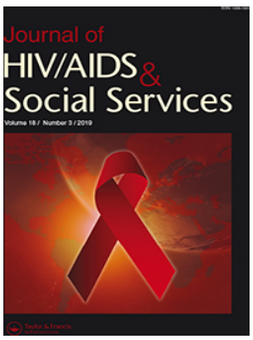

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The efficacy of peer education in sexual behavioral change among school-going adolescents in Northern Malawi: A quasi experiment

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ABSTRACT

We conducted a quasi-experiment to investigate whether a peer education intervention could result in positive sexual behavioral change outcomes in selected schools in Northern Malawi. The experimental participants ($n = 158$) were exposed to an HIV risk reduction intervention. The control participants ($n = 147$) were exposed to a Health Promotion Package. At 8 months, there were significant improvements in the intervention arm on several outcomes. The experimental group was 96% less likely to have sex than the control (OR = 0.04, CI = 0.01–0.20). Intervention participants were also 3.49 times likely to report condom use when they had sex (OR = 3.49, 95% CI = 0.96 to 12.65) and had lower odds of having multiple sexual partners. There were no significant differences on abstinence and the desire to have medical male circumcision (MMC). We suggest the intervention has potential efficacy to improve HIV risk reduction among adolescents in Malawi and perhaps in other similar settings.

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Adolescent; HIV and AIDS; intervention; Malawi; risk reduction

Introduction

Reducing HIV and AIDS among adolescents and young people is one of the Sustainable Development Goals (SDGs) (United Nations, 2015). In sub-Saharan Africa (SSA), HIV and AIDS are major public health challenges. Of the estimated more than 34.2 million people infected with HIV globally over three quarters are estimated to live in SSA representing about 70% of the global infection burden yet the region only accounts for about 12% of the global population (UNAIDS, 2011). There is a high rate of HIV cases among adolescents and young people aged 12–24 years globally with

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females being disproportionately affected. On average 2, 500 young people (12–24 years) get infected with HIV every day and 80% of these infections take place in SSA (Michielsen, 2012). Interventions aimed to prevent new infections among adolescents and young people in SSA seem not to be having meaningful impact in most nations in the region.

Malawi with HIV prevalence of 8.8% in the 15–49 years age category is among 10 countries with the highest prevalence in the world (Malawi Demographic and Health Survey [DHS], 2017). While for instance the national 15–49 years HIV prevalence dropped by 1.8% between 2010 and 2015, the 15–24 year old prevalence rose from 3.6% in 2010 to 5.9% by 2015 (DHS, 2010; DHS, 2017). In 2012 alone, there were 6,700 new HIV infections in the 15–19 years category translating to 18 infections on a daily basis (UNAIDS, 2011, UNGASS Country Progress Report, 2010). Similarly, in 2013 there were 34,000 infections among young people in general with 7 400 of these occurring in those less than 14 years of age (UNAIDS, 2011). The 2015–2016 Malawi Demographic and Health Survey (DHS, 2017) highlights that 41% of young women and 44% of young men have comprehensive knowledge of HIV and HIV risk reduction behaviors. HIV risk reduction behaviors include: limiting the number of sexual partners, delaying sexual initiation, practicing abstinence and consistently using condoms (Hearst and Chen, 2004). HIV risk reduction behaviors are considered a product of Behavior Change Intervention (BCI). BCI programs targeting young people have overtime employed life skills, peer education and other community-based strategies to improve knowledge with the hope that such knowledge can motivate changes in behavior (Kirby, 2008; Laga et al., 2012; Magnani et. al, 2005, Ross, 2010).

Previous studies have reported a weak link between knowledge and behaviors associated with sexual risk taking among young people in SSA in general with growing evidence that HIV behavior change interventions can increase knowledge, but have little effect on behavior (Dancy et al., 2014; Gonsalves et al., 2015; Fonner et al., 2014; Hallett et al., 2010; Heeren et al., 2013; Idele et al., 2014; Morris & Rushwan, 2015; Mwale, 2008a; Napierala-Mavedzenge et al., 2011; Mwale, 2008a; Mwale, 2008b; Paul-Ebhohinhen et al, 2008; Rokicki et al., 2017; Rashid & Mwale, 2016; Rink & Wong-Grunwald, 2017; Toska et al., 2017; UNAIDS, 2011; Underwood et al., 2011; Smith & Watkins, 2005; Weinhardt et al., 2017; Woog et al., 2015). A meta-analysis by Medley et al. (2009) found that most studies report knowledge increases, but little behavioral changes. Current BCI strategies include the imparting of self-efficacy but few have targeted HIV risk reduction skills building. Young people do not just represent a high risk group but also a window of hope for future HIV prevention and programing efforts. The question that arises therefore might be where the efforts are not

effective in HIV and AIDS programing for young people not only in Malawi but SSA in general. Is it a problem that can be ascribed to lack of intervention relevance or efficacy or effectiveness or is it an issue of implementation bottlenecks? We therefore implemented an intervention to test the efficacy of a peer education intervention on sexual behavioral change in Northern Malawi with the hope that it not only improves knowledge but also HIV behavioral risk reduction and skills. Peer education programs have been shown to effectively improve school-based HIV risk reduction outcomes elsewhere (Agha and van Rossem, 2004; Merson et al, 2008; Mkandawire et al, 2013; Mwale & Muula, 2017; Swartz et al., 2012; Visser, 2007). Despite that, there is dearth in studies measuring the impact of peer education on HIV risk reduction outcomes not only in Malawi but SSA (Coates et al, 2008; Kirby et al., 1994; Kirby et al., 2006; Michielsen et al., 2012, Peltzer, 2010; Stöckl et al, 2013). In Malawi, studies focusing on HIV risk reduction and prevention among adolescents and young people have been diverse but many have been observational and not implemented through peer education as a BCI strategy. Except for a recent peer education study by Dancy et al. (2014), there seem also to be paucity in Malawian studies employing randomized trial design or at least quasi experimental design to provide evidence for the efficacy of peer education in improving HIV risk reduction outcomes.

Malawi provides an ideal setting for this study because of the large gaps in adolescent HIV incidence, HIV risk reduction behavioral outcomes, self-efficacy and knowledge. Specifically school-based adolescents both male and female from the rural Mzimba and Nkhatabay districts as well as Mzuzu city were targeted. The rural population was targeted based on the high incidence of new HIV infections, low levels of knowledge and self-efficacy in rural Malawian youth in general (DHS, 2010; DHS, 2017, NAC, 2012). The urban population in Mzuzu city was targeted because urban Malawian adolescents have been demonstrated to be at heightened risk for HIV due to the density of sexual networks as well as vulnerability to transactional and intergenerational sexual relationships (National Plan of Action, 2008). The study was retrospectively registered as a Randomized Controlled Trial with the Pan African Clinical Trial Registry [PACTR] on December 12, 2016 [ref# PACTR 201612001889209].

Methodology

Design

We employed a quasi-experimental design, hypothesizing that the intervention regimen would improve adolescent HIV risk reduction outcomes compared to the standard-as-usual Life skills regimen already provided to

adolescents and young people in schools. Modified propensity score matching (PSM) of groups on characteristics of interest was applied as we aimed for "unbiased" comparison between groups in terms of baseline characteristics. PSM as a quasi-experimental procedure involves identifying a comparison group that is as similar as possible to the treatment group in terms of baseline (pre-intervention) characteristics. The logic being that the comparison group captures what would have been the outcome without the intervention (i.e., the counterfactual) (Shadish & William, 2002).

The primary sampling unit for the study was secondary schools. Schools were selected from cluster for the Northern Region Education registry. Both male and female adolescents were eligible for recruitment. Since most of secondary school students in Malawian schools are below the age of 18, parental assent was obtained. Those students who had signed parental assent forms were considered for recruitment; the pupils signed own consent forms. We purposively selected 6 schools for the quasi experiment from a total of 12 that had been involved in the situation analysis phase (Mwale & Muula, 2018; Thabane, 2004) for the same study. Two schools each were sampled from Mzuzu city, rural Mzimba and rural Nkhata Bay. As the study employed peer education as a strategy, we also involved young peer facilitators ages 18–23 years from Mzuzu University. The inclusion of these older peer facilitators was grounded on the assumption that they would be more knowledgeable, have better HIV self-efficacy and risk reduction behavioral skills.

Recruitment

We recruited participants between July 10 and August 23, 2017. Although individual randomization was not used in the selection of participants, we ensured we enroll 60 participants equal by sex from each of the participating school: in total each arm had 180 participants. One school from each of the three sites was assigned the experimental arm while the other assigned as control. Participants in all schools were briefed on the objectives of the study and were assured of the confidentiality of their data. They were also informed that the study would employ peer education involving young peer facilitators from Mzuzu University. Six peer facilitators were trained and allowed to practice their roles before the intervention was rolled out. They were also briefed on study objectives and what was expected of them. To be included into the study, adolescent participants were supposed to meet the following criteria: be in-school, between the ages of 10–19 years, male or female, and have prior exposure to the standard life skills BCI prevention protocol. Peer facilitators were Mzuzu

University students, between the ages of 18–23 years, and either male or female.

Interventions

Experimental regimen

Study participants in the experimental arm were exposed to a peer education risk reduction intervention that we designed. The Risk Reduction Behavioral Model on which the intervention was grounded is an integration of social-cognitive learning theory (Bandura, 1982), sociocultural learning theory (Vygotsky, 1978) and the theory of reasoned action (Fishbein & Ajzen, 1975). The intervention included information, efficacy (self and interpersonal-social) and skills (coping and practical) building package. This package was modular and complemented with entertainment as recommended by participants in the first cross-sectional situation analysis phase of the study (Mwale & Muula, 2018). In the social infotainment package, study participants were involved in formal HIV risk reduction knowledge, skills and efficacy building sessions that also included: drama, song, music, film, and role-playing. Due to national electricity black outs experienced nationally, video and film were difficult to implement. In each school five sessions spread over the three months intervention period were provided. Messages and skills were transferred through these participatory approaches in which the more knowledgeable facilitators played the role of mentors; instilling, cuing, and modeling expected behaviors in line with the scaffolding and modeling constructs of sociocultural and social learning theories. We distributed pamphlets and booklets containing content on modes of HIV transmission, strategies for avoiding or reducing HIV contraction, how to minimize AIDS stigma and discrimination and on general sexual reproductive health. We hypothesized that the intervention would result in positive sexual and reproductive health behavior.

Control regimen

The control group was exposed to a Health promotion and education package based more on the standard-as-usual Life skills BCI regimen already being provided in all schools. Instead of HIV risk reduction knowledge and skills, they were exposed to malaria and tuberculosis risk reduction and prevention skills. Apart from that they were exposed to generic Life skills like decision making and assertiveness.

Measures and outcomes

Assessments included a questionnaire at baseline [Additional file 1] to compare groups prior to intervention roll out. This was followed-up with a post-test questionnaire 8 months after the intervention [Additional file 2]. The baseline questionnaire targeted pre-intervention characteristics: the primary and secondary outcome measures to evaluate their entrance characteristics. A knowledge quiz was included in the questionnaire to determine entry knowledge. The post-test follow-up was aimed to inform effect determination. A follow-up knowledge quiz was also included in the follow-up questionnaire. At follow-up the information was recoded to inform determination of effects on both the intervention and control groups during analysis. The primary outcome was HIV risk reduction measured as a composite index ranging 0–100. The combinational matrix for computing risk reduction (Additional file 3) included risk reduction indicators. Risk reduction individual outcome measures included: sexual behavior, measured as ever had sexual intercourse and sex at previous 3 months (binary coded; 0-Yes, 1-No), condom use, measured as at sexual debut and at last sex (binary coded; 1-Yes, 0-No); HIV and AIDS knowledge, measured through knowledge scores (metric outcome; range 0–100); biomedical HIV testing and counseling (HTC) as well as medical male circumcision (MMC) intention and uptake behaviors, measured as ever uptaken HTC or MMC (male only), HTC or MMC in previous 3 months and intention for HTC or MMC for those who never had uptaken (binary coded; 1-Yes, 0-No); and self-efficacy measured on abstinence (A- efficacy), partner faithfulness (B-efficacy), and condom (C-efficacy) (>2 outcome values; can, cannot and not sure). Among other outcomes, specifically we targeted intervention improvements associated with: abstinence, delayed debut, reductions in unprotected sex, correct and consistent condom use, faithfulness to one partner, reductions in multiple partnerships.

Statistical analysis

We used intention to treat analysis. The study was powered to detect an improvement of 20 percent points in the risk reduction score measured against the baseline score with 0.95 power and α of 0.05 in independent samples comparison between the control arm and the intervention arm. The power calculation was based on situation analysis findings for the study and on previous meta-analysis (Medley et al., 2009; Mwale & Muula, 2018; Peduzzi et al, 2002). We began our analysis procedure with initial descriptive statistics for baseline demographic variables between the intervention and control groups. Differences were assessed using chi square analyses for categorical variables and t tests for continuous variables. We

also conducted cross-tabulations on outcomes to determine their prevalence and effectiveness of the intervention at 8 months follow-up. The Difference-in-Difference (DID) approach was conducted to determine the overall sexual behavioral efficacy of the intervention. We used multiple logistic regression models to estimate effects on knowledge, reported sexual behavior, reported condom use and HTC, as well as MMC uptake behaviors and intentions. Further we used multinomial logistic regression models for effects on self-efficacy outcomes. The models were adjusted for baseline characteristics, including: sex, age, school location, and school type.

Results

A total of 360 participants enrolled in the study, of which 305 (84%) were successfully followed up at 8 months. Figure 1 below shows the flow diagram through the phases of the study.

All the 305 participants completed baseline and follow-up questionnaires and were involved in the intervention or control activities depending on the arm they belonged. The baseline characteristics of intent-to-treat participants are shown in Table 1.

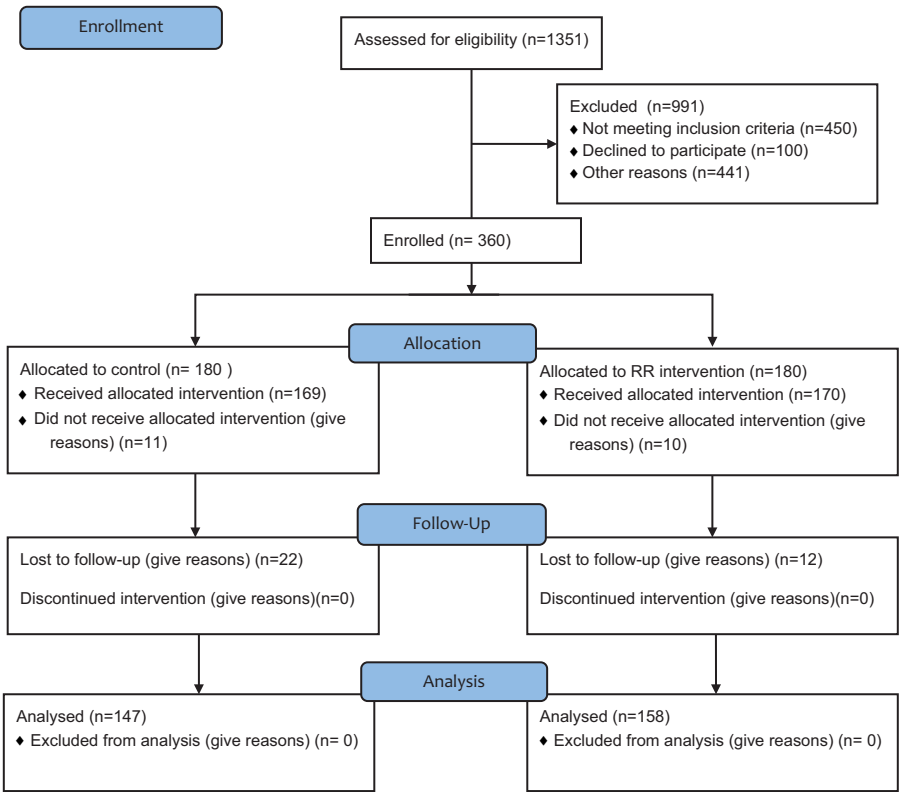

Figure 1. Flow diagram––phases through the risk-reduction intervention.

Table 1. Baseline characteristics of intent-to-treat participants.

	Control	Risk Reduction Intervention
Number of schools per arm	3	3
Number of total participants per arm	170	169
Participants at 8 months follow-up	147	158
Age (years-mean/sd)	16.1 (1.3)	16.2 (1.3)
Age category		
Early (10–14 years)	10 (3%)	25 (7%)
Late (15–19 years)	160 (47%)	144 (42%)
Gender		
Male	74 (22%)	82 (24%)
Female	96 (28%)	87 (26%)
School location		
Rural	110 (32%)	109 (32%)
Urban	60 (18%)	60 (18%)

Table 2. Estimated intervention effects for sexual behavior.

			RR intervention-control	
Variable	Control *N* (%)	RR intervention *N* (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
Ever had sexual intercourse	125/147 (85)	60/158 (40)	0.11 (0.06, 0.19)	0.09 (0.05, 0.19)
Sexual intercourse in past 3 months	122/147 (83)	44/158 (27)	0.06 (0.02, 0.21)	0.04 (0.01, 0.20)
Condom use at last sex	38/125 (30)	6/45 (13)	2.84 (1.11, 7.27)	3.49 (0.96, 12.65)
Condom use at sexual debut	58/125 (46)	20/62 (32)	1.82 (0.96, 3.44)	2.06 (0.93, 4.54)
Unprotected sex in past 3 months	115/147 (78)	8/158 (5)	0.02 (0.01, 0.03)	0.02 (0.01, 0.04)
Multiple partnerships in past 3 months	86/147 (59)	8/158 (5)	0.04 (0.02, 0.08)	0.04 (0.02, 0.11)
Transactional sex in past 3 months	45/147 (31)	2/158 (1)	0.03 (0.01, 0.12)	0.04 (0.01, 0.19)
Culturally related sex in past 3 months	32/141 (22)	6/158 (4)	0.14 (0.06, 0.35)	0.16 (0.05, 0.48)

From baseline to 8 months follow-up, mean risk reduction index scores increased from 62% to 73% in the intervention group. Table 2 shows the effects for behavioral change among individual outcome measures namely: sexual behavior, condom use, self-efficacy, multiple and concurrent sexual partnerships for both unadjusted and adjusted models.

Multiple logistic regression models controlled for baseline covariates showed that exposure to the intervention was associated with improvements for some individual risk reduction outcome measures at 8 months. Specifically, the experimental group was 96% less likely to have sex in the past 3 months compared to the control (OR = 0.04, CI = 0.01–0.20). Similarly, the odds of using condoms at last sex in experimental group participants was 3.49 times the odds of using a condom at last sex in control group participants (OR = 3.49, CI = 0.96–12.65). Experimental group participants also were 98% less likely to have unprotected sex in the past 3 months than control group participants (OR = 0.02; CI = 0.01–0 .04);

Table 3. Estimated intervention effects for risk reduction.

			RR Intervention-Control
Variable	Control mean	RR Intervention mean	Mean differences 95% CI
Baseline	60	62	2.74 (−3.44, 7.35)
Follow-up at 8 months	43	73	33.24 (30.32, 36.16)

were 96% less likely to have multiple sexual partnerships in the past 3 months than control group participants (OR = 0.04, CI= 0.02–0.11); were 96% less likely to be involved in transactional sex in the past 3 months than control group participants (OR = 0.04, CI = 0.01–0.19); and were 86% less likely to be involved in culturally related sex in the past 3 months than control group participants (OR = 0.16, CI = 0.05–0.48). Further, compared to control group participants the experimental group participants were 3.02 times more likely to being knowledgeable on abstinence compared to control group participants (OR = 3.02, CI = 0.81–11.27), and were 2.91 times more likely to being knowledgeable about condoms than control group participants (OR = 2.91, CI = 0.93–9.05).

Applying multinomial logistic models, we assessed effects on self-efficacy for abstinence, condoms and partner faithfulness. Compared to control group the experimental group were 1.14 times more likely to have abstinence self-efficacy (OR = 1.14, CI= 0.25–5.05), and were 2.32 times more likely to have condom self-efficacy than control group participants (OR = 2.32, CI = 0.89–6.13).

We further assessed effects on HTC and willingness to have MMC. The intervention group was 4.97 times more likely to express willingness to uptake HTC than the control group (OR = 4.97, CI = 1.98–12.46). Similarly, the odds of being knowledgeable about MMC in experimental group male participants was 4.42 times more than the odds of being knowledgeable about MMC in their control group counterparts (OR = 4.42, CI = 1.71–11.39). Further experimental group male participants were 1.22 times more likely to report having undergone MMC in the past 3 months than those in the control group (OR = 1.22, CI = 0.48–3.12).

There were no significant differences between arms on partner self-efficacy, willingness for male participants to undergo MMC and on having undergone HTC in the past 3 months. The overall impact for risk reduction as well as Difference-in-Difference impact measures: that is single difference and double-difference are shown in Table 3.

Discussion

The results of this study suggest that the intervention informed by our RRBM model can be an effective strategy to improve not only adolescent

sexual behavior, skills and self-efficacy. The intervention may also inform strategies for managing HIV incidence among adolescents and young people. Significant improvements on sexual behavioral change were shown at 8 months which included: reduced frequency of sexual activities, increased likelihood to use condoms during sexual intercourse, and decrease in likelihood of unprotected sex. There was also less likelihood for intervention participants to be involved in multiple and concurrent partnerships, less likelihood to be involved in transactional sex and less likelihood to be involved in culturally related sex. Large improvements were also registered with respect to knowledge outcomes on both HIV and AIDS and self-efficacy dynamics including: abstinence, condom use and faithfulness to one partner. Although there were no significant differences on partner faithfulness, there were improvements with respect to abstinence and condom self-efficacy. Further, although there were no significant differences for undergoing HTC, participants were more likely to have willingness to undergo HTC in future. There was impact on having undergone MMC but not on willingness to uptake for those who had not indicated uptake in the past 3 months. Contrary to previous studies and literature, female adolescents had more likelihood for HIV risk reduction and sexual behavior change and were therefore less likely to be mathematically at high risk for HIV than their male counterparts. There were also significant results for urban adolescents who had higher likelihood to demonstrate HIV risk reduction and sexual behavior change and were therefore less likely to be mathematically at high risk for HIV.

Our study was conducted in cognizance of similar studies: quasi experimental and RCT intervention studies already conducted in SSA, Malawi and elsewhere (Agha and van Rossem, 2004; Baird et al., 2012; Bandiera et al., 2012; Baptiste et al., 2006; Clark et al., 2007; Cluver et al., 2013; Cowan et al., 2010; Dancy et al., 2014; Heeren et al., 2013; James et al., 2006; Jemmott et al., 2010; Jewkes et al., 2006; Luiz, 2012; Magnani et al., 2005; Maticka-Tyndale and HP4RY Team, 2012; Rokicki et al., 2017; Visser, 2007; Swartz et al., 2012). The approach we took was unique as compared to many of these previous intervention studies, quasi or RCT––with some having been highlighted in systematic reviews (Bollinger & Stover, 2007; Chandra-Mouli et al., 2015; Coates et al., 2008; Fonner et al., 2014; Gallant and Maticka-Tyndale, 2004; Glick, 2005; Hallet et al., 2007; Hayes et al., 2010; Helleringer & Kohler 2007; Kirby et al., 2006; Kirby, 2008; Laga et al., 2012; Medley et al., 2009; Michielsen et al., 2012; Napierala-Mavedzenge et al., 2011; Maro et al, 2008; Paul-Ebhohinhen et al., 2008; Ross, 2010; Ross et al, 2007; Truong, 2005).

Some previous interventions for instance have not included rigorous situation analysis before rolling out their interventions. We ensured that we

gather as much data on correlates contributing to the gap on the ground prior to the intervention. We also included sociocultural and ecological correlates in our RRBM model to inform the intervention. This was done with the observation that many interventions grounded on individually-based frameworks have hitherto ignored sociological determinants of sexual behavior (Michielsen, 2012; Maticka-Tyndale & HP4RY Team, 2012). We assumed the neglect of social determinants of behavior could be contributing to lack of effectiveness in the prevention programs.

Our contextual limit to schools only despite that out of school adolescents also need attention was more logistically driven. Schools being structured environments accorded us an ideal setting for an experimental study and we also envisioned that our school-based adolescent subjects would have the minimum entry criteria of exposure to some form of BCI like Life Skills Sexuality education. That BCI exposure condition can rarely be met in a population of out of school adolescents.

We also tailored our intervention in line with age categories. The rationale for such tailoring was based on previous empirical observation that the late adolescents [15–19 years category––mainly senior secondary school classes] and early adolescents [10–14 years category – mainly junior secondary classes] have slightly different traits relative to what mainly drives risky behaviors and HIV infection. This is further in light with our situation analysis findings that while early adolescents might not have initiated sexual activity; their late adolescent counterparts are more likely to have initiated such.

It became pertinent therefore to focus more on risk-avoidance approaches (abstinence and delaying sexual debut––the A function), in the early adolescence category. We also included in the intervention opportunities to develop efficacy and skills building toward such avoidance in the very young, rather than generalizing the approach to all age groups. Practically refocusing and tailoring interventions toward the risk reduction B and C function as adolescents become older and enter late adolescence was considered more realistic. We further included biomedical prevention strategies in HTC and MMC that many quasi experiments and RCT targeting HIV risk reduction among adolescents in SSA have hitherto ignored.

Despite our design and focus, we however were also cognizant that interventions are currently shifting toward combination options most of which incorporate a structural component, to address not only the proximate determinants of sexual risk behaviors but also more critical distal correlates like poverty and gender disparities (Baxter and Abdool Karim, 2016; Blankenship et al., 2006; Doyle et al, 2012; Hankins and de Zalduondo, 2010; Luiz, 2012; Marklam et al, 2013; Maticka-Tyndale & Barnett, 2010; Reed and Miller, 2014). Combination options integrate two or several of

the intervention designs: a behavioral component, a biotechnology component, a biological component and a structural component. Among adolescents, such combination options might incorporate a structural component of girl empowerment through scholarships or bursaries into a behavioral intervention. Such behavioral interventions that empower girls through cash transfers and bursaries though expensive to implement are premised on the argument that empowerment might reduce indulgence in risky behaviors like transactional, intergenerational and multiple concurrent partnerships (Bandiera et al., 2012; Cluver et al., 2013).

Limitations

Our study had limitations mainly due to the fact that we used questionnaire self-reports for sexual behavior outcomes. Sexual behavior, and especially that collected through questionnaires is prone to respondent bias. Further, the taboo and sensitivity associated with sexuality issues in SSA society exposes sexual behavior data collection to possible social desirability bias. We designed and structured our basement instruments to limit bias through piloting before intervention roll out and participants were strongly encouraged to be honest. Short follow-up duration for the intervention was another of our limitations as that might have limited clinical significance of the findings. For a quasi-experiment, 8 months was reasonable period that might not jeopardize our findings although most quasi experiments and RCT have longer follow-up duration. We also based the likelihood for HIV risk reduction and sexual behavior change on mathematical odds and probabilities simulated from reported behaviors and intentions. This could be considered subjective. Biomarker measures such as actual participant screening for HIV and STIs at baseline and 8 months follow-up could however have helped to objectively measure actual sexual behavior and detect efficacious HIV risk reduction impact. We were however limited logistically to utilize clinical procedures hence our focus on psychological and behavioral markers. Future attempts to replicate the study or extrapolate the intervention can perhaps consider biomarker measures of sexual behavior.

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The authors wish to acknowledge the contributions of all the participants involved in this study as well as the school authorities whose input is invaluable and will go a long way in improving health outcomes for HIV risk reduction among adolescents and young people in Malawi. We also thank Mzuzu University for sponsoring the PhD project and staff at the University of Malawi, College of Medicine for the support they

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Declarations

Ethics approval and consent to participate

Ethics approval for the study was granted by the University of Malawi College of Medicine [ref#: P.01/16/1847]. The quasi experiment was initially retrospectively registered as an RCT with PACTR on December 12, 2016. Informed consent for the study was obtained from all study participants including parental or guardian consent for respondents below the age of 18.

Consent to publish

Consent to publish has been obtained from participants. This was highlighted in the consent to participate form that each participant read and signed before recruitment.

Availability of data and materials

Data and materials for the study will be available from the corresponding author.

Competing interests

The authors declare that they have no competing interests.

Study status

The study has been completed. There were two main phases; a cross-sectional situation analysis phase that informed the model for the intervention and the intervention implementation through the quasi experiment whose findings we present in this paper.

Related articles

No publication containing the intervention results herewith documented in this manuscript have been published or sent to any other journal. We have however published findings for the preliminary cross-sectional situation analysis with *Sahara Journal*. Another article on the preliminary phase is under peer review with *Afrika Focus*. We also published a systematic review on literature that was mainly used in the study with BMC Public Health and the same journal is peer reviewing the study design for the intervention.

Authors' contributions

MM with supervision from ASM conceptualized, designed, and developed the protocol and wrote this paper. All the authors read and approved the final version of the manuscript.

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