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ORIGINAL ARTICLE

Effectiveness of a peer-led HIV/AIDS education program on HIV-related health literacy of jailed adolescents in Tunis, Tunisia

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Abstract

Aim The aim of this study was to evaluate the effectiveness of a peer-led HIV/AIDS education program in improving HIV-related health literacy, knowledge, risk perception, preventive self-efficacy and behavioral intention of jailed adolescents.

Subject and methods A quasi-experimental study design with pre- and post-intervention measurement was conducted at a juvenile detention center in Tunis, Tunisia. One hundred two adolescents out of 112 answered the validated questionnaires at both baseline and follow-up. The intervention consisted of two sections: a 45-min lecture and a 30-min promotional video. The data on HIV-related health literacy, knowledge, risk perception, preventive self-efficacy and behavioral intention were collected up to 30 days prior to the start of the intervention, November 2017, and 30 days following the end of the intervention period, February 2018.

Results When changes over time, from baseline to follow-up, were compared between the intervention and comparison groups, differences were found for HIV-related health literacy ($p = 0.029$), knowledge ($p = 0.031$), risk perception ($p = 0.043$), preventive self-efficacy ($p = 0.031$) and behavioral intention ($p = 0.019$).

Conclusion The peer-led HIV/AIDS education program contributes to the development of HIV-related health literacy of jailed adolescents. It is possible to elaborate aspects of HIV-related health literacy in a non-formal education setting.

Keywords Evaluation · Adolescent · HIV · Health literacy · Intervention

Introduction

Worldwide, 1.8 million (CI: 1.5 million–2.1 million) adolescents (aged 10–19 years) were living with human immunodeficiency virus (HIV) in 2015 (Joint United Nations Programme on HIV/AIDS 2016). Acquired immunodeficiency syndrome (AIDS) is the second most common cause of death among adolescents globally (World Health Organization 2014). The Middle East and North Africa (MENA) is a region where adolescents' AIDS-related deaths are continuing to increase, leading to a profound regional public health challenge (Joint United Nations Programme on HIV/AIDS 2017).

Out-of-school adolescents are a vulnerable population at high risk for HIV/AIDS (Li et al. 2012; Pufall et al. 2015). Most come from intact families and some from displaced families that either choose not to or cannot send their children to school (Adejimi et al. 2017). Many out-of-school adolescents have dropped out of school or never started it (Burns et al. 2004). Non-formal education could play a crucial role in reducing the risk of HIV infection (de Walque 2009; Morisky et al. 2009) and could improve HIV-related health literacy (Perazzo et al. 2017; Nyawasha and Chipunza 2015). HIV-related health literacy is the "capacity of individuals and/or communities to obtain, interpret and understand basic HIV/AIDS prevention, testing and care information, skills and services and the competence to use such information, skills and services to prevent HIV/AIDS infection and related stigma and discrimination, to know of and understand their HIV status and to enhance the physical, mental and social well-being

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of people living with HIV/AIDS. Education for obtaining and utilizing these capacities and competences is trusted with HIV/AIDS educators" (Schenker 2005).

Globally, non-formal education programs to effectively offer help to out-of-school adolescents with messages on HIV have been developed (United Nations Educational, Scientific and Cultural Organization 2014). There is limited evidence exploring the effectiveness of these interventions for improving HIV-related health literacy and other educational outcomes for out-of-school adolescents. There are multiple settings and intended audiences for implementation of the HIV/AIDS health non-informal education program and HIV-related health literacy and other educational outcomes to occur and be measured. However, interventions targeting out-of-school adolescents are limited in Tunisia (Ben Romdhane and Grenier 2009). Of this limited research base, much of it has focused on out-of-school adolescents in public settings rather than out-of-school adolescents in jail settings. This study seeks to help fill this gap. HIV/AIDS health education programs targeted toward jailed adolescents need to be implemented and evaluated to achieve this aim. Analysis of HIV-related health literacy interventions designed for jailed adolescents, and their outcomes, is critical to understanding the present state of the science.

To address the needs of jailed adolescents regarding HIV-related health literacy, knowledge, risk perception, preventive self-efficacy and behavioral intention in Tunisia, the peer-led HIV/AIDS education program was organized by the AIDS Foundation of Tunis, a non-profit institute in Tunisia, and used the theory-based approach. This program focused primarily on increasing the adolescents' potential success in elevating HIV literacy in non-formal education settings. In addition, the program sought to improve HIV knowledge, delay sexual initiation, and promote voluntary counseling and testing as well as public dialogue about HIV. The theoretical foundation of peer-led HIV/AIDS education programs is derived from social cognitive theory (Bandura and National Institute of Mental Health 1986). According to this theory, an adolescent is more likely to approve modeled behavior if he/she perceives the models as friendly, supporting and similar to himself/herself regarding such characteristics as age, gender and ethnicity. The theory has been applied in research related to public health promotion and HIV prevention (Bandura 1994; Bandura 2004). Peer-led approaches are widely used and have targeted a broad range of adolescents in a variety of settings (Simoni et al. 2011). One reason for the popularity of peer-led approaches might be a rudimentary belief that adolescents are effectual educators because they are trustworthy and influential role models (Caron et al. 2004). Research reveals that adolescents identifying with a recognizable peer can imitate the actions to learn the appropriate HIV preventive behaviors (Miller 2005). In a review of 117 studies that compared peer-led and nurse/teacher/adult-led HIV health education programs, peer leaders were found to be more effectual than adults in most studies suggesting positive outcomes (Simoni et al. 2011).

To our knowledge, no previous studies have focused on a peer-led HIV/AIDS education program targeting jailed adolescents. This study aims to evaluate the effectiveness of the peer-led HIV/AIDS education program in improving HIV-related health literacy, knowledge, risk perception, preventive self-efficacy and behavioral intention of adolescents jailed in juvenile detention center, Tunis, Tunisia.

Methods

Study design

A quasi-experimental design with pre- and post-intervention measurement was used between October 2017 and March 2018 to evaluate whether HIV-related health literacy was increased following the implementation of the peer-led HIV/AIDS education program in the juvenile detention center, Tunis, Tunisia. The study was divided into two stages: baseline and follow-up.

Setting and participants

The Tunisian juvenile detention center is a state prison located in Tunis city, the capital of Tunisia. It is a secure jail or facility for people under the age of majority (18 years), recognized or declared in law, termed juvenile offending, to which they have been committed or sentenced for a period of time. The jailed adolescent population was classified into four groups with similar characteristics. All adolescents jailed in the juvenile detention center ($n = 112$) were invited to participate. Due to the quasi-experimental design, there was no random assignment of adolescents within the intervention and comparison groups, and due to the universal nature of the intervention, there were no specific inclusion criteria for participation in the study. Four adolescents were on leave at the time of the baseline data collection. Only two losses to follow-up were due to participant refusal. Of the 108 (96%) adolescents who remained, 102 (94%) answered questionnaires at both baseline and follow-up [52 of 55 (94%) in the intervention group and 50 of 53 (94%) in the comparison group]. The rest ($n = 6$) had either been released from the juvenile detention center ($n = 3$) or moved to another juvenile detention center ($n = 3$) (Fig. 1). Authorization to conduct the study was secured from the head of the juvenile detention center. All participants and guardians were informed of the goal of the study before the intervention. Also, confidentiality was assured before collecting data. The participants were informed that they could cease to participate at any time, without any justifications or consequences.

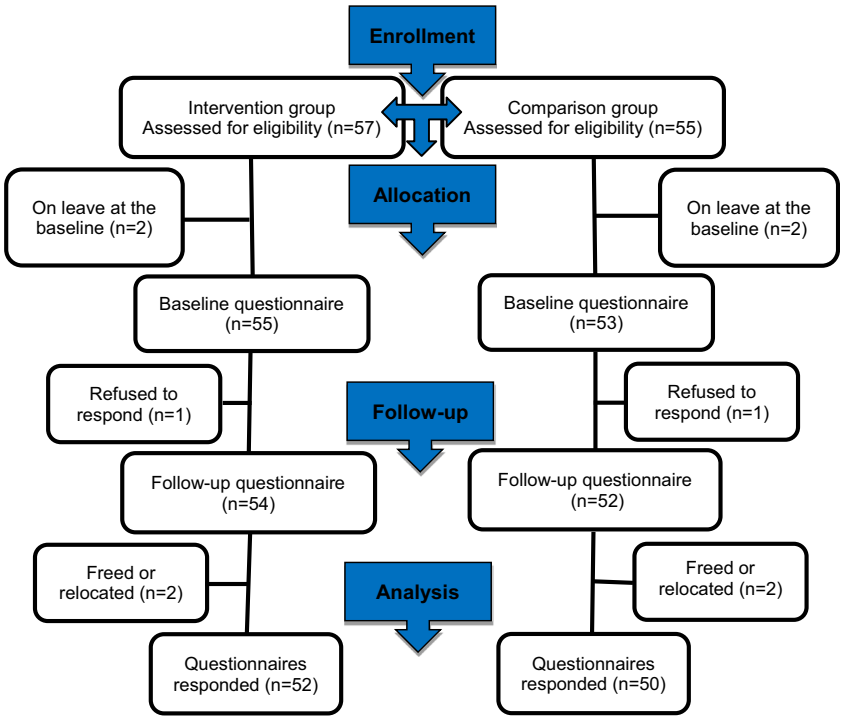

Fig. 1 Flow diagram of participant enrollment for data collection

Intervention

The intervention was composed of two parts, specifically a 45-min lecture and a 30-min promotional video, both of which focused entirely on basic HIV/AIDS prevention, testing, counseling and care information, skills and services. Classes were taught by HIV peer educators who were trustworthy and acceptable to the intended audiences. Peer educators participated in an eight-session, 16-h training program, which was a 4-day workshop conducted by the research team. The resources for peer educators comprised a pamphlet, slideshow, guideline and various appendices. Classes were taught over a period of 12 weeks, comprising approximately 10 h in total. At the end of the classes, the participants were allowed to express their doubts and questions, and necessary information was given to them. A promotional video, which complemented the teaching, was shown using a closed-circuit television in an amphitheater.

Data collection and measures

Data were collected in two study rounds. Baseline data were collected from the participants in the intervention and comparison groups up to 30 days prior to the start of the intervention period, 2 November 2017. The same participants were followed within 30 days after the end of the intervention period, 2 February 2018. The questionnaire, consisting of one instrument for HIV-related health literacy (primary outcome) and four for HIV knowledge, HIV risk perception, HIV preventive self-efficacy and HIV behavioral intention (secondary outcomes), as well as items covering participants' socio-demographic data, took approximately 45 min to complete. Internal consistency values for five instruments were measured as Cronbach's α.

1. HIV-related health literacy. HIV-related health literacy was measured with a questionnaire consisting of a series of 24 items with multiple-choice and closed-ended questions. Ten items were adopted, after minor editing, from the Health Literacy Questionnaire (HLQ) (Osborne et al. 2013), and eight items were taken from the HIV-Related Health Literacy Scale (HIV-HL) (Ownby et al. 2013). Six items were added from the literature review of HIV-related health literacy for adolescents. The initial 14 items were rated on 4-point Likert-type scales (1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree), and the last 10 items were rated on 4-point response scales (1 = very difficult, 2 = difficult, 3 = easy and 4 = very easy), with a possible lowest mean score of 1 and a possible highest mean score of 4. A confirmatory factor analysis (CFA) was performed on the measure of the adolescent HIV-related health literacy to test the validity of the instrument. The results confirmed the instrument's validity [minimum fit function chi-square = 12.53 ($p = 0.028$); RMSEA = 0.022; standardized RMR = 0.036; GFI = 0.90; CFI = 0.93]. Then, an exploratory factor analysis (EFA) was performed. The extraction of factors was done with principal component analysis (PCA) using a Varimax rotation method. To examine whether the data were suitable for factor analysis, we performed Bartlett's test of sphericity. The significance of this test was 0.04.

Moreover, the Kaiser-Mayer-Olkin (KMO) measure of sampling adequacy (MSA) was used (KMO = 0.76). We also used the eigenvalue criterion to determine the number of factors. Factors whose eigenvalue was more than one were selected. The factors were developed according to loadings of the related items. A loading > 0.5 was considered significant. The loadings ranged between 0.56 and 0.78. The reliability test was done using Cronbach's alpha index, which measured the internal consistency among variables. A Cronbach's α coefficient ≥ 0.7 was considered acceptable. After removing four items, a three-factor model was developed: reading and understanding HIV health information (7 items), appraising HIV health information (6 items) and using HIV health information (7 items). The total of variance explained was 46%. The reliability analysis confirmed the construction of factors.

2. HIV knowledge. The Adolescent AIDS Knowledge Scale (AAKS; Zimet 1998), a validated and published questionnaire, consisted of 22 items. The respondents chose from three response categories: yes, no and do not know. For 12 of the items, 'yes' was the correct answer, while for 10 items, 'no' was the correct response. The responses were coded as 1 for a correct answer and 0 for an incorrect or 'do not know' response. The score ranges from 0 to 22, with higher scores demonstrating greater knowledge about HIV. The Spearman-Brown matched-item split-half method has previously resulted in a coefficient of 0.82, suggesting good reliability (Zimet 1998).
3. HIV risk perception. The 8-item Perceived Risk of HIV Infection Scale (PRHS; Napper et al. 2012) was used. The scale is influenced by Bandura's social cognitive theory (Bandura 1994), and items are grouped into three subscales: cognitive assessments of risk (3 items), intuitive assessments of risk (3 items) and salience of risk (2 items). The scale has been found to have excellent internal consistency (Cronbach's alpha = 0.88) (Napper et al. 2012).
4. HIV preventive self-efficacy. The Self-Efficacy for Limiting HIV Risk Behaviors Scale (LHRBS; Smith et al. 1996) is made up of nine items with a 5-point response (1 = not sure at all to 5 = very sure). In the current study, three components of HIV preventive self-efficacy were measured: condom use, drug use with friends and negotiations with partners. Reliability coefficients of Cronbach's α of 0.75 (baseline) and 0.77 (follow-up) have been reported (Smith et al. 1996).
5. HIV behavioral intention. Respondents' behavioral intention to implement each of the AIDS preventive acts was measured by asking them to rate, on the 8-item Behavioral Intentions for AIDS Prevention Scale (BIAPS; Fisher et al. 1996), with a 5-point response format ranging from 1 (very likely) to 5 (very unlikely), how probable it was that they would implement each of the eight AIDS preventive behaviors over the next 3 months. It consisted of two subscales: sexual intentions and social norms. The total score for each subscale was an aggregate of the items for that subscale. The scale has shown good internal consistency (α = 0.80) (Fisher et al. 1996).

Data analysis

Descriptive analysis of the baseline and follow-up characteristics was performed, and rates of HIV-related health literacy and variables related to HIV health were separately calculated. Between-group differences in socio-demographic characteristics were compared using independent sample t-tests for continuous variables and chi-square (χ^2) tests for categorical variables. Wilcoxon signed rank and Mann-Whitney U tests were used to analyze differences in HIV-related health literacy and variables related to HIV health over time within and between groups. The level of statistical significance was set at $p \leq 0.05$. All statistical analyses were performed using IBM SPSS Statistics 22 (IBM Corp., Armonk, NY, USA) for Windows.

Results

Baseline and follow-up characteristics

The sample included 108 adolescents at baseline and 102 at follow-up. The mean age was 15.3 and 15.8 years in the intervention and comparison groups, respectively, at baseline, ranging from 11 to 18 years. The majority were male (87–89%) and had a junior secondary education (46–53%) at baseline. Most of the fathers of the participants had finished junior secondary education in the intervention group (18%) and comparison group (15%) at baseline. However, most of the participants' mothers had finished primary education in the intervention group (29%) and comparison group (32%) at baseline. As the averages of pre- and post-intervention data showed, a total of 39 (71%) and 36 (68%) adolescents in the intervention and comparison groups, respectively, rated their household economic status as low at baseline. At baseline, most of the parents of the participants in the intervention group (fathers: 58%; mothers: 40%) and comparison group (fathers: 55%; mothers: 42%) were farmers, workers or self-employed, with the rest being in business, service, teaching, government, professional or other positions. The majority had Berber ethnic backgrounds at baseline (55–53%) and follow-up (56–50%). Table 1 shows the characteristics of the intervention and comparison groups at baseline and follow-up. There were no differences between the intervention and comparison groups at baseline and follow-up concerning the socio-demographic characteristics (Table 1).

Table 1 Comparison of baseline and follow-up socio-demographic characteristics between the intervention and comparison groups

Characteristics	Baseline			Follow-up		
	Intervention ($n = 55$)	Comparison ($n = 53$)	p Value	Intervention ($n = 52$)	Comparison ($n = 50$)	p Value
Age in years mean (SD)	15.3 (7.9)	15.8 (7.8)	0.812[a]	16.1 (6.3)	15.9 (6.4)	0.931[a]
Sex			0.923[b]			0.739[b]
Male	48 (87%)	47 (89%)		47 (90%)	44 (88%)	
Female	7 (13%)	6 (11%)		5 (10%)	6 (12%)	
Education			0.730[b]			0.845[b]
Illiterate	4 (7%)	3 (6%)		3 (6%)	3 (6%)	
Primary	16 (29%)	15 (28%)		15 (29%)	14 (28%)	
Junior secondary	25 (46%)	28 (53%)		24 (46%)	26 (52%)	
Senior secondary or above	10 (18%)	7 (13%)		10 (19%)	7 (14%)	
Monthly household income			0.403[b]			0.511[b]
Low	39 (71%)	36 (68%)		38 (73%)	34 (68%)	
Middle	12 (22%)	12 (23%)		11 (21%)	11 (22%)	
High	4 (7%)	5 (9%)		3 (6%)	5 (10%)	
Father's education status			0.539[b]			0.667[b]
Illiterate	12 (22%)	14 (26%)		12 (23%)	13 (26%)	
Primary	13 (24%)	10 (19%)		12 (23%)	10 (20%)	
Junior secondary	18 (33%)	15 (28%)		16 (31%)	13 (26%)	
Senior secondary	10 (18%)	11 (21%)		10 (19%)	11 (22%)	
College student or above	2 (3%)	3 (6%)		2 (4%)	3 (6%)	
Mother's education status			0.912[b]			0.859[b]
Illiterate	16 (29%)	17 (32%)		14 (27%)	15 (30%)	
Primary	15 (27%)	14 (26%)		14 (27%)	14 (28%)	
Junior secondary	15 (27%)	13 (25%)		15 (29%)	12 (24%)	
Senior secondary	8 (15%)	7 (13%)		8 (15%)	7 (14%)	
College student or above	1 (2%)	2 (4%)		1 (2%)	2 (4%)	
Father's occupation			0.134[b]			0.201[b]
Farmer/worker/self-employed	32 (58%)	29 (55%)		29 (56%)	28 (56%)	
Business/service person	13 (24%)	18 (34%)		13 (25%)	16 (32%)	
Teacher/governmental/professional	3 (5%)	1 (2%)		3 (6%)	1 (2%)	
Other	7 (13%)	5 (9%)		7 (13%)	5 (10%)	
Mother's occupation			0.673[b]			0.744[b]
Farmer/worker/self-employed	40 (73%)	42 (79%)		37 (71%)	40 (80%)	
Business/service person	9 (16%)	8 (15%)		9 (17%)	7 (14%)	
Teacher/governmental/professional	1 (2%)	0 (0)		1 (2%)	0 (0)	
Other	5 (9%)	3 (6%)		5 (10%)	3 (6%)	
Ethnicity			0.889[b]			0.801[b]
Berber	30 (55%)	28 (53%)		29 (56%)	25 (50%)	
Arab	13 (24%)	14 (26%)		12 (23%)	14 (28%)	
Other	12 (22%)	11 (21%)		11 (21%)	11 (22%)	

$p \leq 0.05$ is statistically significant; [a] independent samples t-test; [b] $\chi 2$ test

Primary and secondary outcomes

The results of examining each group separately over time, from baseline to follow-up, indicated improvements in the intervention group ($p = 0.036$) and comparison group ($p = 0.027$) on the instrument measuring adolescent HIV-related health literacy. Additionally, the results displayed improvements within the intervention group on the Adolescent AIDS Knowledge Scale [AAKS; four out of six subscales (p values range from 0.000 to 0.013) and total scale ($p = 0.011$)], Perceived Risk of HIV Scale [PRHS; each subscale (p values range from 0.021 to 0.034) and total scale ($p =$

0.030)], Self-Efficacy for Limiting HIV Risk Behaviors Scale [LHRBS; two out of three subscales (p values 0.004 and 0.012) and total scale ($p = 0.048$)] and Behavioral Intentions for AIDS Prevention Scale [BIAPS; one out of two subscales ($p = 0.011$) and total scale ($p = 0.038$)]. Similarly, within the comparison group, improvements were found on the Adolescent AIDS Knowledge Scale [AAKS; all except one subscale (p values range from 0.004 to 0.049) and total scale ($p = 0.024$)], Perceived Risk of HIV Scale [PRHS; each subscale (p values range from 0.019 to 0.029) and total scale ($p = 0.022$)], Self-Efficacy for Limiting HIV Risk Behaviors Scale [LHRBS; all except one subscale (p values 0.001 and 0.046) and total scale ($p = 0.026$)] and Behavioral Intentions for AIDS Prevention Scale [BIAPS; one out of two subscales and total scale (p values 0.018 respectively 0.026)]. When changes over time, from baseline to follow-up, were compared between the intervention and comparison group, differences were found for HIV-related health literacy ($p = 0.029$), HIV knowledge ($p = 0.031$), HIV risk perception ($p = 0.043$), HIV preventive self-efficacy ($p = 0.031$) and HIV behavioral intention ($p = 0.019$) (Table 2).

Discussion

We successfully implemented a peer-led HIV/AIDS education program for jailed adolescents with an emphasis on HIV-related health literacy. To our knowledge, this is the first evaluation study in the MENA region to improve the healthcare response to HIV-related health literacy. The results suggest that the peer-led HIV/AIDS education program is effective in promoting HIV-related health literacy in a sample of jailed adolescents. They appreciated and perceived the intervention as helpful and beneficial.

We detected statistically significant and substantial impacts of the peer-led HIV/AIDS education program on educational outcomes in both the field that was targeted directly by the intervention—HIV-related health literacy—and in related but directly targeted fields—HIV knowledge, HIV risk perception, HIV preventive self-efficacy and HIV behavioral intention. Although differences in content and length as well as setting obstructed clear comparisons between educational programs, our study consistently found that training on HIV-related health literacy improves HIV knowledge (Michielsen et al. 2012), HIV risk perception (West and Martin 2000), HIV preventive self-efficacy (Mahat et al. 2014) and HIV behavioral intention (Kalichman et al. 2005). The underlying mechanism of the positive impact of the program may be partly explained by ongoing improvements in the healthcare system. The healthcare providers assist jailed adolescents in acquiring the practical skills and competencies required to manage the HIV/AIDS risk, reading and understanding HIV health information, appraising HIV health information and using HIV health information. This also can be explained by the fundamental assumption that peer educators are trustworthy sources of information on HIV/AIDS for jailed adolescents. HIV health program developers and HIV health educators, as well as healthcare providers, all need to work together to ensure that all adolescents have equal opportunities to access, read, understand, appraise and use HIV health information (McCall and Wilson 2015). The program also increased HIV knowledge over time. This is likely due to understanding the contents of the educational materials and appraising the educational activities. However, innovative ways to convey knowledge particularly about preventing mother-to-child transmission (PMTCT) are essential. The present study provides initial evidence that the program is efficacious in improving the HIV risk perception of jailed adolescents. Emphasis on a change in thinking and perceptions of HIV and promotion of adaptive and protective thoughts and behaviors related to the AIDS epidemic are credible cognitive-behavioral intervention strategies (Onyechi et al. 2016). Interestingly, the program indicates self-efficacy in improving uptake of condom use, drug use with friends and negotiations with partners at 30-day follow-up. Higher levels of communication may be a pathway through which the program has an effect on HIV preventive self-efficacy (Cordova 2017). Our education program considerably promoted positive changes in jailed adolescents' HIV behavior intentions over time. One possible explanation for this positive finding is peer pressure. Peer education is a supplemental mechanism by which trained peers can role pattern healthy social norms and challenge a peer culture that promotes HIV high-risk behaviors. Successful HIV prevention interventions have to engage with the disconnect between social messages and educational messages and to exploit the gaps between awareness, norm and intention as spaces for positive interventions (Selikow et al. 2009).

The results of this implementation evaluation are applicable for two pivotal reasons. First, there is increasing interest among agencies concerned with human rights in understanding strategies and policies for effectively implementing peer-led HIV/AIDS education programs. Second, the findings from the supportive longitudinal and quasi-experimental evaluation are certainly promising. This study emphasized the program aimed at increasing HIV-related health literacy in non-formal education. We contribute an easy-to-implement, peer-led HIV/AIDS education program to the field that can be used for high-risk adolescents jailed in a juvenile detention center. A uniqueness of the program is its emphasis on the adolescents' real lives, including poverty, drug use, sex work, being uninsured, stigma, discrimination and criminal justice involvement that is still in progress. A major consideration when working with adolescents in short-term correctional facilities is that the high-risk

Table 2 Primary and secondary outcomes in the intervention and comparison group at baseline and follow-up and changes between groups

HIV health-related factors	Intervention group ($n = 107$)			Comparison group ($n = 103$)			Change between groups
	Mean (SD)		p Value[a]	Mean (SD)		p Value[a]	p Value[b]
	Baseline	Follow-up		Baseline	Follow-up		
HIV-related health literacy							
Adolescent HIV-Related Health Literacy Scale ($\alpha = 0.75$)							
Reading and understanding HIV health information	1.5 (5.2)	3.4 (1.9)	0.045*	1.7 (5.1)	3.5 (4,7)	0.039*	0.040*
Appraising HIV health information	1.8 (5.8)	3.7 (1.8)	0.038*	1.6 (3.1)	3.2 (5.3)	0.033*	0.022*
Using HIV health information	2.0 (4.9)	3.5 (2.2)	0.048*	1.8 (5.5)	3.4 (4.9)	0.049*	0.043*
Total	1.7 (5.3)	3.5 (2.3)	0.036*	1.7 (4.1)	3.3 (4.7)	0.027*	0.029*
HIV knowledge							
Adolescent AIDS Knowledge Scale (AAKS) ($\alpha = 0.84$)							
Modes of transmission	0.2 (1.1)	0.8 (1.4)	0.001**	0.3 (1.3)	0.8 (0.9)	0.009**	0.012*
High-risk behaviors	0.2 (2.3)	0.9 (2.0)	0.000**	0.4 (1.5)	0.9 (1.2)	0.004**	0.029*
Mortality	0.4 (1.2)	0.5 (1.8)	0.342	0.5 (2.4)	0.6 (2.0)	0.049*	0.030*
Existence of a cure	0.4 (1.7)	0.8 (1.9)	0.013*	0.4 (1.0)	0.7 (1.3)	0.023*	0.019*
Prevention of transmission	0.1 (2.3)	0.2 (2.7)	0.404	0.2 (2.4)	0.3 (2.6)	0.291	0.110
Appearance of persons with AIDS	0.3 (1.8)	0.8 (1.6)	0.008**	0.5 (2.2)	0.9 (1.0)	0.018*	0.009**
Total	0.2 (0.8)	0.6 (1.0)	0.011*	0.4 (1.1)	0.7 (1.9)	0.024*	0.031*
HIV risk perception							
Perceived Risk of HIV Scale (PRHS) ($\alpha = 0.79$)							
Cognitive assessments of risk	3.3 (2.8)	7.1 (3.2)	0.034*	2.5 (4.1)	7.0 (2.6)	0.029*	0.019*
Intuitive assessments of risk	2.9 (3.1)	5.2 (5.2)	0.033*	3.6 (3.1)	6.6 (4.4)	0.028*	0.036*
Salience of risk	3.0 (2.7)	6.7 (5.1)	0.021*	2.9 (4.5)	6.9 (5.2)	0.019*	0.041*
Total	3.1 (2.7)	6.3 (5.0)	0.030*	3.0 (4.1)	6.8 (5.4)	0.022*	0.043*
HIV preventive self-efficacy							
Self-Efficacy for Limiting HIV Risk Behaviors Scale (LHRBS) ($\alpha = 0.81$)							
Condom use	1.8 (2.2)	2.1 (3.2)	0.117	1.8 (5.1)	2.0 (4.4)	0.046*	0.039*
Drug use with friends	1.2 (2.1)	4.0 (2.2)	0.002**	1.9 (3.1)	4.1 (5.9)	0.001**	0.013*
Negotiations with partners	1.9 (2.9)	2.1 (2.1)	0.042*	2.0 (5.5)	2.1 (4.9)	0.130	0.290
Total	1.6 (2.5)	2.7 (3.0)	0.048*	1.9 (4.1)	2.7 (3.8)	0.026**	0.031*
HIV behavioral intention							
Behavioral Intentions for AIDS Prevention Scale (BIAPS) ($\alpha = 0.71$)							
Sexual intentions	3.3 (5.3)	3.5 (2.2)	0.204	3.1(4.6)	3.2 (4.8)	0.211	0.449
Social norms	2.6 (4.9)	5.6 (2.7)	0.011*	2.4 (3.8)	5.7 (3.6)	0.018*	0.010**
Total	2.9 (5.3)	4.5 (2.4)	0.038*	2.7 (4.9)	4.4 (4.2)	0.026*	0/019*

* $p < 0.05$ ** $p < 0.01$ statistically significant; α Cronbach's alpha; [a] Wilcoxon signed rank test; [b] Mann-Whitney U-test

group not only requires information about accessing resources from inside jail, but also requires it as its members transition back to communities and re-establish a relationship with friends, families, community-based healthcare providers or institutions that may facilitate access to healthcare. Although we cannot precisely identify which specific active ingredients led to the revealed effects, we believe that capacity building of healthcare providers and the availability of support services are imperative ingredients for jailed adolescents to address their short- and even long-term health needs.

Strengths and limitations

This study used a sufficiently validated measure to investigate the presence of HIV-related health literacy in a sample of jailed adolescents; nonetheless, we developed a less complicated instrument for program evaluation because ours was not an extensive study. This study has two limitations that should be pointed out. First, our sample size was relatively small to assess the effectiveness of the intervention by comparing the two groups; thus, the generalizability of the results and the

power of our analyses are limited. It would be advantageous for future research to assess the implementation of the education program on a larger sample size. Second, due to the quasi-experimental design, there was the risk of selection bias as well as differences between groups. The participants were not randomly assigned to the intervention group and comparison group; hence, there are some misproportions in baseline characteristics. Future research might prioritize using randomized controlled trials.

Conclusion

The peer-led HIV/AIDS education program contributes to the development of HIV-related health literacy among jailed adolescents. If provided with sufficient training and protective supervision, jailed adolescents can be agents of change in the jail setting. This study makes substantial contributions to the literature concerning the evaluation of HIV-related health literacy interventions through its emphasis on understanding the underlying mechanism of change. It is possible to use a peer-led approach to improve HIV-related health literacy in non-formal education settings, and the program could also be feasible for other subgroups of out-of-school adolescents.

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Compliance with ethical standards

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Ethics Committee of Tunis El Manar University, Tunis, Tunisia, and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent, voluntary participation, was directly acquired from each participant.

Conflict of interest No potential conflict of interest was reported by the authors.

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