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# Investigating the effect of education on man immunodeficiency virus/ acquired immune deficiency syndrome preventive behaviors in vulnerable women living in peripheral neighborhoods: Applications of the health belief model

Somayyeh Khazaeian, Ali Navidian<sup>1</sup>, Fariba Shahraki Sanavi<sup>2</sup>, Lila Hadipoor<sup>3</sup>

Department of Midwifery,  
Pregnancy Health  
Research Center, Zahedan  
University of Medical  
Sciences, Zahedan,  
Iran, <sup>1</sup>Department of  
Counseling, Pregnancy  
Health Research Center,  
Zahedan University  
of Medical Sciences,  
Zahedan, Iran, <sup>2</sup>Health  
Promotion Research  
Center, Zahedan  
University of Medical  
Sciences, Zahedan, Iran,  
<sup>3</sup>MSc Student of Midwifery  
Counseling, School of  
Nursing and Midwifery,  
Zahedan University  
of Medical Sciences,  
Zahedan, Iran

## Address for correspondence:

Dr. Somayyeh Khazaeian,  
Department of Midwifery,  
Pregnancy Health  
Research Center,  
Zahedan University  
of Medical Sciences,  
Zahedan, Iran.  
E-mail: m\_khazaiyan@  
yahoo.com

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## Abstract:

**INTRODUCTION:** Acquired immune deficiency syndrome (AIDS) is a pervasive disease, and its epidemic is spreading around the world. The only way to effectively fight against human immunodeficiency virus (HIV)/AIDS is good-quality health. The present study aimed to investigate the effect of an educational intervention program on HIV/AIDS preventive behaviors based on the Health Belief Model (HBM) in vulnerable women residing in peripheral neighborhoods.

**MATERIALS AND METHODS:** This study was a quasi-experimental research conducted among 200 vulnerable women, randomly selected from four community health centers in peripheral neighborhoods in 2019 in Zahedan, Iran. The data were collected using a researcher-made questionnaire, containing demographic information, HIV knowledge, and the HBM constructs. Besides, the data were collected before, immediately after, and 1 month after the intervention in both groups. Data analysis was performed in SPSS (version 24) using descriptive statistics, Chi-square test, independent *t*-test, repeated-measures analysis of variance, and multivariate linear regression.

**RESULTS:** The findings revealed no significant difference in the mean scores of knowledge and the HBM constructs before the educational intervention ( $P > 0.05$ ). However, after the intervention, this difference was significant in three time intervals ( $P < 0.05$ ). Despite the effectiveness of the educational intervention in the mean scores of knowledge and the HBM constructs in the intervention group compared with the controls, the largest effect size was observed, respectively, in knowledge ( $d = 0.762$ ) and perceived barriers ( $d = 0.612$ ), and the smallest effect size was reported in cues to action ( $d = 0.421$ ). As well, the F-statistic ratio (0.847) demonstrated that the selected demographic variables had failed to explain variations in knowledge mean scores ( $P = 0.497$ ).

**CONCLUSION:** HBM-based training interventions were positive for HIV/AIDS prevention behaviors. However, training alone does not seem to have enough effect on behavior persistence. Therefore, further research is recommended to investigate the role of predictive factors, especially social determinants of health and their relationship to different parts of the model, to take more effective measures for behavioral stability at the same time as training.

## Keywords:

Health education, human immunodeficiency virus, vulnerable populations, women

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## Introduction

Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) epidemic is accepted as one of the main concerns and the biggest challenges facing today's world.<sup>[1]</sup> Ending the epidemic by 2030 has been thus incorporated into the Sustainable Development Goals, and all nations have been encouraged to strive to reach it.<sup>[2]</sup> Although HIV/AIDS-induced mortality rates and newly infected cases have, respectively, reduced by 34% and 18% between 2010 and 2017, their speed is less than what is expected.<sup>[3]</sup>

Based on the estimations of the United Nations Program on HIV/AIDS, the number of people living with HIV in Iran has tripled since 2000–2015, and 31.5% of the cases were related to women. Although the incidence of HIV has generally been declining since 2004 in Iran, the proportion of women has increased from 6% to 30% since 2004–2013.<sup>[4]</sup>

In this regard, the most important reasons for the lack of HIV control in Iran were as follows: AIDS is a negative phenomenon; HIV-infected people in Iran hide their disease from others; failure to expand diagnostic prevention and care services; and lack of awareness of their disease in Iranian people. Moreover, Iranians ignore face-to-face interaction and social networking strategies in HIV. Another problem is the number of checkups for HIV that Iranian pregnant women undergo during pregnancy.<sup>[5]</sup>

On the other hand, Sistan and Baluchestan province is located in the southeast of Iran. The people of this province are very much in traffic with two countries Pakistan and Afghanistan due to the existence of wide common borders. For this reason, access to types of drugs is easy for people living in the province, which can be effective in creating high-risk behaviors.

Moreover, the existence of subcultures such as polygamy among men has made education targeting HIV/AIDS preventive behaviors a necessity.<sup>[6]</sup>

Hence, efforts made to prevent HIV in women's and immediate interventions, particularly for high-risk and vulnerable groups, are keys to cope with this problem.<sup>[7]</sup>

In all societies, groups living in poverty are more susceptible to harm including those residing in peripheral neighborhoods.<sup>[8]</sup> To behavioral disorders such as HIV/AIDS, incidence rates in such disadvantaged neighborhoods are greater than in other urban areas and even villages, in a way that residents in such areas are at substantial risk of the given diseases.<sup>[9]</sup> In this

regard, women are also included among high-risk and vulnerable populations who have been made less empowered to protect themselves against HIV/AIDS due to social injustice, i.e., poverty, economic dependency, violence and intimidation, risky sexual behaviors, limited power, and authority, as well as noninvolvement in decision-making processes.<sup>[10]</sup>

At this time, there is no treatment for the HIV/AIDS epidemic, and prevention has been raised as the most basic and powerful way to deal with this condition.<sup>[11]</sup> According to the report released by the World Health Organization (WHO), 15 countries implementing a comprehensive program for HIV/AIDS prevention in 2012 could decrease its incidence rate to 25%.<sup>[6]</sup> Hence, high-quality health education can influence HIV/AIDS prevention.<sup>[12]</sup> From the WHO perspective, educational intervention will be effective provided that it leads to behavior change.<sup>[13]</sup> Behavior experts also believe that developing educational intervention programs based on existing models can have a significant impact on raising public awareness and consequently enrich their beliefs regarding health behaviors as prerequisites for change in behaviors that are performed for nonhealth-related reasons.<sup>[14]</sup>

In this respect, the Health Belief Model (HBM) is known as one of the health promotion and disease prevention models<sup>[15]</sup> in which decisions and motivations in an individual in terms of adopting a health behavior depend on three separate components of individual perception, behavioral adjustment, and a possibility to act or to show a behavior.<sup>[14]</sup> The HBM allows for evaluating potential internal factors shaping decision-making by individuals to design effective interventions.<sup>[16]</sup> The review of the related literature in this regard implies that numerous studies have been thus far conducted in Iran using the HBM to reflect on HIV/AIDS preventive behaviors, but no study is available, to the best of authors' knowledge, on vulnerable women living in peripheral neighborhoods.

Considering low levels of knowledge about HIV/AIDS in women as well as its mode of transmission in this province<sup>[13]</sup> and concerning the leading role of women in the family and social health, this study aimed to investigate the effect of educational intervention on promoting HIV/AIDS preventive behaviors in vulnerable women referring to community health centers in peripheral neighborhoods located in the city of Zahedan, Sistan, and Baluchistan Provinces, Iran.

## Materials and Methods

This quasi-experimental study was performed on vulnerable women referring to community health centers

in peripheral neighborhoods in the city of Zahedan from May to December 2019. For this purpose, the sample size with a 95% confidence interval (CI) and a power level of 0.80, regarding the study by Ebrahimpour *et al.*<sup>[17]</sup> and based on the following formula, was estimated equal to 200 women.

$$n = 2 \frac{(z_{\alpha/2} + z_{\beta})^2 \sigma^2}{(\mu_1 - \mu_2)^2}$$

The inclusion criteria for sample selection were HIV/AIDS-free women of reproductive age (as self-reported), vulnerable women, or those exposed to risky behaviors according to the directives released by the Ministry of Health and Medical Education (history of addition in women or their husbands, history of intravenous (IV) drug use addiction in women or their husbands, history of imprisonment in women or their husbands, sex outside marriage, tattoos, etc.), lack of any debilitating physical and mental illnesses, as well as nonattendance in educational programs on HIV/AIDS preventive behaviors. The exclusion criterion was attendance in educational programs on HIV/AIDS preventive behaviors.

Sampling in this study was conducted in several stages. First, the city was divided into four clusters of North, South, East, and West using a probability sampling method. According to the experts working in community health centers, two districts covering higher populations of individuals living in peripheral neighborhoods were selected and based on the list of community health centers of the selected districts, four centers (i.e., two intervention and two control centers) were randomly selected using the Randomizer software via the website [www.randomizer.org](http://www.randomizer.org), and the sample size in each center was determined via quota sampling method. Then, the list of all eligible individuals in the selected centers was extracted based on the inclusion criteria, the samples were selected using simple random sampling method and the Randomizer software, and finally, 200 women (100 individuals for each intervention and control groups) were included [Figure 1].

The data collection tool was a researcher-made questionnaire with acceptable validity and reliability (i.e., Cronbach’s alpha of 0.76–0.85 in different constructs) consisting of three parts: the first part contained 20 items related to demographic characteristics information and history of risky behaviors; the second part comprised of 16 items associated with knowledge assessment in which answers *Yes* (namely, having good levels of knowledge) were scored 1 and answers *No* were awarded 0. With the mode of transmission, methods of prevention, and high-risk groups, 3 correct answers were given a score of

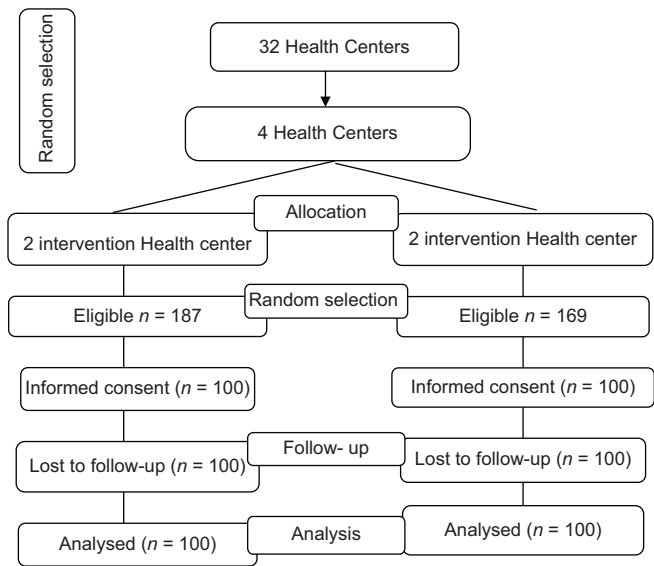


Figure 1: Participant flow

1 and <3 correct answers were granted 0. Moreover, the total score of knowledge was set from 0 to 12. The third part of the questionnaire also included items reflecting on the HBM constructs with 7 items for perceived susceptibility, 8 items for perceived severity, 8 items for perceived benefits, 7 items for perceived barriers, 10 items for self-efficacy, and 7 items for cues to action using a five-point Likert-type scale (*strongly agree, agree, neutral, disagree, and strongly disagree*), scored ranging from 1 to 5.

The educational intervention program consisted of three sessions of 90 min in groups 10–12 cases, often weekly held for the individuals. Educational content included AIDS definition, transmission, prevention methods, misconceptions, and high-risk groups. This content is designed by examining AIDS prevention interventions and programs in Iran and other countries and the guidelines of the WHO. The training was provided only in the intervention group in the form of lectures, group discussions, as well as photos and videos. And after the end meetings, the training booklets were given to the intervention group. The control group, however, received only routine services provided in community health centers.

This study approved by the Research Committee of Zahedan University of Medical Sciences (code of ethics: IR-ZAUMS. REC.1398,024) and registered in the Iranian Registry of Clinical Trials with the code no. 20161126031105N3. The objectives of the study were additionally explained to the participants, and informed consent was obtained from all of them. Data collection was fulfilled before, immediately after, and 1 month after the intervention. The questionnaires were further completed through self-reports by the participants in both groups or the research assistant read the items,

and they completed them in case of illiteracy. It is noteworthy that the research assistant became blinded to the community health centers the participants (namely, intervention and control groups) were referring to during the study to prevent bias. After the completion of the study, the participants in the control group also received educational pamphlets.

### Statistical analysis

Data analysis was performed using the IBM SPSS Statistics software, Version 24 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages, means, and standard deviations) and analytical tests including the Chi-square test, independent *t*-test, repeated-measures analysis of variance (ANOVA), and multivariate linear regression were used. Kolmogorov–Smirnov test was further utilized to determine whether the variables were normal or not.

## Results

In the present study, a total of 200 women were included in the control and intervention groups. The majority of the participants in both groups had secondary school education, and they were married. In terms of risky behaviors, most of them were addicted and noted that they were not using condoms during sexual intercourse. In general, the results of statistical tests also showed no significant difference in terms of demographic variables and risky behaviors between both study groups ( $P < 0.05$ ) [Table 1]. Before starting the intervention, 79% and 77% of those in the intervention and control groups, respectively, did not know about the HIV/AIDS epidemic at all. The results of the multivariate linear regression before the intervention similarly revealed that demographic variables such as age, marital status, level of education, level of income, and employment status had failed to explain variations in knowledge ( $F = 0.847$ ,  $P = 0.497$ ) [Table 2].

Considering the significance of the Mauchly's test of sphericity and lack of sphericity assumption concerning total scores of knowledge assessment and the HBM constructs, univariate analysis results with Greenhouse–Geisser estimate epsilon correction were used. Utilizing this approach, no significant effect was observed over time concerning knowledge ( $F = 434.79$ ,  $df = 1.44$ ), perceived susceptibility ( $F = 223.05$ ,  $df = 1.30$ ), perceived severity ( $F = 153.66$ ,  $df = 1.69$ ), perceived benefits ( $F = 211.46$ ,  $df = 1.66$ ), perceived barriers ( $F = 370.64$ ,  $df = 1.83$ ), self-efficacy ( $F = 192.66$ ,  $df = 1.61$ ), and cues to action ( $F = 133.94$ ,  $df = 1.52$ ) ( $P = 0.000$ ). In addition, a significant difference in interaction effect mean scores was found between the study groups and time intervals in relation to knowledge ( $F = 458.45$ ,  $df = 1.44$ ), perceived susceptibility ( $F = 181.91$ ,  $df = 1.30$ ),

perceived severity ( $F = 168.54$ ,  $df = 1.69$ ), perceived benefits ( $F = 185.42$ ,  $df = 1.66$ ), perceived barriers ( $F = 417.54$ ,  $df = 1.83$ ), self-efficacy ( $F = 218.52$ ,  $df = 1.61$ ), and cues to action ( $F = 130.72$ ,  $df = 1.52$ ) ( $P = 0.000$ ). The repeated-measures ANOVA results also showed that the educational intervention had a significant effect on total scores of knowledge and the HBM constructs in three time intervals, i.e., before, immediately after, and 1 month after the intervention ( $P < 0.05$ ), while the independent *t*-test findings suggested no significant difference between the mean scores of knowledge and the HBM constructs in both groups before the intervention ( $P < 0.05$ ) [Table 3].

Given the significant effect of the educational intervention overtime on both groups, paired comparisons were performed within groups. In this respect, a significant difference was observed in the intervention group in two time intervals after the intervention compared with the pre-intervention stage ( $P < 0.05$ ). However, there was no significant difference between the two time intervals (namely, immediately, and 1 month after the intervention) except in knowledge and the construct of perceived benefits ( $P > 0.05$ ). On the other hand, no significant differences were reported within the three stages of evaluation in the control group [Table 4]. Besides, the results established that no common use of personal tools (e.g., razors and syringes) was observed in 1 month after education in the intervention group. Alcohol and drug abuse were also, respectively, reported by 27% and 38% before the intervention, and these values were equal to 4% and 22% 1 month after it. Before the educational intervention, 92.5% of women reported no condom use during sexual intercourse, but 1 month after intervention, 55.5% of them stated condom use in their sex. No tattoos were correspondingly observed within a month. In addition, Fisher's exact test results showed a statistically significant difference between both groups in terms of risky behaviors ( $P < 0.05$ ).

## Discussion

The results of this study demonstrated that about two-thirds of women in both groups did not know about the HIV/AIDS epidemic before the educational intervention. While, at the post-intervention stage, the large effect size endorsed the role of education on levels of knowledge in the intervention group compared with the controls. In this line, the findings of various studies had revealed that the majority of women did not know about HIV/AIDS.<sup>[18,19]</sup> In this respect, in the study by Haroun *et al.*, 61% of university students had moderate levels of knowledge concerning the HIV/AIDS epidemic.<sup>[20]</sup> These findings were strong evidence that raising awareness of HIV/AIDS needed continuing education, highly supported by national media, the



**Table 1: Demographic characteristics**

Variable	Intervention group (n=100), n (%)	Comparison group (n=100), n (%)	P
Educational level			
Illiterate or secondary	53 (53)	49 (49)	0.510 <sup>a</sup>
Middle	33 (33)	34 (34)	
High school	14 (14)	17 (17)	
Occupational status			
Homemaker	94 (94)	92 (92)	0.813 <sup>a</sup>
Employed	6 (6)	8 (8)	
Marital status			
Married	81 (81)	77 (77)	0.517 <sup>a</sup>
No spouse	19 (19)	23 (23)	
Income (IRR)			
≤ 15,000,000	86 (86)	87 (87)	0.633 <sup>a</sup>
>15,000,000	14 (14)	13 (13)	
Educational level of spouse			
Illiterate or secondary	26 (33.31)	21 (27.27)	0.502 <sup>a</sup>
Middle	30 (37.03)	38 (49.35)	
High school	25 (29.66)	21 (23.38)	
Prison record of a spouse (yes)	16 (19.75)	20 (25.97)	0.611 <sup>a</sup>
Addiction record of a spouse (yes)	61 (75.30)	55 (71.42)	0.557 <sup>a</sup>
Occupational status of spouse			
Unemployed	44 (54.32)	41 (53.24)	0.323 <sup>a</sup>
Self-employed	37 (45.68)	36 (46.76)	
Variable (behavior)			
Drug use (yes)	38 (38)	37 (37)	0.568 <sup>a</sup>
Alcohol consumption (yes)	27 (27)	29 (29)	0.489 <sup>a</sup>
Condom use (no)	75 (92.59)	68 (88.31)	0.273 <sup>a</sup>
Tattoos (yes)	44 (44)	47 (47)	0.670 <sup>a</sup>
Using common means (razor, syringe) (yes)	11 (11)	17 (17)	0.221 <sup>a</sup>
Age (years), mean (SD)	29.01 (7.95)	30.28 (7.39)	0.244 <sup>b</sup>
Marriage age, mean (SD)	19.31 (3.08)	19.08 (2.96)	0.592 <sup>b</sup>
Parity, mean (SD)	2.58 (2.07)	2.74 (1.88)	0.569 <sup>b</sup>

<sup>a</sup>Derived from Chi-square test, <sup>b</sup>Independent - sample t-test, SD=Standard deviation, IRR=Internal rate of return

government, medical staff, as well as affiliated medical teams. However, the important point to mention was the types and the methods of education to significantly influence all population groups in the society.

In the present study, education was effective in increasing perceived susceptibility to HIV/AIDS in the intervention group. It means, following the intervention, these individuals accepted HIV/AIDS as a serious threat in the absence of care, which was consistent with the findings reported by Montazeri and Fallahi<sup>[21]</sup> and Khani Jeihooni *et al.*,<sup>[22]</sup> but in conflict with the results in the studies by Kharazi and Peyman,<sup>[23]</sup> Abebe and Mitikie,<sup>[24]</sup> and Pirzadeh and Sharifirad,<sup>[25]</sup> in which the effects of educational intervention had been investigated on female high school students. It should be noted that risky behaviors such as IV drug use would less likely occur in adolescents, so their perceptions of potentials of developing a specific disease and possible damage can affect the susceptibility of this age group. However, in vulnerable groups, the negative consequences of high-risk behavior can be a reason to increase perceived

sensitivity, which could be the reason for the differences in the studies expressed with the present study. The perceived severity in the intervention group after training showed a significant increase, which was consistent with the studies of Solhi *et al.*,<sup>[26]</sup> Karimi *et al.*,<sup>[27]</sup> and Montanaro and Bryan,<sup>[28]</sup> but it contradicted the results of Garcia and Mann.<sup>[29]</sup> Perceived severity is relatively related to one's experiences. Perhaps, people's constant experience can have a significant impact on this construct, that leads to change or no change in one's behaviour.

All the findings of this study suggested the positive effect of education on the HBM constructs in the intervention group compared with the control one, but the effect size showed the greatest impact on the perceived barriers after knowledge and perceived susceptibility. Lower mean scores of perceived barriers after the intervention correspondingly indicated the importance of education in HIV/AIDS prevention in this study, which was in agreement with the results reported by Lance Coleman,<sup>[30]</sup> Hounton *et al.*,<sup>[31]</sup> and Eshrati *et al.*,<sup>[32]</sup> but the results of the Biden study did not show it.<sup>[33]</sup> Perhaps, the diversity of

**Table 2: Relationship between total scores of knowledge and independent variables before intervention based on multivariate linear regression**

Variable	Unstandardized coefficients		Standardized coefficients, $\beta$	t	P
	B	SE			
Constant	1.80	0.515		3.500	0.001
Age	0.007	0.008	-0.073	0.872	0.384
Education	0.041	0.059	0.055	0.698	0.486
Marital status	0.097	0.142	0.058	0.683	0.495
Income	-0.020	0.075	-0.022	-0.264	0.792
Employment status	0.019	0.061	-0.024	-0.320	0.749

SE=Standard error

**Table 3: Comparison of total scores of knowledge and the Health Belief Model constructs before, immediately after, and 1 month after intervention in both study groups**

Variable	Research steps	Intervention group <sup>a</sup> (n=100)	Comparison group <sup>a</sup> (n=100)	P		$\eta^{2b}$
				A	B	
Knowledge	Before intervention	2 (0.72)	1.84 (0.69)	0.112	0.000	0.762
	Immediately after intervention	8.67 (3)	1.74 (0.62)			
	4 weeks after intervention	9.43 (2.85)	1.75 (0.62)			
Perceived susceptibility	Before intervention	17.14 (5.33)	18.52 (5.96)	0.086	0.000	0.521
	Immediately after intervention	30.17 (2.75)	19.37 (4.32)			
	4 weeks after intervention	29.58 (3.16)	18.94 (3.92)			
Perceived severity	Before intervention	24.58 (5.02)	25.26 (5.03)	0.340	0.000	0.470
	Immediately after intervention	35.69 (3.75)	24.95 (4.96)			
	4 weeks after intervention	35.34 (3.46)	25.07 (5.15)			
Perceived benefits	Before intervention	26.56 (4.40)	25.87 (4.58)	0.279	0.000	0.524
	Immediately after intervention	36.84 (2.93)	25.85 (4.73)			
	4 weeks after intervention	37.24 (3.01)	26.62 (4.75)			
Perceived barriers	Before intervention	26.38 (4.12)	25.75 (3.96)	0.272	0.000	0.612
	Immediately after intervention	13.49 (3.47)	25.89 (4.06)			
	4 weeks after intervention	13.86 (3.50)	26.39 (4.10)			
Self-efficacy	Before intervention	30.69 (6.10)	32.02 (5.91)	0.119	0.000	0.505
	Immediately after intervention	45.49 (3.93)	31.44 (5.88)			
	4 weeks after intervention	44.43 (4.13)	31.73 (8.81)			
Cues to action	Before intervention	22.81 (3.51)	23.35 (3.37)	0.269	0.000	0.421
	Immediately after intervention	30.40 (3.49)	23.19 (3.20)			
	4 weeks after intervention	30.66 (3.66)	23.57 (3.02)			

<sup>a</sup>Mean (SD), <sup>b</sup>Effect size between-subject effects. A=Independent sample t-test, B=Repeated-measures analysis of variance. SD=Standard deviation

**Table 4: Comparison of the difference in mean scores of knowledge and the Health Belief Model constructs before, immediately after, and 1 month after intervention in both study groups**

Variable	Group	MD (95%CI)		
		Pre-post intervention	Post- 4 weeks after intervention	Pre-4 weeks after intervention
Knowledge	Intervention	-6.67* (-7.43--5.90)	-0.76* (-1.15--0.36)	-7.43* (-8.15--6.70)
	Control	0.10 (-0.03-0.23)	-0.01 (-0.13-0.11)	0.09 (-0.06-0.24)
Perceived susceptibility	Intervention	-13.03* (14.49--11.56)	0.59 (0.00-1.17)	-12.44* (-13.91--10.96)
	Control	0.85 (-2.16-0.46)	0.43 (-0.33-1.19)	-0.42 (-2.02-1.18)
Perceived severity	Intervention	-11.11* (-12.47,-9.74)	0.350 (-0.50-1.20)	-10.76* (-12.16--9.35)
	Control	0.31 (-0.62-1.24)	-0.12 (-1.23-0.99)	0.19 (-1.26-1.64)
Perceived benefits	Intervention	-10.28* (-11.40--9.15)	0.60* (0.08-1.12)	-9.68* (-10.73--8.63)
	Control	0.02 (0.82-0.86)	-0.77 (-1.75-0.21)	-0.75 (-2.04-0.54)
Perceived barriers	Intervention	12.89* (11.77-14.00)	-0.37 (-1.21-0.47)	12.52* (11.38-13.65)
	Control	-0.14 (-0.72-0.44)	-0.50 (-1.21-0.21)	-0.64 (-1.52-0.24)
Self-efficacy	Intervention	-14.80* (-16.31--13.28)	1.06 (0.28-1.83)	-13.74* (-15.34--12.13)
	Control	0.58 (-0.56-1.72)	-0.29 (-1.65-1.07)	0.29 (-1.49-2.07)
Cues to action	Intervention	-6.56* (-7.58--5.59)	-0.26 (-0.70-0.18)	-6.85* (-7.93--5.76)
	Control	0.16 (0.40-0.72)	0.38 (-1.10-0.34)	-0.22 (-1.14-0.70)

\*P<0.001. Adjustment for multiple comparisons: Bonferroni. MD=Mean difference, CI=Confidence interval

different types of perceived barriers, including physical, psychological, social, and cultural barriers, as well as the different effects of educational interventions.. Stigma, inadequate education by health-care providers, lack of guidelines on optimal care, or problems with health-care service delivery could be included among the barriers.<sup>[34]</sup>

Furthermore, wrong beliefs and perceptions of timely and appropriate demonstration of health behaviors were among barriers to adopting HIV/AIDS preventive behaviors. Researchers have thus argued that it is difficult to change behavior if perceived barriers are not removed.<sup>[21]</sup> Fear of positive test results and resultant exclusion by family, no access to condom, wrong beliefs in terms of reduced libido during the use of condoms, and other cases originated from low levels of knowledge, were accordingly among barriers to adopting preventive behaviors. It seems that even with the presence of a large number of perceived benefits, expected changes in behavior will not occur until barriers to adoption of health behaviors are not reduced. The results showed that educational intervention could significantly increase self-efficacy scores in the intervention group, while no change was observed in the control group. The effect of high levels of self-efficacy to prevent HIV/AIDS had been also reported in numerous studies.<sup>[35-38]</sup> The impact of education had been additionally mentioned as an effective factor in such investigations.<sup>[17,39,40]</sup>

However, what matters is the effect of this construct on education. The given construct is one of the most effective factors in HIV/AIDS prevention especially in women because it strengthens a woman's sense of personal power to exert control over risky situations.<sup>[41,42]</sup> Following Bandura's Social Learning Theory, levels of self-efficacy in individuals need to be boosted in terms of HIV/AIDS prevention if it is expected to observe behavior change.<sup>[42]</sup> Despite the significant effects of educational intervention on enhancing self-efficacy scores in this study, the effect size showed that other factors along with education could improve self-efficacy and predict stable behavior. These factors include age, gender,<sup>[43]</sup> marital status, husband's violence,<sup>[44,45]</sup> self-confidence,<sup>[46]</sup> employment status, and even culture.<sup>[47,48]</sup> Given that the statistical population in this study was comprised of vulnerable women living in peripheral neighborhoods, education could not suffice to sustain a behavior to prevent infection, but other dimensions need to be investigated and modified, if necessary.

Further results in this study reflected on an increase in the mean scores of cues to action in the intervention group compared with the controls, indicating that educational recommendations could be of utmost importance in enhancing HIV/AIDS preventive behavior. In this

respect, the key role of experts in the provision of health-care services to promote HIV/AIDS preventive behavior is evident, but it is of note that types and methods of education can perhaps play a more important role in the effectiveness of enhancing health behavior.

Concerning risky behaviors, the results showed that condom use had consistently grown in the intervention group following education, which was consistent with some studies<sup>[17,28,49]</sup> and was not consistent with Baker *et al.* study.<sup>[50]</sup> This may be due to the contradictions of the target population in studies because young people and adolescents do not consider themselves invincible and at risk, so they may use condoms less. Besides, no significant difference was observed in alcohol consumption and drug abuse in the intervention group compared with the control one, implying that such behaviors in the intervention group had minimized. Hence, it can be concluded that the performance of the individuals in adopting HIV/AIDS preventive behavior in the intervention group receiving an education was better than that in the controls.

One of the strengths of this study was addressing important dimensions such as HIV/AIDS and its prevention in vulnerable women living in peripheral neighborhoods under socially, economically, and culturally adverse conditions, which had been previously less considered. Among the limitations of this study was the lack of follow-ups within longer intervals to review the stability of health behavior, so consideration of this issue in future studies can picture richer findings. Failure to pay attention to the effective predictive factors in model constructs was the next limitation of the study. Moreover, vulnerable women included in this study were also from disadvantaged and low-income neighborhoods, which would affect the generalizability of the findings to other socioeconomic groups. And, the last point is that the data in this study were collected via self-reports and the results can be effectively provided that the women had correct answers.

## Conclusion

The results of this study showed that the educational intervention program based on the HBM had a significant effect on improving levels of AIDS prevention behaviors in vulnerable women. However, it is suggested that other models be examined and the results be compared. Besides, the study of various factors affecting the constructs of the model is recommended.

Among them, we can name the social factors of health because these factors can affect the stability of behavior. Identifying these factors in training and other necessary measures in this field is helpful,

which can lead to the promotion and sustainability of preventive behaviors. Therefore, extensive research that designing community-based intervention programs is recommended to help identify and link predictive factors to model constructs.

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### Conflicts of interest

There are no conflicts of interest.

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