention in Sudan. Intervention Mapping (IM) could be very useful for this purpose as it provides tools and guidelines for "the empirical and theoretical foundation of health promotion programs, application of theory, translation of theory into actual intervention activities and materials, management of program adoption and implementation, and for the collaboration between health educators, researchers, priority groups and stakeholders" (102).

Scientific relevance

We contributed to an important research area that has been understudied in Sudan. We have submitted our research papers to open access journals to disseminate our scientific findings and share them globally with researchers and public health scientists. Although we aimed to share these findings with the Sudan National AIDS Program (SNAP) officers and present the findings in the program workshops and local conferences, this was not achieved because of the political instability in Sudan and the COVID19 pandemic. However, the findings have been communicated in a regional workshop in Saudi Arabia with public health professionals from similar Arab countries. Besides, the recommendations were included in the scientific material of a course designed for HIV counsellors in Saudi Arabia.

Public health professionals and scientists in Sudan and other similar countries can benefit from our research findings and recommendations to develop culturally adapted interventions to prevent HIV among university students. In addition, one of the expected impacts of our research is raising the attention of the public health professionals and policymakers in Sudan and similar Arab and Islamic countries to the lost opportunity of implementing exported interventions without local adaptation. Our research is expected to open the door for implementing locally designed, web-based, computer-tailored interventions to prevent HIV in Sudan and the Middle East.

Furthermore, given the identified research gaps, we provided some important recommendations for future research. For instance, we recommended further exploration of the gender differences in the determinants of students' sexual behaviours. Besides, our findings alluded to the promising role of religious leaders in promoting abstinence and condom use among sexually active students and recommended further research to characterise and augment their active participation in this field. In addition, studies to identify the other determinants of risky sexual behaviours and explore the perceptions of the other important stakeholders and policymakers were suggested to broaden the scope of the intervention and maximise the chances of success. Finally, it was also recommended to prioritise research about action planning and its role in translating intentions into healthy behaviours and incorporate the findings in future interventions.

Despite the consensus about the importance of the cultural adaptation of health promotion interventions in general and how this could influence the effectiveness of these interventions (114, 115), the importance of the cultural adaptation of HIV interventions seems to be underestimated among the scientific community. This has been observed in the hesitancy of some scientific journals to publish research findings recommending abstinence from premarital sex as an HIV prevention strategy in conservative communities based on previous studies showing no role for abstinence in western and liberal communities. Hence, we believe that our research findings call for supporting future researchers from religious communities and building their research capacity to design, implement and evaluate culturally adapted interventions to curb the HIV epidemic in their communities.

Societal relevance

Although our research was solely conducted among university students, it provided insight into the importance of community participation in HIV prevention among university students. The perceived role of religious leaders, family members and health professionals in shaping students' sexual behaviours, including both abstinence from sex until marriage and consistent condom use, calls for their involvement in designing culturally accepted HIV interventions. They could also be trained to participate, as trustworthy models, in delivering these interventions. In addition, our findings could be used to equip HIV counsellors in Sudan with the knowledge and skills required to participate effectively in the intervention development and implementation. For instance, the counsellors should be trained to assess the students' behaviours and their determinants using the I-Change model constructs. They should also be trained on behavioural change methods to help them select the suitable methods, messages and skills that could exert behavioural change. Finally, since most of the funding for HIV prevention programs in Sudan comes from non-governmental organisations (NGOs), communicating our research findings with them could encourage them to fund the development, implementation and evaluation of locally designed interventions based on our research findings.

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SUMMARY

HIV represents an important public health problem globally. The public concerns about HIV are not only due to its physical impact but also because of the social, psychological and economic impacts on the affected individuals and communities. Sudan has the highest HIV incidence in the MENA region. Besides, the country is suffering from a lack of finance and political instability, which have resulted in a decline in HIV prevention services, including harm reduction and condom promotion in 2019. Although previous studies identified university students in Sudan as a high-risk group, they are not well covered with HIV prevention programs. Therefore, this dissertation aims to inform the development of a comprehensive HIV intervention by identifying the psychosocial determinants of two of the important HIV prevention strategies: abstinence from premarital sex and consistent condom use.

Chapter 1 provides a general introduction to the studies presented in this dissertation. Initially, the global, regional and local HIV epidemiology is described with special emphasis on the negative impact of the political instability and financial constraints on the future of HIV epidemiology in Sudan. Then, the rationale for targeting university students in Sudan is discussed. Local and international research findings explaining why this population is to be targeted with HIV prevention programs are presented. Next, the different HIV prevention strategies commonly used are discussed, considering the local situations in Sudan. These include both behavioural and biomedical strategies such as abstinence from premarital sex and consistent condom use. The importance of identifying the psychosocial determinants of these behaviours with reference to the Intervention Mapping protocol is discussed. Besides, the advantages of using mixed research methods and theoretical frameworks to identify these determinants are presented. This is followed by a brief description of the I-Change model for behavioural change, which has been used as a theoretical framework for all the studies in this dissertation. Finally, a review of the current literature about the psychosocial determinants of premarital sex and condom use among university students in general and Sudan is presented. It has been concluded that a paucity of research exists outlining the psychosocial determinants of premarital sex and condom use in Sudan in general and among university students in particular. These identified research gaps highlight the importance of the current studies.

Chapter 2 aims to explore the university students' beliefs about abstinence and premarital sex using a qualitative approach. For this purpose, thirty semi-structured individual interviews were conducted based on the Integrated Change (I-Change) Model constructs. The study sample included 16 (53%) male and 14 (47%) female university students, whose average age was 21.2 years (Range 18-27 and SD 2.5). Data were analysed using Nvivo 10. The findings indicated that both the abstainers and the sexually active students perceived HIV severity and susceptibility and most of them had a positive attitude towards abstinence. However, the sexually active students also perceived some advantages of engaging in sexual practices, such as sexual pleasure and proving adulthood. In addition, sexually active

students more often mentioned to be influenced in their sexual practices by their peers than by their families. Besides, the sexually active students reported lower self-efficacy to refrain from sex than abstainers. Based on these findings, we conclude that interventions seeking to promote abstinence among those willing to achieve this should stress the advantages of abstinence from sex until marriage, offer tools to resist peer pressure and enhance self-efficacy to abstain. It was also recommended to adopt a more comprehensive approach and consider promoting condom use and other safer-sex practices among those who are sexually active. Given the observed gender differences in these determinants, it was also recommended that these interventions should be gender-sensitive to address the needs of both male and female students.

In Chapter 3, findings from a study that aimed to identify the psychosocial determinants of premarital sex among university students are outlined. Using a cross-sectional design, a sample of 257 students, between 18-27 years old, was recruited from randomly selected public and private universities in Khartoum. The participants filled out an online questionnaire based on the Integrated Change Model (ICM) to assess their beliefs and practices about abstinence from premarital sex. The analysis of variances (MANOVA) showed that sexually active students differed significantly from abstainers in having more knowledge about HIV/AIDS, higher perception of susceptibility to HIV, more exposure to cues that made them think about sex and a more positive attitude towards premarital sex. The abstainers had a significantly more negative attitude towards premarital sex, higher self-efficacy to abstain from sex until marriage and perceived more peer support and norms favouring abstinence from sex until marriage. These findings suggest that promoting abstinence from sex until marriage among university students in Sudan, which aligns with the Sudanese religious values and social norms, requires health communication messages addressing these psychosocial determinants. However, given that sexual encounters still may occur, the importance of a comprehensive approach to address the need for condom use for those not willing to refrain from sex was highlighted.

Chapter 4 describes the findings of a qualitative study that was carried out to gain a broad insight into the psychosocial determinants of condom use among university students. Therefore, we conducted 30 semi-structured individual interviews with male and female students to explore these determinants using the I-Change Model as a theoretical framework. The study sample included 16 (53%) male and 14 (47%) female university students. Their age ranged from 18 to 24 years (mean age 19). Data were analysed using Nvivo 10. The results suggested that barriers to condom use among university students included misconceptions about condoms use, negative attitudes towards condom use, lack of social support, low self-efficacy to use condoms and poor action planning. It was concluded that sexual health promotion should address these aspects to successfully promote condom use among sexually active students and subsequently reduce the risk of HIV transmission.

In chapter 5, a quantitative study of the psychosocial determinants of consistent condom use among university students in Sudan is described. The Integrated Change Model (ICM)

was applied to identify which items need to be addressed in a prevention program. A cross-sectional design was used and a sample of 218 students, 18-25 years old, was recruited from randomly selected public and private universities in Khartoum. Data were collected online and analysed with SPSS 24. The findings of the analyses of variance indicated that condom users differed significantly from non-condom users in having more HIV and condom use-related knowledge, higher perception of susceptibility to HIV and reporting more exposure to condom use cues, having a less negative attitude towards condom use (attitude cons), experiencing social support and norms favouring condom use and having higher condom use self-efficacy. Binary logistic regression also showed that peer norms favouring condom use in addition to HIV-related knowledge, condom use cues, negative attitude and self-efficacy were the factors uniquely associated with consistent condom use among university students in Sudan. It was concluded that to promote consistent condom use among sexually active students; interventions could benefit from increasing knowledge about HIV transmission and prevention, raising HIV-risk perception, using condom use cues, addressing perceived condom disadvantages and enhancing students' self-efficacy to avoid unprotected sex. Moreover, such interventions should enhance positive peer influence and seek health care professionals' and religious scholars' support for condom use.

Chapter 6 provides an overview and discusses the findings of the studies included in this dissertation. Initially, a summary of the main findings of the qualitative and quantitative studies on premarital sexual practices and consistent condom use was presented. This summary discussed the most salient psychosocial determinants of these behaviours in addition to the role of parents' and religious leaders' influence on the students' behaviours. Gender differences in behavioural determinants were also highlighted. Next, the methodological strengths and limitations of the studies included in this dissertation were presented. Then, the recommendations for future research to fill the identified knowledge and research gaps were provided. Finally, the practice implications of our studies were discussed. Based on the findings, an abstinence-plus intervention has been recommended as a suitable choice because abstinence-plus programs aim to promote abstinence from sex until marriage, which is in line with the prevailing religious values and social norms, but also seek to promote consistent condom use among the sexually active single students. Recommendations for the development of both components of such a program were provided. Considering the influence of religious values and cultural norms prohibiting all types of extramarital sexual practices and the high level of stigma associated with such behaviours in Sudan, the need for cultural adaptation of future interventions was discussed. Besides, suggestions about the suitable communication channels and intervention adoption and implementations were presented. Finally, the impact paragraph highlighted the practical, scientific and societal relevance of this dissertation.

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CURRICULUM VITAE

Husameddin Farouk Elshiekh was born in London 1970. He obtained his Bachelor of Medicine and Surgery in 1997 from the Faculty of Medicine, Omdurman Islamic University, Sudan. Since 1999, he has been working in the field of preventive medicine and participated in several outbreaks control in Darfur, Western Sudan. Then he travelled to Saudi Arabia, where he participated in establishing the system for infectious disease surveillance among pilgrims (hajj) in Medina Munawara, Western Saudi Arabia. In 2011, he got his master's degree (MSc) in infectious disease from London School of Hygiene and Tropical medicine (LSHTM). Since then, he has been assigned as the director HIV and sexually transmitted diseases control program and the coordinator of infectious diseases surveillance in Medina Munawara. During the COVID19 pandemic, he was also a member of the command and control team and the coordinator of COVID19 electronic surveillance system in the region. Husameddin Elshiekh is currently working as a preventive medicine and public health specialist at the Public Health Administration in Medina Munawara, Ministry of Health, Saudi Arabia.

LIST OF PUBLICATION

Peer-reviewed international publications

1. Elshiekh, H.F., Hoving, C. & de Vries, H. Psychosocial Determinants of Premarital Sexual Practices among University Students in Sudan. *Sexuality & Culture* (2022). <https://doi.org/10.1007/s12119-022-10004-8>
2. Elshiekh, H. F., de Vries, H., & Hoving, C. (2021). Assessing sexual practices and beliefs among university students in Khartoum, Sudan; a qualitative study. *SAHARA J : journal of Social Aspects of HIV/AIDS Research Alliance*, 18(1), 170–182. <https://doi.org/10.1080/17290376.2021.2011390>
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Papers under review

1. Elshiekh, H. F., Hoving, C., & de Vries, H. Psychosocial Determinants of Consistent Condom Use among University Students in Sudan: Findings from a study using the Integrated Change Model. Manuscript under review at *African Journal of AIDS Research*.

