

Behavioral response for condom use messages to prevent human immunodeficiency virus/acquired immune deficiency syndrome among Bahir Dar City High School students, North West Ethiopia, 2022: Application of the extended parallel process model

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Abstract

Objective: The human immunodeficiency virus has become one of the world's most serious health and development challenges. Human immunodeficiency virus prevention has not received sufficient attention, and the prevalence of human behavioral virus infections among Ethiopian high school and preparatory students has also increased. The aim of this study was to assess behavioral responses to condom use messages to prevent human immune virus/acquired immune deficiency syndrome among Bahir Dar city high school and preparatory students using the extended parallel process model, Bahir Dar, Ethiopia, 2022.

Methodology: This institution-based cross-sectional study was conducted from 15 November to 15 December 2022, in Bahir Dar city. The data were collected from 601 participants. A multi-stage sampling technique was used to select the study participants. Data were entered into Epi-Info version 7.2.5 and exported to SPSS version 26 for analysis. Descriptive statistics, percentages, and frequencies were calculated. Bivariable logistic regression was performed to identify variables candidates for multivariable logistic regression at p -values less than 0.25, and multivariable logistic regression was performed to identify factors associated with the outcome variable at p -values < 0.05 . A 95% confidence interval and odds ratio were used for the interpretation of the association.

Result: The response rate of the respondents was 94.9%. The behavioral response for condom use messages was affected by grade level adjusted odds ratio, 0.473, 95% CI (0.252–0.886), knowledge adjusted odds ratio, 2.627, 95% CI (1.788–3.859), attitude adjusted odds ratio, 3.19, 95% CI (2.145–4.744), efficacy adjusted odds ratio, 3.286, 95% CI (2.03–5.339), and threat adjusted odds ratio, 0.249, 95% CI (0.167–0.369). The behavioral response for condom use messages was associated with danger control.

Conclusion: The danger control response is 60.9%. Grade level, knowledge, attitude, and perceived and threat efficacies were independent predictors of danger control. Therefore, messages must aim to enhance threat component perception with appropriate efficacy to control danger and developed using scientific health communication strategies to promote behavioral change.

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Keywords

Behavioral response, human immunodeficiency virus immunodeficiency syndrome, Bahir Dar city, secondary and preparatory school students

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Introduction

Acquired immunodeficiency syndrome (AIDS) is brought on by the human immunodeficiency virus (HIV).¹ The three main ways that HIV is transmitted are sharing needles and/or syringes among those who have the disease, sexual contact with an infected person, and, less frequently (and now very infrequently in countries where blood is screened for HIV antibodies), transfusions of infected blood or blood clotting factors. HIV cannot be eliminated by the human body, even with treatment, unlike certain other viruses. As a result, once we contract HIV, it stays with us forever.^{2,3}

The use of alcohol and/or cigarettes, early sexual participation that disrupts future lives, and other problematic behaviors and risks affect young people in a variety of ways. HIV has become one of the major risks to world health and development since the first instances of HIV/AIDS were found in 1981.^{1,4,5} Lower awareness of sexual health and HIV risk perception are the main causes of the rise in HIV infections among young people.⁶ Combination preventive program integrate evidence-based biological, behavioral, and structural interventions to best meet the current HIV prevention needs of people and communities and have the greatest impact on reducing the number of people who contract the disease. Adolescents should be able to access contraception, HIV testing and counseling services, and treatment and prevention program through legal legislation.⁷

HIV remains a global health crisis, and the world must reckon with the 1.5 million new HIV infections and 680,000 deaths from AIDS-related causes that occurred in 2020 in those aged 10–24 years,⁸ and the second leading cause worldwide. Many young people live in Africa, which can increase the rate of HIV infections. Among teenagers, the most common way to contract HIV is through heterosexuality.^{4,9,10}

Globally, AIDS-related deaths now account for 680 per 1000, of which 580,000 and 240,000 were adults and women, respectively, and the remaining 99,000 children were under the age of 15. AIDS has emerged as one of the most pervasive and serious anxieties in modern life, education, and social and economic development, with high morbidity and mortality.^{8,11,12} New HIV infections among adolescents are an issue in all regions, with sub-Saharan Africa constituting 83% of them.^{13,14} Globally, 3.9 million youths are living with HIV, and there were 590,000 new infections among global youth in 2017. Every day, approximately 1600 youth acquire HIV, and one young person dies from an AIDS-related illness every 10 min worldwide.^{15,16}

Evidence has shown that there is an increased risk of acquiring HIV among adolescents due to early initiation of sexual intercourse and high-risk sexual behavior. Such high-risk behaviors include sexual intercourse with multiple partners. The use of alcohol and drugs is known to motivate young people to engage in high-risk sexual behaviors.^{7,17} Seventy percent of AIDS-related deaths worldwide occur in Africa. In Ethiopia, the young population had a 34% HIV/AIDS-related mortality rate, which also accounted for 66% of all deaths among urban dwellers in the reproductive age range from 15 to 49 years.^{18,19}

Hence, HIV/AIDS is a serious social, health, and developmental problem in Ethiopia. Currently, productive and skilled human resources are required. It also claims a large amount of wealth to treat people live with HIV and combat challenges. According to the EDHS 2016, there are 0.9% HIV cases nationwide, and the Amhara region had the highest rate of new HIV infections (26% on average) over the same year.^{19–21}

One of the most common serious consequences of HIV/AIDS is the loss of young adults in their most productive years, and Ethiopia is one of the most affected countries in East Africa (11). The majority of the victims HIV/AIDS primarily affects are aged 15–24 years.^{20,22}

The majority of HIV/AIDS awareness campaigns are grounded in behavioral theories, such as the theory of reasoned action, theory of planned behavior, social learning/cognitive theory, Bruner's theory of discovery learning, theory of classical conditioning, the health belief model (HBM), and extended parallel process model (EPPM).^{23–25} Models and theories can help us understand and explain why certain health interventions work and others do not. It focuses on structural, environmental, social, and individual elements. EPPM is more appropriate for assessing motivational variables than awareness in situations where the target groups have already a high level of awareness. The different behavioral theory and models were applied to understand and predict condom use for HIV prevention.^{26,27}

The studies discussed that framed messages including icon arrays increased adherence to self-reported condom use by giving rise to enduring changes in attitudes and behavioral intentions, which influenced behavior. Icon arrays were found to be most beneficial among young adults with relatively low numeracy as long as they had high graph literacy. The risk information environment and competencies to understand and use risk information interact to influence their risk perception and risk talk, risk literacy tends to stabilize people's risk perceptions and their risk communications.^{28,29}

The extended parallel processing model describes how rational considerations (efficacy beliefs) and emotional reactions (fear of a health threat) combine to determine behavioral decisions. It has two main constructs, which are susceptibility to threat and severity of the threat. Efficacy is defined as the perception that an individual effectively performs the recommended response to avoid a health problem. It has response efficacy, which is the perception of an individual regarding the effectiveness of the recommended action to avoid a threat, and self-efficacy, which is the belief that an individual can act based on the recommended action.^{30–32}

The increasing rate of infection among youth shows a situation where either the youth have not received adequate information regarding the dangers related to the disease or they have disregarded the message. The role of behavioral change has been recognized as critical to the control of the pandemic since HIV/AIDS first emerged globally.⁴ In addition, behavioral responses to HIV prevention messages in Ethiopian high schools have not been well studied.

Materials and methods

Study design and settings

This study was conducted at Bahir Dar city secondary and preparatory schools. Bahir Dar is the capital city of the Amhara National Regional State. It is situated 565 km northwest of Addis Ababa, Ethiopia's capital city. There are a total of fourteen secondary and preparatory schools in Bahir Dar. The total number of students enrolled in high school (grade 9, 10) and preparatory groups (grade 11, 12) was 21,867. There are 7763 males and 14,104 females. This institution-based cross-sectional study was conducted among high school and preparatory students in Bahir Dar city between November 15 and December 15, 2022.

Participants and sampling

Students attending their classes during data collection were included in the study, whereas those who were critically ill during the data collection period were excluded from the study.

The sample size of this study was determined by using the single population proportion formula by considering a prevalence of 50% since there has been no previous study done, a 5% margin of error, a design effect of 1.5, and a 95% confidence interval. The final sample size was 634 after adding 10% non-respondents.

A multi-stage sampling technique was used in this study. First, a list of secondary and preparatory schools is obtained from the Bahir Dar city Administration Education Office. In the second stage, six schools were selected from 14 schools using a lottery method with table of random number. Considering the rule of thumb of 30% coverage of a

representative sample of the study population, the sample size was distributed proportionally among the selected schools to account for 634 students.³³ In the third stage, within the selected schools, by considering each grade from 9 to 12 strata, three classes from each stratum (grade) were selected randomly by lottery method. Finally, students were randomly selected from each class.

Data collection

Ethical approval was obtained from the Institutional Review Board of Bahir Dar University, College of Medicine and Health Sciences (reference number: 552/2022). An official letter was sent to the Amhara Public Health Institute. Both verbal and written informed consent was taken from the participants over the age of 18 and from parents or legally authorized representative for under the age of 18. Confidentiality was assured for the respondents by not writing their names on the questionnaire.

The questionnaire was prepared from previous studies³⁴ in English, translated to the local language, Amharic, and then back to English to ensure consistency by English teacher who has experience in translation. A pre-test of the questionnaire was done on 5% of the total sample prior to the actual data collection period for the amendment of the questionnaire. Self-administered questionnaires were used to collect the data.

Measurements

Behavioral response: One of the three outcomes was no response, danger control, or fear control. In this study, they were categorized into two danger control responses and a fear control response based on the discriminative value.

Perceived susceptibility was a belief in students' self-perceptions of their vulnerability to HIV. *Perceived severity:* A belief about the severity or seriousness of HIV in one's state of health affairs. *Self-efficacy* is a belief in one's capability to avert a threat (HIV). *Response-efficacy* was defined as an acceptance (belief) of the effectiveness message in decreasing the risk of HIV. These variables were measured using a 5-point Likert scale (from strongly disagree to strongly agree). As there were no negatively worded statements, the scores were summed for each respondent. It had a minimum value of 3 and a maximum value of 15. A higher score indicates higher perceived susceptibility, perceived severity, self-efficacy, and response efficacy. The overall score of each individual was used to obtain the mean score.³⁴

Perceived threat is a collective perceived threat that was measured by obtaining the sum of both perceived severity and perceived susceptibility for each respondent. It had a minimum value of 6 and a maximum value of 29. A higher score indicates a higher perceived threat.

Perceived efficacy: Collective perceived efficacy was measured by obtaining the sum of both self-efficacy and

response efficacy for each respondent. It had a minimum value of 6 and a maximum value of 30. A higher score indicates higher perceived efficacy.

Fear: An internal emotional reaction comprises psychological dimensions that may arise when a serious and personally relevant threat is perceived.

Danger control response: An intended behavioral response when students believed they were at health risk from HIV (high perceived threat) and they believed they were able to effectively avert it from occurring (high perceived efficacy); they were motivated to control the danger or threat. A positive score is obtained by subtracting the perceived threat score from the perceived efficacy score.

The fear control response was an unintended behavioral response when students believed that they were at risk for a serious or significant threat (HIV) (high perceived threat), but they believed that they were unable to perform the recommended response or believed that the recommended response was ineffective (low perceived efficacy), and then focused on controlling their fear of the treatment. A negative score for fear control and a zero score for no response were obtained by subtracting the perceived threat score from the perceived efficacy score.

No responses: Students with low threat perceptions regarding a health threat do not engage in danger or fear control, which means that the critical value is 0.³⁴

Knowledge: The students' knowledge was assessed using 19 questions. The scoring of the questions ranged from 0 (minimum) to 19 (maximum). For each question, the participants were given three choices: "yes item," or "I do not know item." The yes item was given a value of 1, unlike the no, and I did not know the items that were given 0 values. A higher score indicates higher knowledge.³⁵

Attitude: Students who scored above the median were categorized as having a favorable attitude, while those who scored less than the median was considered to have an unfavorable attitude.³⁵

Data quality assurance

Data quality was ensured by proper design, pre-testing of the questionnaire, and appropriate supervision of the data collectors. The data were collected by 4-degree nurses who has experience in data collection. One day training was given on data collection tools. The principal investigator provided overall supervision on data collection tool utilization, proper data filing and handling comparing with the objective of the study. A pre-test was performed on 5% of study participants at a school in Bahir Dar city not included in the study. Appropriate modifications were made after analyzing the pre-test results before actual data collection.

The completeness, accuracy, and consistency of the collected data were checked daily by the responsible supervisor and the principal investigator. The questionnaires were prepared in English, translated into the Amharic language, and then returned to English to maintain consistency.

Table 1. Sociodemographic characteristics of high school and preparatory students in Bahir Dar city, 2022 (n=601).

Variable	Category	Frequency	%
Sex	Male	247	41.1
	Female	354	58.9
Age	15–20	468	77.8
	20–25	133	22.2
	Grade level	Grade 9	259
Grade level	Grade 10	151	25.1
	Grade 11	126	21
	Grade 12	65	10.8
	Ethnicity	Amhara	583
Ethnicity	Oromo	6	1
	Tigray	12	2

Statistical analysis

Data were cleaned, coded, and entered into Epi-Info statistical software version 7.2.5, which was then transferred to SPSS version 26 for further analysis. Descriptive analyses, such as the mean, percentage, and frequency distribution of the respondents, were used for sociodemographic characteristics and the percentage of important variables in the study. The results are presented in tables, graphs, and text based on the type of data. Bivariable and multivariable logistic regression analyses were performed to detect any significant associations. The relationship between the dependent and independent variables was investigated using an odds ratio with 95% confidence.

To determine the effect of several factors on the outcome variable and to control for confounding effects, bivariate logistic regression analysis was performed to estimate the relative contribution of each variable to the outcome variable. Data from bivariate analysis with a *p* value of less than 0.25 was entered into multivariable analysis, and those variables with a *p* value of less than 0.05 in multivariable analysis were considered to have a significant relationship between the factors associated with the outcome variable (danger control).

Results

Sociodemographic characteristics

This study was conducted among a total of 634 participants, with a response rate of 94.9%. Among the 601 respondents, 41.1% were male. Their ages ranged from 15 to 22 years (mean, 17.97 (SD=±2.45) years (Table 1).

Knowledge of students on condom use for HIV/AIDS prevention

Among the respondents, 168 (42%), 132 (33%), 40 (10%), 24 (6%), 18 (4.5%), and 18 (4.5%) of them received messages on HIV/AIDS prevention from healthcare workers, radio/

Table 2. Distribution of correct answers about knowledge-related questions among Bahir Dar city high school and preparatory students, 2022 (N= 601).

Knowledge related question with correct answer	Frequency	%
1. HIV is a virus (T)	515	85.5
2. HIV is caused by evil spirit (F)	612	81.9
3. HIV is a biological weapon created by whites (F)	571	95
4. HIV is transmitted by sexual intercourse with HIV infected person (T)	538	89.5
5. HIV is transmitted by sharing injectable needle (T)	590	98.2
6. HIV is transmitted by infected blood transfusion (T)	406	67.6
7. HIV can transmitted from mother to child (T)	283	47.1
8. HIV can transmitted by kissing or shaking infected person (F)	216	35.9
9. HIV can transmitted by mosquito bite (F)	496	82.5
10. HIV can be prevented by abstinence (T)	534	88.9
11. HIV can be prevented by consistent condom use (T)	571	95
12. HIV can be prevented by avoiding sex with causal person (T)	571	95
13. HIV can be prevented by avoiding sex with commercial sex worker (T)	538	89.5
14. HIV can be prevented by avoiding sharing injectable needle (T)	590	98.2
15. HIV can be prevented by avoiding using untested blood (T)	590	98.2
16. HIV can be prevented by avoiding sharing toilet food and cloth (F)	348	56.8
17. HIV can be prevented by avoiding kissing and shaking with infected person (F)	283	47.1
18. HIV can be prevented by avoiding mosquito bite (F)	216	35.9
19. HIV can be cured	452	75

Table 3. Attitude toward HIV prevention messages among high school and preparatory students in Bahir Dar city, 2022 (n=601).

Attitude indicators	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree
1. Using condom would be good	81 (13.5)	160 (26.6)	73 (12.1)	170 (28.3)	17 (19.5)
2. Being abstinence is good	68 (11.3)	162 (27)	79 (13.1)	184 (30.6)	108 (18)
3. Being exclusive monogamous would be good	70 (11.6)	16 (27.8)	74 (12.3)	186 (30.9)	104 (17.3)
4. Knowing sero-status is good	67 (11.1)	162 (27)	74 (12.3)	191 (31.8)	107 (17.8)

television, religious leaders, other (club) sources, friends/parents, and people living with HIV, respectively. The overall knowledge of the respondent was good (78%) (Table 2).

Attitude of respondents

Approximately 287 (47.5%) of the participants had a favorable attitude, while 314 (52.2%) of participants had an unfavorable attitude toward HIV prevention messages (Table 3).

Sexual behavior of the respondent

For those having sex in the past, reported reasons for not using condoms were trust in partner, condom not available, and my partner refused; I dislike it; partner refused; condoms reduced pleasure, and others accounted for 35.7%, 35.8%, 16.1%, 5.4%, and 7.2 %, respectively (Table 4).

Perceptions of threat and efficacy in HIV/AIDS (constructs of EPPM)

The mean score for perceived efficacy (19.74) was greater than that for perceived threat (16.58). They also engaged in

protective motivation (Tables 5–7). Approximately 366 (60.9%; 95% CI: 56.9–64.9) of the students were in danger control (positive critical value), 235 (39.1%; 95% CI: 30–39) had a fear control response with negative critical value, and no individuals had zero critical value (Figure 1).

Factors associated with response to HIV prevention messages

In the bivariable logistic regression analysis, current sexual partner, mean lifetime of sexual partner, grade level, attitudes and knowledge, threat responses, and efficacy responses were statistically associated with the responses from students toward HIV prevention messages with a *p*-value less than 0.25 at 95% confidence interval (Table 8).

The grade level, knowledge level, attitude, perceived efficacy, and perceived threat were significantly associated with the response of students toward the condom use message for HIV prevention in the multivariable analysis. Grade 9 students were 52.7 times less likely to develop danger control than to grade 12 students (AOR=0.473; 95% CI: 0.252–0.886).

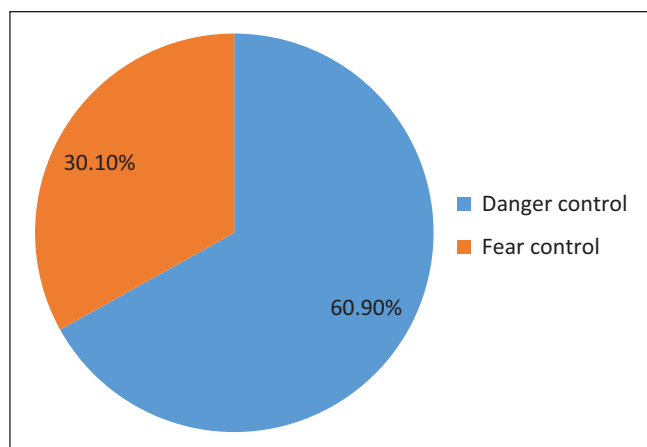
Students with good knowledge were 2.6 times more likely to develop danger control than those who did not too poor

Table 4. Sexual experience of the high school and preparatory students in Bahir Dar city, 2022 ($n = 601$).

Variable	Response	Frequency	%
Sexual experience			
Mean age of sexual commencement	16.81 ± 1.3		
Mean life time sexual partner	0.321 ± 0.518		
Sexual intercourse during the last 12 months	No	500	83.2
	Yes	101	16.8
Current sexual partner	No	489	81.4
	Yes regular partner	98	16.3
	Yes occasional partner	14	2.3

Table 5. The efficacy and threat response of the students.

Category	Low efficacy	High efficacy	Total
Low threat	218	81	299
High threat	219	83	302
Total	437	164	601

**Figure 1.** Figure behavioral response of the preparatory and high school students for condom use.

knowledge (AOR=2.627; 95% CI: 1.788–3.859). The number of students with favorable attitude was 3.1 times more likely to develop danger control than unfavorable attitudes (AOR=3.190; CI: 2.145–4.744).

Students who had high efficacy were 3.2 times more likely to develop danger control than those who did not low efficacy (AOR=3.286; CI: 2.023–5.339). Students who posed a high threat were nearly 75% less likely to develop danger control as compared to students with low threats.

Discussion

The immune system's deterioration brought on by HIV/AIDS frequently results in the comorbidity of other illnesses whose treatment might worsen the burden of HIV/AIDS. Globally countries use different mechanism to decrease the

impact of HIV like, diagnose all individuals with HIV as early as possible after infection; treat HIV infection rapidly and effectively to achieve sustained viral suppression; prevent at-risk individuals from acquiring HIV infection, including the use of pre-exposure prophylaxis; and rapidly detect and respond to emerging clusters of HIV infection to further reduce new transmissions.³⁶ Adolescents are more likely to acquire HIV due to a combination of risky sexual behaviors, such as condom-less sex, sex while intoxicated, and multiple sex interactions, as well as poor health-seeking behaviors, such as failing to seek sexually transmitted infection (STI) treatment and skipping HIV testing.^{30,37}

The risk of contracting HIV and many other sexually transmitted diseases is decreased by using a condom, which also protects against unintended pregnancy. However, condom use is occasionally quite low among people who are participating in sexual activity. The main goal of preventive education should be to increase a person's self-confidence in their ability to take steps to minimize their risk of contracting HIV and their belief in the efficacy of their risk-reduction strategies. As a result, education and preventive measures are appropriate choices. In this study, an EPPM was applied to assess the response of students to the condom use message for HIV/AIDS prevention among high school and preparatory students in Bahir Dar city, Ethiopia.^{26,38,39}

In this study, 60.9% of the respondents provided danger control responses. This is higher than a study conducted in Hosanna, Ethiopia among high school students aimed to evaluate the effectiveness of being faithfulness message for HIV prevention, which showed that 48.1% of the respondents were in danger control response.³⁴ This may be because students in Bahir Dar have access to more information from different sources like social media on HIV prevention.

This is lower than a study in Iran among university students under the age of 28 years, in which 68.7% of the respondents were in danger control.⁴⁰ This might be because of fear control; they denied danger and focused on controlling fear by not processing the risk and danger control. The participants may have considered alternatives to avert health threats to HIV/AIDS.

In this study, 61.9% of the respondents had adequate knowledge toward HIV/AIDS prevention messages. This is

Table 6. Descriptive statistics of perceived threat, perceived efficacy, attitude, and knowledge in Bahir Dar high school and preparatory students (N=601).

Variable	Min	Max	Median	Mean	SD	Range	No. of item	Cronbach α
Knowledge	9	19	14.6	14	1.5	10	19	
Perceived susceptibility	3	15	6	6.6	2.79	12	3	0.7
Perceived severity	3	15	11	9	2.85	12	3	0.701
Self-efficacy	3	15	10	9.8	2.9	12	3	0.75
Response efficacy	3	15	10	9.9	2.8	12	3	0.73
Perceived threat	6	29	17	16.58	3.36	23	6	0.702
Perceived efficacy	6	30	20	19.74	3.2	24	6	0.721
Attitude	4	15	9	9.4	4	12	4	0.71

Table 7. Perception of threat and efficacy among Bahir Dar city high school and preparatory students, 2022.

Statements	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
Perceived threat					
1. I am at risk of getting infected with HIV/AIDS	304 (50.6)	104 (17.3)	48 (8)	85 (14.1)	60 (10)
2. It is possible that I was get HIV/AIDS	269 (44.8)	105 (17.5)	85 (14.1)	83 (13.8)	59 (9.8)
3. It is likely that I was get HIV/AIDS	269 (44.8)	103 (17.1)	80 (13.3)	95 (15.8)	54 (9)
4. Getting HIV is the worth thing that could happen to my life	119 (19.8)	72 (12)	58 (9.7)	113 (18.8)	239 (39.8)
5. If I get HIV, it was destroying my life	119 (19.8)	72 (12)	58 (9.7)	113 (18.81)	239 (39.8)
6. Getting HIV is a sure death sentence	206 (34.3)	64 (10.6)	51 (8.5)	07 (17.8)	173 (18.8)
Perceived efficacy					
1. Using condom is effective in preventing HIV	32 (8)	171 (42.8)	85 (21.2)	88 (22)	24 (6)
2. Condoms prevent HIV/AIDS	47 (11.8)	60 (15)	97 (24.2)	172 (43)	24 (6)
3. If I use condom consistently, I am less likely to get HIV	41 (10.3)	78 (19.5)	97 (24.3)	110 (27.4)	74 (18.5)
4. Using condom is convenient	28 (7)	123 (30.8)	126 (31.5)	105 (26.2)	18 (4.5)
5. I am able to use condom to prevent getting HIV	63 (15.8)	97 (24.2)	81 (20.2)	143 (35.8)	16 (4)
6. Using condom is easy for me	69 (17.2)	109 (27.3)	93 (23.2)	99 (24.8)	30 (7.5)

Table 8. Factors associated with response of students in multivariate logistic regression toward condom use message for prevention of HIV/AIDS among Bahir Dar city high school and preparatory students 2022 (n=601).

Variable	Variable response	Behavioral response		COR (95% CI)	AOR (95%CI)	p-Value
		Danger control	Fear control			
Grade level	Grade 9(1)	220	39	0.473 (0.252–0.886)	0.473 (0.252–0.886)	0.019*
	Grade 10(2)	117	34	0.637 (0.347–1.170)	0.800 (0.407–1.573)	0.518
	Grade 11(3)	102	24	0.509 (0.273–0.9487)	0.518 (0.259–1.037)	1.037
	Grade 12	57	8			
Threat response	Low threat	219	80			
	High threat	147	155	0.346 (0.246–0.487)	0.249 (0.167–0.369)	0.000*
Efficacy response	Low efficacy	232	205			
	High efficacy	134	30	3.947 (2.547–6.117)	3.286 (2.03–5.339)	0.000*
Knowledge	Poor	104	125			
	Good	262	110	2.863(2.033–4.032)	2.627 (1.788–3.859)	0.000*
Attitude	Unfavorable	154	160			
	Favorable	212	75	2.937 (2.082–4.142)	3.19 (2.145–0.744)	0.00*

COR: crude odds ratio; AOR: adjusted odds ratio.

*Statistically significant variables.

in line with a study conducted among university students in United Arab Emirates, where 61% of them had good knowledge.²⁸

This result showed that more people engaged in danger control than in fear control. Grade 9 students are 52.7% less likely to develop danger control than to grade 12 students. This may be because grade 9 students are less knowledgeable than grade 12 students. Students with favorable attitudes were three times more likely to develop danger control as compared to those with unfavorable attitudes. Students with high threat scores were negatively associated with danger control, and students with high efficacy scores were positively associated with danger control, which is in line with EPPM.³⁰

Limitations and strengths of the study

The major strength of this study is the assessment of behavioral responses to condom use messages for HIV prevention using the EPPM for similar studies in high and preparatory schools. It does not include the response to other HIV prevention messages, such as abstinence and being faithful to one sexual partner; it did not consider other associated factors like social media exposure to get knowledge on consistent condom utilization.

Conclusions

The danger control response is 60.9%. The perceived efficacy was higher than the perceived threat. The grade level, attitude, knowledge, threat, and efficacy responses of respondents were factors associated with students' responses to HIV/AIDS prevention messages for condom utilization. Therefore, using scientific health communication strategies all concerned bodies should develop appropriate messages with health learning materials on condom utilization for effective HIV prevention. Health extension program should be strengthened by incorporating an HIV prevention message to reach for all community, and future research should use mixed methodologies.

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Authors' contributions

All authors made a significant contribution to the work reported in all these areas: they took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article had been submitted; and agreed to be accountable for all aspects of the work.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Disclosure

This article was presented as the thesis report "Behavioral Response for HIV/AIDS Prevention Messages Among Bahir Dar city high school and preparatory students, North West Ethiopia, 2023: An Application of Extended Parallel Process Model" by Gebeyehu, Lakew at Bahir Dar University repository, <http://ir.bdu.edu.et/handle/123456789/14990>, Date: 2023-01-14.

Declaration of conflicting interests

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Ethics approval

An ethical approval letter was obtained from the ethics review board of Bahir Dar University, College of Medicine and Health Science. An official letter was sent to the Amhara Public Health Institute, then the Bahir Dar city educational bureau, and each secondary school director.

Informed consent

Both verbal and written informed consent was taken from the participants over the age of 18 and from parents or legally authorized representative for under the age of 18. Confidentiality was assured for the respondents by not writing their names on the questionnaire. The study was performed in accordance with the principles stated in the Declaration of Helsinki. The ethical approval protocol number was 552/2022.

Trial registration

Not applicable.

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Supplemental material

Supplemental material for this article is available online.

References

1. Davis KR and Weller SC. The effectiveness of condoms in reducing heterosexual transmission of HIV. *Fam Plann Perspect* 1999; 31: 272–279.
2. Patel P, Borkowf CB, Brooks JT, et al. Estimating per-act HIV transmission risk: a systematic review. *AIDS* 2014; 28(10): 1509–1519.
3. Klimas N, Koneru AO and Fletcher MA. Overview of HIV. *Psychosom Med* 2008; 70(5): 523–530.

4. World Health Organization. *Consolidated guideline on sexual and reproductive health and rights of women living with HIV*. Geneva: World Health Organization, 2017.
5. Tian X, Chen J, Wang X, et al. Global, regional, and national HIV/AIDS disease burden levels and trends in 1990–2019: a systematic analysis for the global burden of disease 2019 study. *Front Public Health* 2023; 11: 1068664.
6. Negeri E. Determinants of risky sexual behavior, relation between HIV risk perception and condom utilization among Wollega University students in Nekemte town, Western Ethiopia. *Sci Technol Arts Res J* 2014; 3(3): 75–86.
7. Kyalo D and Mberia H. Abstinence communication campaigns and prevention of HIV and AIDS among undergraduate university students in Kenya: a case of Jomo Kenyatta University of agriculture and technology. *Int J Commun Public Relat* 2022; 7(1): 45–68.
8. Kempton J, Hill A, Levi JA, et al. Most new HIV infections, vertical transmissions and AIDS-related deaths occur in lower-prevalence countries. *J Virus Erad* 2019; 5(2): 92–101.
9. Singh UK. *Human development in Bihar, India: experiences of millennium development goals*. Berlin, Germany: Springer Nature, 2022.
10. Kim SB, Yoon M, Ku NS, et al. A mathematical model for HIV/AIDS under pre-exposure and post-exposure prophylaxis. *PLoS One* 2022; 11(2): 2208319.
11. Bekker LG, Alleyne G, Baral S, et al. Advancing global health and strengthening the HIV response in the era of the sustainable development goals: the international AIDS society—lan-cet commission. *Lancet* 2018; 392(10144): 312–358.
12. Post J, Ng'ambi W, Keiser O, et al., Changes of sociobehavioural characteristics and HIV in 29 Sub-Saharan African countries, 2000–2018. *medRxiv* 2023; 16: 23286024.
13. Fleischman J and Peck K. *Addressing HIV risk in adolescent girls and young women*. JSTOR, 2015.
14. World Health Organization. Annual technical report: 2013: department of reproductive health and research, including UNDP/UNFPA/WHO/World bank special programme of research training in human reproduction (HRP). Geneva: *World Health Organization*, 2014.
15. Rahyani NKY. *HIV/AIDS problems and policies in adolescent population, in Integrated science of global epidemics*. New York, NY: Springer, 2023, pp. 545–561.
16. Gabelnick T, Igweta R and Ombija M. *Global and regional initiatives to prevent HIV among adolescents and youth*. Oxfordshire, UK: Routledge, p. 48.
17. Hosek S and Pettifor A. HIV prevention interventions for adolescents. *Curr HIV/AIDS Rep* 2019; 16: 120–128.
18. Bekker LG. Health, HIV control in young key populations in Africa. *Lancet Child Adolesc Health* 2019; 3(7): 442–444.
19. Kibret GD, Ferede A, Leshargie CT, et al. Trends and spatial distributions of HIV prevalence in Ethiopia. *Infect Dis Poverty* 2019; 8(1): 90.
20. Muluneh AG, Merid MW, Kassa GM, et al. Hotspots and determinants of women's discriminatory attitude towards people living with HIV; evidence from Ethiopian demographic and health survey data. *BMC Womens Health* 2022; 22(1): 420.
21. Susuman AS. HIV/AIDS in Ethiopia: health view. *J Asian Afr Stud* 2017; 52(3): 302–313.
22. Waktole ZD. Sexual behaviors and associated factors among youths in Nekemte town, East Wollega, Oromia, Ethiopia: a cross-sectional study. *PLoS One* 2019; 14(7): e0220235.
23. Tarkang EE and Zotor FB. Application of the health belief model (HBM) in HIV prevention: a literature review. *Central Afr J Public Health* 2015; 1(1): 1–8.
24. Reinecke J, Schmidt P and Ajzen I. Application of the theory of planned behavior to adolescents' condom use: a panel study. *J Appl Soc Psychol* 1996; 26(9): 749–772.
25. Popova L. The extended parallel process model: illuminating the gaps in research. *Health Educ Behav* 2012; 39(4): 455–473.
26. Witte K, Meyer G and Martell D. *Effective health risk messages: a step-by-step guide*. Thousand Oaks, CA: Sage, 2001.
27. Liu Z, Wei P, Huang M, et al. Determinants of consistent condom use among college students in China: application of the information-motivation-behavior skills (IMB) model. *PLoS One* 2014; 9(9): e108976.
28. Haroun D, El Saleh O, Wood L, et al. Assessing knowledge of, and attitudes to, HIV/AIDS among university students in the United Arab Emirates. *PLoS One* 2016; 11(2): e0149920.
29. Kusumi T, Hirayama R and Kashima Y. Risk perception and risk talk: the case of the Fukushima Daiichi nuclear radiation risk. *Risk Anal* 2017; 37(12): 2305–2320.
30. Shi JJ and Smith SW. The effects of fear appeal message repetition on perceived threat, perceived efficacy, and behavioral intention in the extended parallel process model. *Health Commun* 2016; 31(3): 275–286.
31. Witte K. Fear control and danger control: a test of the extended parallel process model (EPPM). *Commun Monogr* 1994; 61(2): 113–134.
32. Allahverdipour H, MacIntyre R, Hidarnia A, et al. Assessing protective factors against drug abuse among high school students: self-control and the extended parallel process model. *J Addict Nurs* 2007; 18(2): 65–73.
33. Van Belle G. *Statistical rules of thumb*. Vol. 699. Hoboken, NJ: John Wiley & Sons, 2011.
34. Doyore FD. Communication factors that influence high school students in their response to being faithfulness message for HIV/AIDS prevention in Hossana Town, Ethiopia: a cross sectional study. *Reprod Syst Sex Disord* 2014; 3(133): 2.
35. Afenigus AD, Mulugeta H, Tsehay B, et al. Behavioral response to HIV/AIDS prevention messages among students in selected universities of Amhara Region, Northwest Ethiopia: an extended parallel process model. *HIV AIDS (Auckl)* 2021; 13: 115–124.
36. Fauci AS, Redfield RR, Sigounas G, et al. Ending the HIV epidemic: a plan for the United States. *JAMA* 2019; 321(9): 844–845.
37. Kanyemba R, Govender K, Dzomba A, et al. HIV focused sexual risk-reduction interventions targeting adolescent boys and young men in Sub-Saharan Africa: a scoping review. *AIDS Behav* 2023; 27(10): 3356–3391.
38. Glanz K, Rimer BK and Viswanath K. *Health behavior: theory, research, and practice*. 5th ed. San Francisco, CA: Jossey-Bass Public Health, 2015.
39. Millanzi WC, Kibusi SM and Osaki KM. Effect of integrated reproductive health lesson materials in a problem-based pedagogy on soft skills for safe sexual behaviour among adolescents: a school-based randomized controlled trial in Tanzania. *PLoS One* 2022; 17(2): e0263431.
40. Esmacilzadeh S, Allahverdipour H, Fathi B, et al. Risk perception of HIV/AIDS and low self-control trait: explaining preventative behaviors among Iranian University students. *Glob J Health Sci* 2015; 8(4): 44–52.