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# The effect of education based on the theory of planned behavior on the intention of vaccination against human papillomavirus in female students: A controlled educational trial

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## Abstract:

**BACKGROUND:** Human papillomavirus (HPV) is the most common sexually transmitted infection and causes more than 90% of cervical cancers. The highest rate of infection occurs between the ages of 18 and 28. This study aimed to determine the effect of education based on the theory of planned behavior (TPB) on the intention of vaccination against HPV in female students.

**MATERIALS AND METHODS:** This controlled educational trial study was performed on 72 female students aged 18–26 years of Mashhad University of Medical Sciences by random assignment to intervention and control groups. For random assignment in the intervention and control groups, random blocking with four blocks was performed using a random number table with a ratio of 1:1. Data collection tools included demographic questionnaire, awareness about HPV vaccination, and TPB theory constructs. The control group was received the university routine training. The intervention group was received the virtual group training in four sessions, 60–90 min at weekly intervals and with educational content including TPB constructs on HPV vaccination with the method of lecture training, group discussion, questions and answers, and presentation of training package. Questionnaires were completed before, instantly, and 1 month after the educational intervention. Data were analyzed using the Chi-square test, Fisher's exact, *t*-test, Mann–Whitney test, and Friedman test.

**RESULTS:** The mean age of students was  $18.9 \pm 1.1$  years. The intervention and control groups were homogeneous in terms of demographic characteristics ( $P > 0.05$ ). Before the intervention, the mean score of model constructs did not show a statistically significant difference between the two groups ( $P > 0.05$ ), but after the intervention, in the intervention group, mean scores of attitude, subjective norms, perceived behavioral control, and behavioral intention in the intervention group was significantly higher than the control group ( $P < 0.001$ ). In the intervention group, the difference in the mean score of HPV vaccination intention instantly ( $P < 0.001$ ) and 1 month ( $P < 0.001$ ) after the intervention significantly increased.

**CONCLUSION:** TPB-based education was effective in increasing attitudes, subjective norms, and perceived behavioral control and the intention to vaccinate against HPV in the female students of Mashhad University of Medical Sciences. Therefore, it is suggested that the present educational intervention be widely used to educate female students.

## Keywords:

Education, papillomavirus vaccine, student, theory of planned behavior

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## Introduction

Human papillomavirus (HPV) is a sexually transmitted pathogen that causes anogenital disease in women and is one of the most common sexually transmitted infections.<sup>[1,2]</sup> Low-risk types of HPV, such as types 6 and 11, can cause genital warts, and high-risk types, such as types 16 and 18, cause 70% of cervical cancers, 80% of anal cancers, 60% of vaginal cancers, and 40% of vulvar cancers.<sup>[3]</sup> Risk factors for HPV infection include age, smoking, prolonged use of hormonal pills, sexual intercourse with different people, infection with *Chlamydia trachomatis*, and not using a condom, and the most important risk factors are having multiple sexual partners.<sup>[3]</sup> The World Health Organization (WHO) estimates that by 2030, cervical cancer will be the cause of death of about 474,000 women a year, and 95% of these deaths will occur in low- and middle-income countries.<sup>[4]</sup> Despite cytological screening and the start of HPV vaccination in some countries, there are still approximately 530,000 new cases and 275,000 deaths from cervical cancer each year.<sup>[5]</sup> Studies have shown that more than 75% of sexually active people become infected with HPV during their lifetime,<sup>[6]</sup> and the highest rate of infection occurs between the ages of 18 and 28.<sup>[7]</sup> In Iran, the prevalence of infection with HPV among patients with cervical cancer is 70%–84%<sup>[8]</sup> and in a healthy population is reported to be about 6%–8.8%.<sup>[9]</sup>

One effective way to prevent it is to get vaccinated against HPV, which can reduce the risk of cervical cancer, preexisting lesions, and genital warts.<sup>[10]</sup> The WHO recommends vaccination of girls aged 9–13 years (before experiencing sexual contact).<sup>[11]</sup> HPV vaccination is not included in Iran's general vaccination schedule,<sup>[12]</sup> but reducing cervical cancer is one of the goals of the Ministry of Health of Iran, so that cervical cancer screening program for women over 30 years of age is performed in health centers.<sup>[12]</sup> Studies have shown that the level of awareness of the HPV virus, cervical cancer, and vaccine acceptance is very low among young people. In the study of Fakour *et al.*, the level of knowledge and attitude of medical students about HPV vaccination was low.<sup>[13]</sup> In the study of Pourkazemi *et al.*, the results showed that the mean score of knowledge of 57.2% of medical students about HPV and HPV vaccine was at an undesirable level.<sup>[14]</sup> However, medical and paramedical students have been studying HPV and HPV prevention and treatment strategies. The study of Salehifar *et al.* showed a significant relationship between knowledge about cervical cancer and attitudes toward vaccines as predictors of willingness to accept vaccines.<sup>[15]</sup>

Due to the complexities of behavior, a change in consciousness will not always lead to a change in attitude

and behavior because the individual's environment may not allow behavior to occur.<sup>[16]</sup> The effectiveness of health education programs depends to a large extent on the correct use of theories,<sup>[16]</sup> and the most practical theory of health education in the field of behavior change is the theory of planned behavior (TPB)<sup>[17]</sup> which predicts the occurrence of a specific behavior, provided that the person intends to do so. According to this theory, the intention to perform a behavior is predicted by three factors: attitude, subjective norms, and perceived behavioral control.<sup>[18]</sup> Catalano *et al.* in a cross-sectional study aimed at using TPB to predict HPV vaccination intention in college males showed that attitudes toward behavior and mental norm were significant predictors of behavioral intention, accounting for 58% of the variance.<sup>[19]</sup> Studies on the medical community showed that they do not have comprehensive information on HPV and ways to prevent it.<sup>[20]</sup> Therefore, it is predicted that by promoting attitudes, subjective norms, and perceived behavioral control through education, it may be possible to increase the intention to get vaccinated against HPV. Therefore, considering the prevalence and complications of HPV and the importance of preventing it in reducing cervical cancer, which is one of the goals of the Ministry of Health, the lack of HPV vaccine in the Iranian vaccination program, the role of midwives in programs to reduce cervical cancer, the importance of training in the student population as a target population in terms of age and impact on other people in the community, and the lack of a similar study in this regard, the present study was designed to determine the effect of TPB-based education on intention of HPV vaccination in female students of Mashhad University of Medical Sciences.

## Materials and Methods

### Study design and setting

This study was a controlled educational trial with two groups of intervention and control and a pretest–posttest that was performed on 72 female students of Mashhad University of Medical Sciences in the academic year 2020–2021. Due to the prevalence of COVID-19 pandemic at the time of this study and holding student training classes virtually and much less students in the faculties, the researcher attended the faculties and also the central self-service of Mashhad University of Medical Sciences and students who are eligible to study.

### Study participants and sampling

There was not similar study based on the current review of literature. Therefore, Sample size was calculated based on a Cohen effect size  $d = 0.7$ ,  $\alpha$  error probability = 0.05 and Power (1- $\beta$  error probability) = 0.8, and with the aim of comparing the average of two independent groups

using G Power 3.1.5 software; in which determined 34 people in each group.

Due to the possibility of sample loss, 74 students who met the inclusion criteria were included in the study. They entered the study by convenience sampling and after completing the written consent. For random allocation in the intervention and control groups, random blocking with four blocks was performed using a random number table with a ratio of 1:1. During the study, one person from the intervention group was excluded due to not completing the questionnaires and one person from the control group was excluded due to unwillingness to continue the study, and finally, the study ended with 72 people [Figure 1].

### Data collection tool and technique

The data collection process lasted from December 2020 to May 2021. Inclusion criteria included: willingness to participate in the study, being Iranian, age range 18–26 years, resident of Mashhad, first-year student, not participating in the same study during the last 12 months, no history of HPV vaccination, no sex, being single, not having genital warts, not having contraindications to HPV vaccination, and not experiencing a major stressful event in the past 6 months. Exclusion criteria included:

incomplete and incorrect completion of more than 10% of the questionnaire questions, not participating in more than one training session, the occurrence of a major stressful incident during the study, and resignation of the study.

Data collection tools in this study were questionnaires that were developed based on a review of published texts and articles, which included a demographic questionnaire, knowledge questionnaire about HPV vaccination, and a researcher-made questionnaire on the constructs of planned theory of behavior. Demographic questionnaire included: age, field of study, college, parents' education, household income, and number of siblings. The awareness questionnaire included 15 questions about cervical cancer, HPV, and its vaccine adapted from Salehifar's study.<sup>[15]</sup> The TPB Constructs Questionnaire consisted of attitudes (7 questions), subjective norms (4 questions), perceived behavioral control (6 questions), and intention to vaccinate against HPV (3 questions), adapted from the Catalan study.<sup>[19]</sup> Awareness score was obtained based on the correct answer to each question of the knowledge questionnaire so that a higher score indicated more awareness. The questions of the TPB Constructs Questionnaire with a Likert scale and a scale of 1 to 5 were scored, so that in the constructs of attitude,

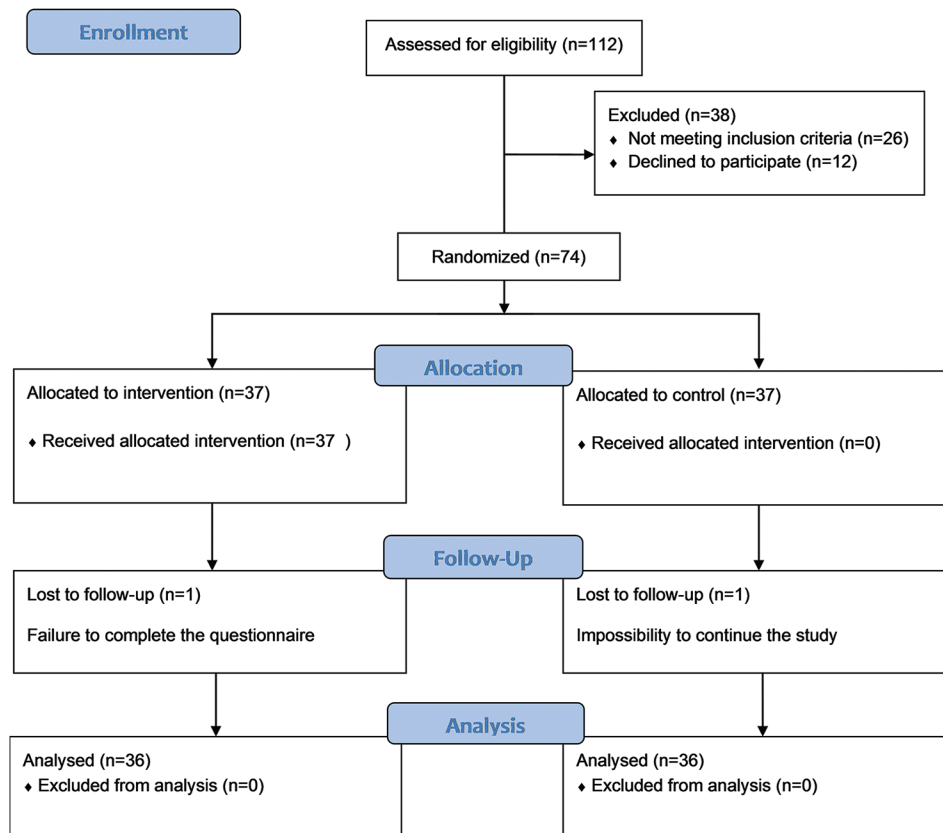


Figure 1: Consort diagram of the study

subjective norms, and perceived behavioral control, a higher score indicated a more positive attitude, subjective norms, perceived behavioral control, and finally, the intention construct, in which the increase in score also meant an increase in intention to HPV vaccination. Data were collected through self-reported online questionnaires. The questionnaire's validity and reliability were measured. The content validity of the questionnaires was measured using content validity ratio (CVR) and content validity index (CVI) using seven faculty members of the School of Nursing and Midwifery of Mashhad University of Medical Sciences. The CVI = 0.87 and CVR = 0.89 were calculated. The reliability of the knowledge questionnaire was confirmed by test-retest method ( $r = 0.87$ ), and its internal consistency was confirmed by Cronbach's alpha coefficient ( $r = 0.87$ ). Internal consistency of TPB Constructs Questionnaire was confirmed by Cronbach's alpha coefficient ( $r = 0.82$ ). The questionnaires were completed by the research units in three stages, before, instantly, and 1 month after the intervention.

The control group was received the university routine training including the virology course. For the students of the intervention group, in addition to the routine university education, the educational intervention was performed in the form of four virtual group training sessions (three groups of 10 and one group of 6 students) of 60–90 min through a webinar with emphasis on TPB constructs by the researcher on a weekly basis. The content of the training package included: knowledge

about HPV and its vaccines, cervical cancer and its prevention, and treatment methods, which was prepared based on TPB constructs under the supervision of supervisor and co-supervisors. The teaching methods were in the form of lectures using PowerPoint and video screening, group discussion, brainstorming, interviewing people with a history of HPV vaccine injection, and questions and answers [Table 1]. In order to emphasize the construct of subjective norms and the prominent role of mothers in the intention to vaccinate their daughters against HPV, they attended virtual training sessions and an educational pamphlet with approved content was provided to mothers.

To analyze baseline and post intervention data, first normality of variables were assessed by ShapiroWilk test and then based the type of variables, independent t test or Mann Whitney tests were used. Chi-square and Fisher's exact tests were used to examine the relationship between category variables and Friedman test was used for group comparison. Data analysis was performed using SPSS software version 25 (IBM Company, New York, NY, USA), and a significance level of 0.05 was considered.

### Ethical consideration

This study was approved by the ethics committee with the code of IR.MUMS.NURSE.REC.1399.023 and was registered in the Iranian Registry of Clinical Trials with the code IRCT20200622047883N1. In order to observe ethical considerations at the end of the study, the training package was given to the control group.

**Table 1: Educational content of the sessions**

Session	Aim	Subjects	Educational method
First session	Emphasis on attitude	Knowledge of on female's reproductive system, knowledge on HPV, prevalence of HPV in Iran and the world, information about manifestations and diagnosis and methods of HPV transmission and its complications, methods of HPV prevention and treatment	Organized lecture Show PowerPoint slides Question and answer
Second session	Emphasis on subjective norm	Strategies to reduce the incidence of human papillomavirus and prevent its complications Talk about cervical cancer, its signs and symptoms, ways to treat it and ways to prevent it Showing an educational video about cervical cancer Students' mothers participated in this session	Organized lecture Group discussion Show PowerPoint slides Show educational videos Question and answer
Third session	Emphasis on perceived behavioral control	Talk about HPV vaccine, its benefits and side effects Barriers to HPV vaccination and its solutions Showing videos related to the HPV vaccine Holding a group discussion and brainstorming about the benefits and barriers to HPV vaccination Broadcast an interview with a person who has been vaccinated with the HPV vaccine	Group discussion Show PowerPoint slides Brainstorming question and answer
Fourth session	Emphasis on subjective norms and perceived behavioral control	Express students' experiences about the HPV vaccine and the benefits of HPV vaccination Talk about vaccination problems and ways to deal with it Overview and summary of all sessions	Organized lecture Group discussion Show PowerPoint slides Show educational videos Brainstorming question and answer

HPV=Human papillomavirus



## Results

The demographic information is shown in Table 2. The mean age of students was  $18.9 \pm 1.1$  years. According to Mann-Whitney test the two groups of intervention and control were homogeneous in terms of age ( $P = 0.7$ ). Furthermore, based on the results of Chi-square test, the two groups were homogeneous in terms of faculty of study ( $P = 0.9$ ), field of study ( $P = 0.9$ ), mother education ( $P = 0.7$ ), and household income ( $P = 0.9$ ) [Table 2].

The mean and standard deviation of the TPB constructs score and the knowledge of the students of the two groups during the three stages of measurement are reported in Table 2. Mann-Whitney test did not show a significant difference between the mean and standard deviation of the scores of TPB constructs and knowledge in the pretest stage in the intervention and control groups ( $P = 0.1$ ). Regarding knowledge and constructs of attitudes and subjective norms and perceived behavioral control,

instantly and 1 month after the educational intervention, the difference between the mean and standard deviation of the mentioned scores in the intervention group increased compared to the control group. Mann-Whitney test showed a significant difference ( $P < 0.001$ ). Intragroup comparison, Friedman test showed that in the intervention group, the difference between the previous stages, instantly and 1 month later, was significant ( $P < 0.001$ ). Therefore, the implementation of educational intervention for the intervention group caused a significant improvement in knowledge and constructs of TPB immediately after the intervention, and this effect remained stable after 1 month compared to the control group. Furthermore, Friedman test showed that the educational intervention caused a significant difference in the mean scores of TPB constructs between the three stages before, instantly, and 1 month after the intervention in the intervention group ( $P < 0.001$ ) [Table 3].

The results of Mann-Whitney test showed that there was no statistically significant difference between

**Table 2: Demographic characteristics in the two groups of intervention and control**

Variable	Category	Intervention group (n=36)	Control group (n=36)	The significance level (P)
Age, mean±SD		18.9±1.1	19±1.2	0.7*
Faculty of study, n (%)	Medical	2 (5.6)	4 (11.1)	0.9**
	Dentistry	3 (8.3)	2 (5.6)	
	Pharmacology	2 (5.6)	2 (5.6)	
	Nursing-midwifery	13 (36.1)	12 (33.3)	
	Health	4 (11.1)	4 (11.1)	
Mother's education, n (%)	Paramedical sciences	12 (33.3)	12 (33.3)	0.7**
	Cycle degree	5 (13.9)	4 (11.1)	
	Diploma	11 (30.6)	14 (38.9)	
Household income, n (%)	Academic degree	20 (55.6)	18 (50)	0.9**
	Less than enough living expenses	3 (8.3)	4 (11.1)	
	Enough living expenses	20 (55.6)	19 (52.8)	
	More than enough for living expenses	13 (36.1)	13 (36.1)	

\*Mann-Whitney test, \*\*Chi-square test. SD=Standard deviation

**Table 3: Comparison of mean and standard deviation of theory of planned behavior constructs and students' knowledge about human papillomavirus vaccination before and after intervention in the intervention and control groups**

Variable	Time	Mean±SD		The significance level	
		Intervention group (n=36)	Control group (n=36)	Group (Z, P)	Time ( $\chi^2$ , P)
Attitude	Before intervention	16.2±3.6	19±5.6	-7.39, <0.001*	68.2, <0.001**
	Instantly after the intervention	28.8±2.4	18.9±5.4		
	1 month after the intervention	28.9±2.5	17±3.8		
Subjective norms	Before intervention	8.8±2.1	10.5±3.5	-5.79, <0.001*	68.4, <0.001**
	Instantly after the intervention	15.1±1.8	10.2±3.4		
	1 month after the intervention	15.3±1.7	9.6±2.7		
Perceived behavioral control	Before intervention	12.3±3.3	15.4±5.5	-6.6, <0.001*	69.2, <0.001**
	Instantly after the intervention	25.4±2.2	14.8±5.2		
	1 month after the intervention	25.5±2.1	14.3±4.6		
Knowledge	Before intervention	4.6±1.2	4±1.2	-7.3, <0.001*	69.2, <0.001**
	Instantly after the intervention	14.2±0.9	4.1±1.3		
	1 month after the intervention	14.4±0.9	3.9±1.4		

\*Mann-Whitney test, \*\*Friedman test. SD=Standard deviation

the intervention and control groups before the intervention ( $P = 0.5$ ), but after the intervention, the mean vaccination intention score in the intervention group was significantly higher than the control group ( $P < 0.001$ ). In the control group according to Friedman test, there was no statistically significant difference between the scores of intention to vaccinate before, instantly, and 1 month after the educational intervention ( $P = 0.5$ ), while the intervention group had a significant difference between the scores of vaccination intention instantly and 1 month after the educational intervention compared to before intervention ( $P < 0.001$ ). Therefore, the implementation of the educational intervention caused a significant intention to vaccinate against HPV after the educational intervention [Table 4].

### Discussion

This study was designed and implemented to determine the effect of an educational intervention on increasing the intention to vaccinate against HPV in female students based on TPB. The educational intervention showed to be effective. For specifying study purpose about the amount of implemented educational programs effect, results showed positive effects of theory-based educational intervention on knowledge about the HPV vaccine and made improvements in the subconstructs of TPB, that is, behavioral intention, subjective norm, attitude toward behavior, and perceived behavioral control in the intervention group.

After implementing educational intervention, the mean score of knowledge and attitude toward HPV vaccination in the students was improved. Consistent with the results of the present study, the study of Said showed that educational intervention improves women’s knowledge and attitude about cervical cancer screening.<sup>[21]</sup> In Said’s study, the training process was performed using lecture methods, group discussion, and question and answer and it was not a theory-based approach, but nevertheless, the same results were obtained in the present study. Vasheghani *et al.*’s study also showed that there is a significant difference between attitudes before and after the educational intervention to perform Pap smear test among women in the intervention group.<sup>[22]</sup> In Vasheghani *et al.*’s study, the educational process was based on TPB, which showed that the educational

intervention process promotes and improves attitude in individuals. Gerend and Shepherd’s study (2012) compared the Health Belief Model and the TPB in prediction of HPV vaccination and showed that there was no statistically significant difference in the attitude to HPV vaccination between before and after the intervention in the intervention group.<sup>[23]</sup> Gerend and Shepherd study was performed 2 years after the general HPV vaccination in the U. S.

The findings of the present study showed that the mean score of subjective norms after the educational intervention in the intervention group was significantly different from the control group and indicated the effectiveness of the educational intervention in increasing subjective norms in the intention to vaccinate against HPV after the educational intervention. Moradi *et al.*’s study showed that subjective norms were one of the most important predictors of the intention and behavior of Pap smear test among women.<sup>[24]</sup> Another study by Gerend *et al.* found that subjective norms were positively associated with vaccination intent.<sup>[23]</sup> In these studies, subjective norms emerged as predictors of intention independently, emphasizing the social nature of decision-making in health behaviors. However, Sargazi *et al.*’s study showed that there was no statistically significant difference between the two stages before and after the intervention of subjective norms in relation to behaviors leading to early detection of breast cancer in the intervention group.<sup>[25]</sup>

The findings of the present study showed that there was a statistically significant difference in the mean score of perceived behavioral control after the educational intervention in the intervention group compared to the control group and showed the effect of education in removing barriers to improve perceived behavioral control. Getahun *et al.*’s study showed that perceived behavior control of women significantly affects the intention and behavior of cervical cancer screening.<sup>[26]</sup>

Furthermore, the results of the present study showed that the difference between the mean scores of TPB constructs in the three stages before, instantly, and 1 month after training in the intervention group was statistically significant, which showed that the educational intervention improved TPB constructs in the intervention group.

**Table 4: Comparison of human papillomavirus vaccination intention scores in the intervention and control groups**

Group	Mean±SD			The significance level (P)
	Before intervention	Instantly after the intervention	1 month after the intervention	
Intervention group (n=36)	6.3±1.8	12.2±1.3	12.3±1.2	<0.001**
Control group (n=36)	6.8±2.3	7.2±2.1	6.9±1.8	0.5**
The significance level (P)	0.5	<0.001	<0.001	

\*Mann-Whitney test, \*\*Friedman test. SD=Standard deviation

After educational intervention and during 1 month after the intervention follow-up, the mean of intention in HPV vaccination for girl students was calculated. It is noted that making decision for doing a behavior improves the goal because improving intention increases the possibility of a behavior.<sup>[27]</sup>

The results of the present study showed that the mean score of HPV vaccination intention after educational intervention in the intervention group compared to the control group was increased statistically significant, then the educational intervention was effective on increasing the intention of HPV vaccination. These results were consistent with the results of Villanueva *et al.*'s study, which was an observational cross-sectional descriptive study which showed that the intention toward personal vaccination increased significantly after completing the questionnaire.<sup>[28]</sup> The results of our study were in line with the results of the Mokarrami *et al.*'s study that was conducted on health ambassadors with the aim of investigating the effect of education based on the TPB on vaginitis prevention behaviors.<sup>[23]</sup>

The results of the Porter *et al.*'s study was in contrast to the results of the present study.<sup>[29]</sup> Porter *et al.* conducted a study on parents of girls 9 to 17 years old to investigate the effect of cancer information on human papillomavirus vaccine. The results of the study showed that there was no statistically significant difference between the intervention and control groups in terms of vaccination intention. Neither message had effect on intent to vaccinate, highlighting need for research to identify successful messaging strategies for HPV.<sup>[29]</sup> The results of our study showed that training based on the TPB through theoretical constructs increases the intention to perform HPV vaccination behavior.

### Limitation and recommendation

One of the limitations of this study was the differences in personality, psychological status, and cultural background of the research units that can affect the way they respond to the questionnaires. In this study, we tried to control this concern to some extent by randomizing the sampling method. Another limitation was the self-reported nature of the questionnaires, which was controlled to some extent by encouraging the samples to complete questionnaire honestly and emphasizing on the confidentiality of the information.

### Conclusion

Education based on the TPB was effective in increasing attitudes, subjective norms, and perceived behavioral control and the intention to vaccinate against HPV in female students of Mashhad University of Medical Sciences. Therefore, it is suggested that the present

educational package, which was based on TPB, to be used to educate female students as an effective way to get acquainted with the HPV vaccine and its benefits in order to improve the health of girls and women.

The results of the present study could be used for health planning in order to prevent the incidence of cervical cancer and genital warts, including the development of training programs for health professionals of health centers to educate and counsel girls and increase vaccination intension against HPV. Implementing educational interventions will enable girls to learn appropriate and effective methods of HPV preventing, which can reduce the incidence of cervical cancers, which will ultimately helping in step with the Iran and the WHO's goal of reducing cancers.

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### Conflicts of interest

The authors declared no conflict of interest.

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