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Effects of Peer and Provider-Based Education Interventions on HIV/AIDS Knowledge and Behaviour-Risk among in-School Adolescents in Ebonyi State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author AFC designed the study and led the data collection exercise. The literature searches were managed by author HNC while the protocol and the first draft of the manuscript were written by author POUA. Author AEN monitored data entry and analysis, while CJC supervised implementation in rural cohorts. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Adolescents and youths are at high risk due to knowledge gap and behaviour risks related to HIV/AIDS thus need for intervention programs. There is paucity of data on comparative analysis on effect of the education intervention models such as peer-based and provider-based models. This study assessed the effect of peer and provider-based HIV/AIDS education on HIV knowledge and behaviour risk among adolescents and youths in Ebonyi State, Nigeria.

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Methodology: This study involved 2 intervention groups (peer-based and health provider-based) and 1 control group. Multistage sampling was used to select participants. HIV education was provided by peers and health providers in the two intervention groups, but hygiene education was given to the control group. Pre-test and post-test questionnaires were deployed to assess baseline and effect of intervention on HIV/AIDS knowledge and behaviour risk. Total participants were 1831 shared among the 3 groups.
Result: Total baseline mean knowledge score was 48.8 and behaviour risk was 42.3. Within the intervention groups, significant changes were recorded in terms of knowledge gain and behaviour risk reduction post-intervention ($p<0.05$). No change was observed in control group. Provider-based group had higher knowledge gain and better behaviour risk reduction than peer-based group ($p<0.05$).
Conclusion: Baseline HIV knowledge among adolescents and youths was on unimpressive, and behaviour risk was high. Education resulted in better knowledge and lower behaviour risk in the two groups, but health provider-based group had better outcome than peer-based group. It is recommended that the two models of HIV education intervention be adopted in secondary schools in view of their peculiarities and applicability.

Keywords: Peer; provider-based; education; HIV/AIDS; behaviour-risk; in-school; adolescent.

1. INTRODUCTION

The Human Immunodeficiency Virus/Acquired immunodeficiency Syndrome (HIV/AIDS) pandemic has had a particularly devastating effect on young people throughout the world [1]. Adolescents and young adults aged 15 to 24 years account for half of all new HIV infections globally [2], while in the United States, although youths aged 15 to 24 years constitute only 25% of the sexually active population, they account for about half of new Sexually transmitted diseases (STD) (including HIV) cases [3]. Adolescence is an age of difficulty in understanding complex concepts, or the relationship between behaviour and consequences. The youths find it challenging exerting reasonable degree of control over health decision-making, including that related to sexual behaviour. This could make them particularly vulnerable to sexual exploitation and high-risk behaviours for contracting HIV. Available data suggests that the highest rates of new infections occur within this age group globally [4-6] and in Nigeria one third of the currently HIV infected individuals are adolescents and youths aged 15 to 24 years [7].

Despite the well-known need for protection from HIV infections and other reproductive health risks, being an adolescent coupled with social and economic status could limit access to information and services. Even when services do exist, providers' attitudes about adolescents having sex could pose a significant barrier to use of those services.

Overall it appeared that a significant proportion of adolescents remained underserved. School-based health service is a strategy for the provision of health care services-with inclusion of HIV risk reduction education to adolescents. In-school HIV prevention/risk reduction education is used for adolescents because the age group are within secondary schools age [8]. This study will therefore; provide HIV prevention intervention for adolescents, provide evidence about which intervention method (Peer-based and Health-provider-based) is more effective in delivery of the recommended HIV education curriculum for adolescents in secondary schools; improve coverage of HIV prevention intervention among adolescents in Ebonyi State where there is 3.3% HIV prevalence, >70% illiteracy level and 74% poverty rate [9].

Though peer-based and health provider-based HIV education interventions have been discussed to have their unique effectiveness on different outcome measure, there is paucity of information that could be accessed that compared the two types of intervention. There is however need to have evidence comparing effectiveness of the different models of delivering the recommended curriculum for HIV education among school-based adolescents. This study therefore aims to achieve that.

The specific objectives of this study include: to determine baseline HIV/AIDS knowledge and behaviour risk among in-school adolescents and young adults in Ebonyi State; to evaluate HIV/AIDS education intervention on HIV/AIDS knowledge and behaviour risk within intervention groups three months post intervention; to compare changes in HIV/AIDS knowledge and

behaviour risks between Intervention groups and control group three months post intervention; and to compare changes in HIV/AIDS knowledge and behaviour risk between the two intervention groups after HIV/AIDS three months post intervention.

2. METHODOLOGY

2.1 Study Area

Ebonyi state is in South East of Nigeria with an estimated population of about 2.8 million. There are three senatorial districts in Ebonyi State; Ebonyi North, Ebonyi Central and Ebonyi South. Government secondary schools in Ebonyi State comprise of 221 secondary schools (63 from Ebonyi central, 82 from Ebonyi North, 76 from Ebonyi South senatorial districts) with approximately 222,510 senior secondary school students [10] The State comprises of 1,064,156 (49%) males and 1,112,791(51%) females [9].

2.2 Study Population

This includes adolescents and young adults in Ebonyi State who are in senior secondary classes. School based adolescents and young adults from; Government schools**,** mixed schools (boys and girls) and in senior class 1, 2 and 3- were included in the study.

2.3 Study Design

This was an interventional study that comprised 3 study groups; 2 intervention groups (HIV/AIDS education intervention was done by peers in intervention group one and done by health providers in group two), and one control group (which did not receive HIV education). The study was a prospective study carried out over a period of three months. Baseline assessment was done for the 3 study groups using questionnaire as data collection / assessment tool. HIV education was provided by trained peers for peer-based group (PBIG) while the same HIV education was provided by trained health provider for health provider based (HPBIG). Only education on personal hygiene was provided for control group. Three months after intervention, same assessment tool was introduced to the three groups for outcome evaluation.

2.4 Sample Size Determination

RAOSOFT software, [11] a statistical software for sample size calculation for an intervention study was used to generate minimum sample size for the study. To calculate the sample size, the software was set at SD of 0.5 (5%) and CI of 0.05 (95%). The sample size n and margin of error E are given by $x= Z(^{c}/_{100})^{2}r(100-r)$; $n=^{N\,x}/_{((N-1)E^{2}+x)}$; $E=$ Sqrt$[^{(N-n)x}/_{n(N-1)}]$. Where N is the population size, r is the fraction of responses interested in and Z(c/100) is the critical value for the confidence interval c.

Sample size for total population of 222,510 was generated at 1602. Population of senior secondary school students per school was 1000 which resulted to sample size of 278 per school**.** To allow for anticipation of 10% attrition, 56 participants were added making a minimum sample size of 334 participants per school. This resulted to total of 2004 participants across six (6) selected schools. All students of SS1, 2 and 3 classes from the 6 selected schools were recruited into the study.

2.5 Sampling Technique

Sampling technique used was multistage sampling. From a sample frame of secondary schools from Ebonyi State, [10] 3 senatorial districts (Ebonyi north, central and south) in Ebonyi State were assigned into 2 intervention groups (peer-based and provider-based) and 1 control group by simple random sampling (balloting) technique. Thus Ebonyi North senatorial district was the peer based intervention group, Ebonyi south senatorial district was the health provider based intervention group while Ebonyi central senatorial district became the control group.

By simple random sampling using balloting, 2 government schools (1 rural and 1 urban) were selected in each of the 3 senatorial districts. This was done from six ballot boxes; two boxes (1 rural and 1 urban) were assigned to each senatorial district. One box contained names of rural mixed government schools written in folded pieces of paper while the second was that of urban schools. One paper each was picked from each of the boxes, 1 from rural area and 1 from urban area of the 3 senatorial districts making a total of 6 schools.

Participants were selected from SS1, 2 and 3 classes from the 6 selected schools. Each of the 6 schools had minimum of 334 participants. In each school, SS1 and SS2 provided minimum of 111 participants while SS3 provided 112 participants to ensure minimum of 334 participants per school were selected. 'Yes' was

written in 111 papers for SS1 and SS2 students and in 112 papers for SS3 students amidst 100 other empty papers and members of the classes picked randomly, allowing for equal opportunities for participation. Thus 334 participants were selected per school (of 6 schools); 1002 per rural and 1002 per urban schools. Also ensuring relatively similar numbers were assigned to the 2 intervention groups and 1 control group, each senatorial district had 2 schools (1 rural and 1 urban). Each district –which represented a study group- provided 668 participants. All amounted to 2004.

By balloting, schools were selected into HPBIG, PBIG and control group. Schools from HPBIG (from Ebonyi South senatorial district) include Mgbom secondary school (urban school) and Uburu community secondary school (rural school); PBIG (from Ebonyi North senatorial district) include; Urban model secondary school (Urban school) and Izzi high school (rural school); and Control group (from Ebonyi central senatorial district) include; Onueke high school (urban school) and Ezza north community secondary school (rural school).

2.6 Study Instruments

A self-guided questionnaire was adapted from Family Life HIV Education (FLHE) training manual and from Centres for Disease prevention and Control (CDC) HIV behavioural risk assessment tool [12]. The training manual was adapted from curriculum of Family Life and HIV Education (FLHE) for secondary schools and used for the education intervention. Both instruments were pre-validated in earlier studies [12,13].

2.7 Training of (Peer & Healthcare Providers) Trainers

Six (6) peers (3 from each of the 2 schools for peer-based intervention) and 4 providers (2 for each of the 2 schools for providers-based intervention) were selected as trainers. Peers were selected from class representatives of SS 1, 2 and 3 classes while providers were selected from trained service providers in HIV clinics in the senatorial districts. The research assistants on HIV risk reduction were also appropriately trained using the curriculum.

2.8 Data Collection

Baseline assessment was done using self-administered questionnaires (questions to answer all by the participants). Education intervention (HIV education) was done in the 2 intervention groups by peers and health providers respectively, the control group received education on personal hygiene done by the investigators. Three months after intervention, re-evaluation was carried out using the same questionnaire among the same participants, to examine changes in knowledge and behaviour risk among across the 3 study groups.

2.9 Data Management and Statistical Analysis

Categorical data were displayed in the form of rates, and continuous data were presented as means for knowledge and behavior risk scores before and after the intervention. ANOVA and Z test were applied to compare the means of groups, t-test applied to compare pre-test and post-test knowledge and behavior risk scores within each group. While independent chi square was used to test significance in nominal variables. Statistical significance was defined at $P<0.05$ with a 95% confidence interval. Pre assessment score was used as baseline assessment on knowledge and behaviour risk among the study group. Changes in knowledge and behaviour risk were evaluated after education intervention.

2.10 Limitations of Study

Three months post intervention, though minimum period for post intervention evaluation for any study, may not have provided ample time to evaluate long-term effect of intervention. Also, this is a questionnaire-based study without an observation checklist thus evaluation was only by self-response from participants and not by actual observation for change in behaviour. In addition, the positive change in knowledge and behaviour may also be contributions from other programs running in the State.

2.11 Study Duration

The study lasted for 6 months; first 1-3 months was used to get ethical approval and consents, selection and training of trainers, pre-test evaluation and education intervention. By month 5 (3 months after intervention) it was post-test evaluation. 5-6 months was data analysis, result presentation and discussion.

3. RESULTS

Two thousand and four (2004) students were recruited for study. Completed pretest and

posttest data were obtained on 1831 students (91% of the original pretest sample). Peer-based intervention groups were 611, health provider-based intervention group 613 and control group 607. The average non- response/attrition rate for the three groups was 9%.

Table 1; displays demographic characteristics of participants among the three study groups which are relatively similar but for differences in age. The highest age range of the total population was 16-20 years. However, difference in age range across the three study groups occurred in age 11-15 ($p<0.004$). In addition, females (68.8%) were more than males (31.2%) participants. The proportions of participants in classes and settings were essentially similar.

The Table 2 shows outcome of intervention on knowledge and behaviour risk between intervention and control groups. Significant increases in knowledge were observed within peer-based intervention (from 49.1 to 69.4) and health provider-based intervention groups (from 46.4 to 74.6), but remained largely unchanged in control group. Also, there was significant risk reduction among peer-based group (from 43.1 to 21.9) and in health provider-based intervention group (from 40.6 to 17.8) but no such change in control group.

Table 3 displays sexual risk taken across the three study groups at post intervention. Among the total population, after education intervention, 17.6% (323/1831) were still currently having sex. However, among the three groups, order than 'ever had sex" and MSM practice indices, there were marked reductions in all other sexual risk indices following intervention among the PBIG ($p<0.001$) and the HPBIG ($p<0.001$), but the control group recorded no changes.

Table 4 shows condom use across three study groups at post intervention. All assessment categories demonstrated significant difference when intervention groups were compared against control group at $p<0.05$. Importantly, while 73% (32/44) of those currently having sex in peer based group and 55% (38/69) in health provider based group reported consistent use of condom, 6% (8/129) was reported among control group.

Table 5 shows that at post intervention,79% of the total population were willing to improve behaviour either to abstain, 72% had one sexual partner and 20% used condom. However, the willingness to improve behaviour were remarkably demonstrated among peer-based and health provider-based intervention groups, and were significantly higher than for control group ($p<0.05$). While 2% each in peer-based and health provider-based intervention groups still reported having sex under influence of alcohol, control group had 9%. There was significant difference in this parameter between the intervention groups compared to control group at $p<0.05$.

As displayed in Table 6, though peer-based intervention group showed significant difference in knowledge and behavior risks at post intervention, health provider-based intervention showed higher significance when compared with peer-based intervention group; both in knowledge gain and behavior risk reduction ($p<0.001$).

4. DISCUSSION

Majority of participants fell within age range of 16 to 20 years with more of the participants in SS2 classes. There were more females than males. Number of students in urban school settings that completed the study were essentially similar to the number in rural school settings. Demographic characteristics of participants among the three study groups (peer- and health provider-based intervention groups and control group) were also similar but with differences in age and sex. No difference was found in class and school setting. The difference in age could be because the groups were made up of different age groups and sexes that could not be controlled during random selection of participants. None of these differences however affected the objectives of the study.

4.1 Effect of HIV Risk Reduction Education Intervention on HIV Knowledge and Behavioural Risks among Adolescents and Young Adults

Studies in Europe, America, China, Africa, sub-Saharan Africa and Nigeria all agree that the outcome measures of HIV risk reduction education intervention include; biological outcomes (prevalence of HIV infection in the study cohort); behavioural outcome (sexual behaviours like delayed initiation of sex, increased abstinence, reduced number of sex partners, increased use of condoms, drug and alcohol use, sharing of sharps); and knowledge

outcome [14-17] Other studies [10,16] have consistently established that education interventions on STIs/HIV and their prevention show a positive change in knowledge and reported sexual behaviours.

This study however measured effectiveness of HIV risk reduction education intervention under two categories; effect on knowledge gain and effect on behaviour risk reduction (sexual risks and condom use, non-sexual risks and willingness to improve behaviour) and found extremely significant difference before and after intervention. Findings from this study agree with the above findings and reports and demonstrated significant increase in knowledge and decrease in behaviour risk among adolescents and young adults.

4.2 Effect of Intervention on Knowledge within Intervention Group

This study found highly significant effect of intervention on HIV knowledge among intervention group. Knowledge within intervention group increased from mean of 47.8 at baseline to 72.3 after intervention. The finding agrees with several other studies that demonstrated significant increase in HIV and sexuality knowledge among the intervention compared to control group [14,16,18,19]. Therefore, providing HIV education intervention for adolescents and young adults using a structured model can result to increase in knowledge/awareness on HIV/AIDS transmission, detection and prevention. This knowledge increase will hopefully be a precursor for adopting positive behaviour to reduce risk of transmission. Moreover, since prevention messages are on-going among the adults and have been demonstrated to improve behaviour, there is need to also pay attention to deliver same messages in youth friendly manner which is also demonstrated to improve knowledge and hopefully behaviour.

4.3 Effect of Intervention on Behaviour Risks within Intervention Group

This study demonstrated a significant difference in behaviour risk reduction after intervention in the intervention groups. Other similarly designed studies in Nigeria have also shown improvement in behaviour following interventions [20-23] However, in the current study, behaviour change among the participants was self-reported only and may need to be integrated with other means of observations to verify actual change.

4.3.1 Effect on current sexual activity

The HIV education received by the adolescents markedly reduced the proportion currently having sex (within the previous three months), from 30.1% at baseline to 18% at 3 months post intervention. This could be attributed to appropriate health information that explained the link between HIV infection and sexual promiscuity.

4.3.2 Effect on frequency of sex

The effect of intervention on reduction in frequency of sex (at more than once per month) showed that though population that reported to be having sex after intervention reduced, there was no reduction in frequency among current sexually active ones. Moreover, studies reviewed showed either reduction in frequency of sex or no change [16,24].

4.3.3 Effect on number of sexual partners

Another common measure of sexual risk behaviour is number of sexual partners during a specified period of time. This study found out that number of adolescents/young adults who have more than one sexual partner reduced after intervention across participants in intervention group. This finding agrees with results of similar interventional studies which indicated that in general, programs did not increase the number of sexual partners and some reduced the number [24,25]. Thus, education intervention on risks of HIV transmission is effective in changing the concept of having multiple sexual partners among adolescents/young adults.

4.3.4 Effect on condom use

This study found significant difference in condom use across intervention study groups. Condom use among the population reported to be having sex increased from 30% to 50%. Globally, studies reviewed to compare with the present study of the effect of intervention showed that all studies that measured program impact on condom use found increased condom use [24-27]. The proportion of effective condom programs in developing countries was similar to the proportion in the developed countries with programs found to be effective in both in-school and community settings [24] In agreement with

this study which identified reported increase in condom use, a study conducted in Dominican Republic [28] showed that respondents who received sex education were 2.52 times more likely to report current use of condoms. Condom education/awareness is thus encouraged among sexually active adolescents and young adults as it increases use of condom and invariably reduces behaviour risks of unprotected sex that lead to HIV infection.

4.3.5 Effect on willingness to change/ improve behavior

Findings from this study showed increase in willingness to abstain from sex from 50% at baseline to 79% which is in agreement with another interventional study which reported that secondary students were willing to practice abstinence and had a strong commitment to stop having sex among the sexually active [27] Also similar to another interventional study which found more than 60% improvement in abstinence behaviour among the young subjects [26]. They even inferred attitude (willingness to change) to be supportive of reported behaviour risk status. Education intervention is encouraged as a means of improving attitude of adopting positive behaviours that could reduce risk of HIV transmission among the adolescents and young adults.

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4.3.6 Non-sexually related HIV risk behaviours

Non-sexually related behaviours that influence HIV infection include; negative sexual decisions under alcohol or drug influence and sharing of sharps among injection drug users. This study showed that the non-sexual behaviour is low among participating adolescents and young adults and remained almost the same even after intervention. While injection drugs use remained almost absent both before and after intervention, sex on influence of alcohol merely reduced marginally from just 5% at baseline to 4% at post intervention. This finding agrees with Laud et al [16] who reported that though there is paucity of data on effectiveness of HIV education on non-sexually HIV related behaviour, there is also low use of alcohol and drugs among study group in developing countries. Kirby et al. [24] in their study also remarked that despite the positive impact on avoiding places and situations that might lead to sex and affect choice of condom use, measure of alcohol or drug use showed that a large majority found no reduction in use and that none of the studies that measured alcohol or drug use before sex reported any impact. The addictive properties of alcohol and drugs may be the reason for the low impact of education on risk reduction choices. Nonetheless, further studies are required to unravel the effect of education on drug and alcohol use among this population to further guide health policy interventions.

4.3.7 Effect of HIV and AIDS education intervention on knowledge outcome between intervention groups and control group

This study compared the effect of education intervention on HIV/AIDS knowledge outcome between intervention groups (IGs) and control group (CG). Very significant difference was observed between IGs and CG. This agrees with findings of other studies which reported that sex and HIV education programs did increase knowledge about a wide variety of topics involving sexual risk behaviour [18,24] Furthermore, it is in agreement with finding of study in the Dominican Republic [28] which reported that respondents who received sex education (intervention group) were 1.72 times more likely to have high HIV/AIDS knowledge than respondents who reported not receiving sex education (control group). A programme evaluation study of developing countries[14] similarly demonstrated that participants who received HIV prevention education intervention reported superior knowledge when compared with control group. Thus, HIV education is encouraged to be used as a means of improving HIV/AIDS knowledge/awareness among adolescents and young adults to achieve HIV pandemic control especially as adolescents/young adults are contributing to more than half of new infections.

4.3.8 Effect of HIV education intervention on behaviour risk reduction between IGs and CG

This study found out that intervention was effective on reported behaviour risks reduction among adolescents in IGs but none was observed in CG and actually slightly increased from 43.3 to 44.4%. Similar findings were reported by studies among secondary school adolescents which showed that a higher proportion of sexually exposed students in intervention group had a better behaviour risk reduction [14] (54% condom use at last intercourse) compared to control (43% condom

use at last intercourse) and also reported a reduced number of sex partners [19] Therefore, education intervention has proven to be effective in reducing reported HIV related behaviour risk among adolescents and young adults and is recommended for adoption to reduce HIV infection and subsequently the HIV burden globally.

4.3.9 Effect of peer-based interventions on HIV and AIDS knowledge and behaviour risk

The findings in this study showed that among peer-based group, there was knowledge increase from 49.1 to 69.4% and behaviour risk reduced from 43.1% to 21.9%. This finding agrees with Frank et al [29] who demonstrated in a rural Nigerian study, an increased knowledge and decreased sexual risk behaviour among adolescents receiving peer education. Studies [8,27,30] have also suggested that most peer-based in-school interventions were successful at improving knowledge and behaviour but however, sexual risk behaviours were more difficult to change. A study by Kirby et al [26] revealed that the intervention effect of peer education at the individual was significant. In support of effectiveness of peer-based education intervention, another study in Yemen by Buthaina et al [31] reported that 68% of students targeted by peer education had good knowledge scores. The study also reported that peer-based intervention among students demonstrated better knowledge on the modes of transmission and prevention and fewer misconceptions; and knowledge on the use of condoms also increased. They therefore concluded that school-based peer education intervention has succeeded in improving levels of knowledge and reducing behaviour risks associated with HIV infection. A similar Nigerian study [32] reported that adolescents who believe their friends are not in favour of sexual intercourse for teenagers have been found to be more likely not to engage in sexual intercourse whereas those who perceive their peers as being in support of condom use are more likely to use a condom. Thus, the study demonstrated significant knowledge gain and risk reduction in peer-based study group. Peer based (peer-led) HIV education has therefore been shown to be effective in delivering messages for HIV prevention efforts among adolescent and young adults. Because it is done by peers and for peers, peer led intervention influences adolescents and young adults' behaviour in a non-judgemental and understanding way and thus could make them accept message passed thus improving knowledge and behaviour. Peer based in-school intervention is also cost effective and sustainable as this is done using the human resources within the school. This effective HIV/AIDS education intervention model is strongly encouraged.

4.3.10 Effect of health provider-based intervention on HIV and AIDS knowledge and behaviour risk

Findings from this study demonstrated that among health provider-based group, there was knowledge increase from mean of 46.4 to 74.6 and behaviour risk reduction from mean of 40.6 to 17.8. A review study [14] on health provider-based intervention in developing countries agrees with this finding by reporting increased knowledge and decreased behaviour risks such as increased use of condoms. Same review [14] pointed out that a health provider-based HIV education among Nigerian secondary school student led to increase in knowledge at six months post-intervention. Health provider-based intervention has been said to have its own effectiveness in that the providers who are adults and experts usually are able to implement HIV education curriculum because they are experienced and skilled.

4.3.11 Comparison of effect on HIV/AIDS knowledge outcome between peer-based and health provider-based intervention groups

This study observed that among peer- based group, there was knowledge increase from mean of 49.1 to 69.4 while among health provider based group, there was knowledge increase from mean of 46.4 to 74.6 and there is statistical difference in score, showing greater increase in knowledge among the health provider based intervention groups. There is however paucity of data on this comparison as studies found did not necessarily compare these two types of intervention but evaluated their individual effects. The higher score among health provider-based group could be because health providers have better experience and skill for delivering education intervention. Selected adolescents should therefore receive adequate tutelage from health providers to develop required skills to give HIV education to their peers in-school settings.

Table 1. Demographic characteristics of respondents

Variable	Peer-based intervention group n=611 Frequency (%)	Health provider-based intervention group n=613 Frequency (%)	Control group n=607 Frequency (%)	Total n=1831 Frequency(%)	χ^2	P value
Age						
11-15	261(42.7)	299(48.7)	207(34.1)	767(41.9)	10.9993	0.004*
16-20	301(49.3)	247(40.3)	365(60.1)	913(49.9)		
21-24	49(8.0)	67(10.9)	33(5.4)	149(8.1)		
Gender						
Male	219(35.8)	166(27.1)	187(30.8)	572(31.2)	5.7504	0.056
Female	392(64.1)	447(72.9)	420(69.2)	1259(68.8)		
Class						
SS1	206(33.7)	187(30.5)	212(34.9)	605(33.0)	1.4603	0.481
SS2	214(35.0)	201(32.8)	208(33.9)	623(34.0)		
SS3	191(31.2)	225(36.7)	185(30.5)	601(32.8)		
School setting						
Rural	299(48.9)	302(49.3)	304(49.6)	905(49.4)	0.0573	0.971
Urban	312(51.0)	311(50.7)	303(49.9)	926(50.6)		

*Note: *=statistically significant*

Table 2. HIV knowledge and behaviour risk before and after intervention

Group	Before intervention Mean±SD	After intervention Mean±SD	Mean Difference	t-test	P-value[a]
Knowledge					
PBIG (n=611)	49.1±20.1	69.4±18.2	20.3	18.2573	<0.001*
HPBIG (n=613)	46.4±18.5	74.6±14.6	28.2	29.8298	<0.001*
Control group (n=607)	50.8±23.3	52.1±23.2	1.3	0.6244	0.532
ANOVA (P value [b])	7.00(<0.001)*	24.55(<0.001) *			
Behaviour risk					
PBIG (n=611)	43.1 ±24.5	21.9±17.5	-21.2	19.8428	<0.001*
HBIG (n=613)	40.6±25.3	17.8±14.5	-22.5	23.4258	<0.001*
Control group (n=607)	43.3±24.4	44.4±24.8	1.1	1.6320	0.103
ANOVA (P value [b])	2.22(0.104)	31.71(<0.001) *			

Table 3. Pre- and Post-intervention sexual risks among respondents

Assessment categories	Pre- PBIG Frequency (%)	Post-PBIG Frequency (%)	Pre- HPBIG Frequency (%)	Post-HPBIG Percentage Frequency (%)	Pre-control Frequency (%)	Post-Control group Frequency (%)	χ^2 (P value) (Compares post-intervention values
Ever had sex (among all population)	(n=611) 265 (43)	(n=611) 265(43.4)	(n=613) 253(41)	(n=613) 253(41.3)	(n=607) 260(43)	(n=607) 260(42.8)	2.483(0.688)
Early sexual debut at <15 years (among population who ever had sex)	(n=265) 99(37)	(n=265) 99(37.4)	(n=253) 69(27)	(n=253) 69(27.2)	(n=260) 130(50)	(n=260) 130(50.0)	16.650(<0.001) *
Currently having sex (<3 months) (among all population)	(n=611) 190(31)	(n=611) 47(7.8)	(n=613) 187(31)	(n=613) 72(11.7)	(n=607) 191(31)	(n=607) 204(33.6)	108.297(<0.001) *
Currently have only 1 regular sexual partner (among population currently having sex)	(n=190) 115(61)	(n=47) 44(93.6)	(n=187) 120(64%)	(n=72) 69(95.8)	(n=191) 117(61)	(n=204) 139(68.1)	50.302(<0.001) *
Currently have more than 1 sexual partner (among population currently having sex)	(n=190) 70(37)	(n=47) 3(6.4)	(n=187) 69(37%)	(n=72) 3(4.2)	(n=191) 77(40)	(n=204) 65(31.9)	21.741(<0.001) *
Current frequency of sex>1 per month (among population currently having sex)	(n=190) 76(40)	(n=47) 4(8.5)	(n=187) 115(61%)	(n=72) 7(9.7)	(n=191) 88(46)	(n=204) 120(58.8)	36.918(<0.001) *
Currently having same gender sex (MSM) (among population currently having sex)	(n=190) 4(2)	(n=47) 1(2.1)	(n=187) 5(3)	(n=72) 1(1.3)	n=191) 5(2.6)	(n=204) 4(2.0%)	0.113(0.944)

Note for Table 2: PBIG=Peer-based intervention group; HBIG=Health provider- based intervention group. P-value[a] =t- significance across study groups; P-value[b] significance within study groups; SD= standard deviation;

**=Statically significant*

Table 4. Pre- and Post-intervention condom use among respondents

Assessment categories	Pre- PBIG Frequency (%)	Post-PBIG Percentage Frequency (%)	Pre-HPBIG Frequency (%)	Post-HPBIG Frequency (%)	Pre-control Frequency (%)	Post-Control Frequency (%))	χ^2 (P value) (Compares post-intervention values)
Ever used condom (among population ever had sex)	(n=265) 128(48.3%)	(n=265) 128(48.3)	(n=253) 120(47.4)	(n=253) 120(47.4)	(n=260) 122(46.9)	(n=260) 122(46.9)	1.078(0.583)
Currently using condom (among population currently having sex)	(n=190) 57(30.0%)	(n=47) 37(79)	(n=187) 59(31.6)	(n=72) 57(79)	(n=191) 55(28.8)	(n=204) 67(33%)	20.237(<0.001) *
Consistently using condom with the one regular sexual partner (among population currently having one regular sexual partner)	(n=115) 5(4.3%)	(n=44) 32(73)	(n=120) 6(5.0)	(n=69) 38(55)	(n=117) 5(4.3%)	(n=129) 8(6%)	71.606(<0.001) *
Consistently using condom with more than one regular sexual partner (among population currently having more than one regular sexual partner)	(n=70) 6(8.6%)	(n=3) 1(33)	(n=69) 15(21.7)	(n=3) 1(33)	(n=77) 4(5.2%)	(n=65) 19(29)	10.023(0.028) *

*Note: *= Statistically significant*

Table 5. Willingness to improve behavior risk among respondents at pre and postintervention

Assessment categories	Pre- PBIG (n=611) Frequency (%)	Post-PBIG (n=611) Frequency (%)	Pre- HPBIG (n=613) Frequency (%)	Post-HPBIG (n=613) Frequency (%)	Pre-control	Post-Control group (n=607) Frequency (%)	χ^2 (P value) (Compares post-intervention values)
Willingness to abstain till marriage	291(47.6)	538(88)	254(41.4)	533(87)	370(60.9)	370(61)	21.534(<0.001)*
Willing to have only one sexual partner	208(34.0)	415(68)	270(44.0)	539(88)	236(38.9)	356(59)	21.798(<0.001)*
Willingness to consistently use condom	52(8.5)	174(28)	45(7.3)	156(25)	67(11.0)	36(6)	81.085(<0.001)*
Having sex in influence of alcohol or drug	31(5.1)	10(2)	0(0.0)	12(2)	1(0.2)	54(9)	46.3633(<0.00)*
Sharing of injection needles	0(0.0)	0(0)	18(2.9)	0(0)	43(7.1)	1(0)	

**= Statistically significant*

Table 6. HIV knowledge and risk among PBIG and HBIG before and after intervention

Parameters	Comparison Groups	Before intervention Mean ±SD	After intervention Mean ±SD
HIV Knowledge			
PBIG vs HBIG	PBIG (n=611)	49.1±20.1	69.4±18.2
	HBIG (n=613)	46.4±18.5	74.6±14.6
	Unpaired t-test (p value)	2.4890(0.0629)	5.5876 (P<0.001)*
HIV Behaviour risk			
PBIG vs HPBIG	PBIG (n=611)	43.1 ±24.5	21.9±17.5
	HBIG (n=613)	40.6±25.3	17.8±14.5
	Unpaired t-test (p value)	4.084(P=0.087)	19.924(P<0.001)*

Note: PBIG=Peer-based intervention group; HPBIG=Health provider- based intervention group.
**=Statistically significant*

4.3.12 Effect of HIV education intervention on HIV behaviour outcome between peer based and health provider-based intervention groups

Also, on behaviour risk reduction, while peer-based group showed risk reduction from mean of 43.1 to 21.9, health provider-based intervention groups, showed risk reduction from mean of 40.6 to 17.8. Again, there is paucity of data on comparison of peer based versus health provider-based intervention models as studies found did not compare these two types of intervention but the two models are effective individually. The higher score among health provider-based group could also be as a result of health providers having better teaching and demonstrative experience and skill for delivering education intervention.

In summary, while studies have shown that peer-based intervention and health provider-based intervention are both individually effective, none was found to compare effectiveness between the two types. This study observed higher increase in knowledge among health provider-based group than in peer-based group, and also better decrease in behaviour risks in health provider-based group than the peer-based group.

5. CONCLUSION

Baseline HIV/AIDS knowledge among in-school adolescents and youths in Ebonyi State were moderate at 48.8 while their behaviour risk is considered high even at 42.3. However, HIV/AIDS education resulted in increased HIV/AIDS knowledge and decreased HIV/AIDS behaviour risks among adolescents and youths three months after intervention. There is significant difference in HIV/AIDS knowledge and behaviour risk between adolescents and youths who received HIV/AIDS education and those who did not. And though there is significant difference in HIV/AIDS knowledge gain and behavioural risk reduction among peer-based groups, health provider -based group showed better outcomes in knowledge and behaviour risk.

6. RECOMMENDATIONS

a) Program implementers should adopt any or both of the effective peer based and/or health provider-based intervention models for HIV/AIDS risk reduction education among in-school adolescents and youths. **b)** Both intervention models were significantly effective though health provider-based intervention was found to be more effective than peer-based intervention, it is recommended that peer-based intervention be considered by HIV program implementers to ensure sustainability of intervention in secondary schools.

Further study on 'Effect of teacher-based HIV/AIDS education intervention' should be carried out and its comparative assessment with peer-based and health provider-based interventions is recommended for further research.

CONSENT AND ETHICAL APPROVAL

Ethical approval was sought and obtained from Ebonyi State University Ethics Committee. Written consent forms from principals of schools selected for study were sought and obtained while verbal informed assent was obtained from participants who were under the age of 18 years. Assent was obtained from them after reading and explaining the consent form, giving detailed explanation of the objectives of the study, risk and benefits, voluntary nature of study participation and freedom to withdraw from the study at any time. To ensure that confidentiality was maintained, in course of education intervention by trained trainers, adequately trained research assistants administered and collected the pre and post-test evaluations. Moreover, participants were given a study code (not names) to aid in comparison of pre-test and post-tests while maintaining confidentiality.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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