

A Study Analyzing the Intention of HPV Vaccination Among Chinese Female College Students Based on Social Cognitive Theory

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Abstract. According to the statistics of the World Health Organization, cancer is an important cause affecting the life expectancy of human beings. Cervical cancer is one of the most common cancers among the female population. Then a major cause of this disease in women is human papillomavirus (HPV) infection. Therefore, it is necessary to promote the popularization of HPV vaccination to prevent and control the disease, and college students should be more concerned about it as the age-eligible vaccination population. On the basis of the social cognitive theory (SCT), this study will use a questionnaire method to investigate the correlation between female college students' knowledge of HPV and HPV vaccine, as well as subjective norms, self-efficacy, and expectation of the vaccination outcome and their intention to be vaccinated with HPV vaccine. The results suggest that the SCT model is effective in explaining the intentions of Chinese female college students to receive HPV vaccination. Overall, greater knowledge of HPV and its vaccine-related aspects leads to higher self-efficacy, which in turn leads to positive outcome expectations and higher vaccination intentions, while higher subjective norms also facilitate this process. Therefore, the above aspects should be taken into account to increase the HPV vaccination rate in China in the future.

Keywords: Human papillomavirus, HPV vaccine, college women, social cognitive theory.

1. Introduction

According to the World Health Organization (WHO) 2022, cancer is one of the leading causes of human death in the world [1]. Among them, cervical cancer is the fourth most common cancer among women worldwide [2]. In addition, the percentage of cancers caused by HPV infection has reached 5% of all cancers globally, and WHO estimates that 625,600 women and 69,400 men develop cancer each year as a result [3]. Since vaccination against HPV can prevent these cancers, it is essential for people of the appropriate age group to receive the appropriate vaccine (HPV vaccine) in a timely manner [3].

The human papillomavirus (HPV) contains 200 known viruses, most of which do not pose a serious threat to the body, but some of the high-risk types may cause genital warts or cancer [3]. These viruses are mainly transmitted through sexual contact, and most people become infected after further sexual activity [3]. Condoms can play a role in preventing this type of virus, but they do not completely block them, as part of the genital skin can still be exposed [3]. However, 90% of people who are infected with HPV will recover on their own [3]. HPV types 16 and 18 cause nearly 50% of cervical cancers with severe precancerous lesions [2]. The incidence of cervical cancer has been on the rise in some areas in recent years, which is all the more reason to pay attention together [4].

In China, cervical cancer is also the sixth most prevalent cancer among women, and HPV infection is a known cause of cervical cancer [5]. In July 2017, China released the "Guidelines for Comprehensive Prevention and Control of Cervical Cancer", which put forward a three-tiered system of prevention and control [6]. In December 2020, the State Council of China announced its support for the Global Strategy for Accelerated Elimination of Cervical Cancer issued by the World Health Organization in the same year [7]. There are currently three imported HPV vaccines and two domestic HPV vaccines approved for registration in China. And despite the fact that in recent years China has relaxed the age at which the HPV 9-valent vaccine is suitable for vaccination, at this stage China's HPV vaccination is still dominated by a small number of individuals, with a very low vaccination

rate. This is because the vaccine has been on the market in China for a relatively short period of time (it was approved in mainland China in 2016) and has not been included in the government's immunization program [8]. Therefore, this study will investigate the intention of female college students in China to receive the HPV vaccine through questionnaires, analyze the factors that may be associated with their willingness and intention to complete the vaccine, and try to put forward some strategies to help promote the popularization of the HPV vaccine.

In order to better explore the factors associated with the intention of Chinese female college students to be vaccinated, the present study used social cognitive theory as the basis to investigate the possible correlates of the group's intention to receive HPV vaccination from the perspective of HPV and HPV vaccine-related knowledge, self-efficacy for HPV vaccination, subjective norms, and the expectation of the outcome of HPV vaccination as the dependent variables.

2. Literature Review

First of all, for HPV-related research, most of the past studies on HPV vaccination have been conducted in developed countries such as America. The subject population is mostly the general adult, and some of the studies have taken the college student population as the main research object, considering the different attitudes of men and women about HPV, etc. The results obtained include, for example, in America, male adults may know about HPV and the HPV vaccine than females, but there is no sex difference in the perceived effectiveness of the vaccine in the prevention of cancer [9].

Most of the past studies on intention to receive the HPV vaccine are based on cognitive risk and the theory of planned behavior. For example, in *The influence of effect on HPV vaccine decision making in an HPV vaccine naïve college student population* mentions that college students are ideal targets for HPV vaccine decision-making interventions and focuses on the role of cognitive risk, affective risk in the relationship between intentions toward the HPV vaccine; and in *Social Determinants of HPV Vaccination Intentions Among Black Mothers with Young Daughters* investigated the social determinants of Black mothers' cognitive attitudes related to the HPV vaccine through the TPB and Health Beliefs Model [10, 11]. In studies using social cognitive theory, in addition to examining basic behavioral activities such as those related to physical activity, studies have also reported that situational awareness and self-control can increase HPV vaccination intentions [12, 13].

In some studies, on HPV vaccination among Chinese college students, more attention has been paid to the dissemination of knowledge and understanding of the vaccine and raising their awareness of the risk of HPV infection, which is beneficial for raising awareness of HPV vaccination [14,15]. In addition to this, several studies have explored that social norms such as receiving more support from family members and physicians are associated with higher HPV vaccination intentions, and that higher self-efficacy from this is also associated with increased vaccine intentions [16]. The increase in research in recent years on males' attitudes and willingness to HPV and the vaccine has been beneficial to public health, but the female population, which is more susceptible to HPV, needs further attention and research, especially in the section for female college students.

Social cognitive theory was first proposed by Bandura and has been widely applied to understand, explain, and predict the interactions between behavior and an individual's perceptions of the environment and environmental factors. Bandura opposes the traditional behaviorist view that human behavior is influenced only by external factors and believes that human behavior is the result of the interaction between internal and external influences, emphasizing the interactions between thoughts and behaviors as well as behaviors and thoughts.

Applied to this study, SCT can be used as a basis for a more comprehensive study of HPV vaccination intentions among Chinese female college students. This can be done not only by considering factors based on individual attitudes, but also by involving other social and behavioral factors. Therefore, the theoretical framework of SCT can better predict behavioral intentions and the implementation of health behaviors, which can not only obtain behavioral and social information to

provide data for public health and safety, but also remind individuals to take the correct preventive measures. Previous studies have applied SCT to preventive interventions for some basic behaviors of college students, such as safe sex, physical activity, and tobacco use, so it is feasible to apply this model to the study of HPV vaccination.

3. Method

3.1. Research Objects

There are two reasons for this paper to use a group of female college students in China as the study population. On the one hand, it is because college students are more sexually active and can begin to make their own choices about whether or not to be vaccinated, with less family intervention than in middle school. On the other hand, with China's openness to global cultural exchanges, many college students begin to have their first sexual intercourse during college and engage in high-risk sexual behaviors [17,18]. The female population has a higher probability of HPV causing cervical cancer and other diseases, so it needs to be paid more attention to. Therefore, the study population was determined.

3.2. Questionnaire

This study utilized a cross-sectional design with a questionnaire survey, and data were collected through the online questionnaire star software. The questionnaires were anonymous, and the participants covered 30 provincial administrative regions in China. 568 questionnaires were collected, of which 405 were valid (excluding invalid questionnaires, which were filled in by males, those who had been vaccinated, those who had not attended university, and those who might not have been filled in conscientiously).

Data were analyzed using SPSS 27.0 for correlation analysis and Amos 26.0 for path analysis.

3.3. Variable Selection

Regarding the selection of variables, this study selected five variables: knowledge of HPV and HPV vaccine, self-efficacy, subjective norms, outcome expectations, and intention to receive the vaccine. Knowledge and outcome expectations are at the level of individual perception of the environment, subjective norms are at the level of the environment, and self-efficacy and intention to act are at the level of behavior. Bandura pointed out that self-efficacy, outcome expectations and intention to act are the most basic elements in many studies, so this study made the above choice of experimental variables. The following is a description of the variables of the study (Figure 1).

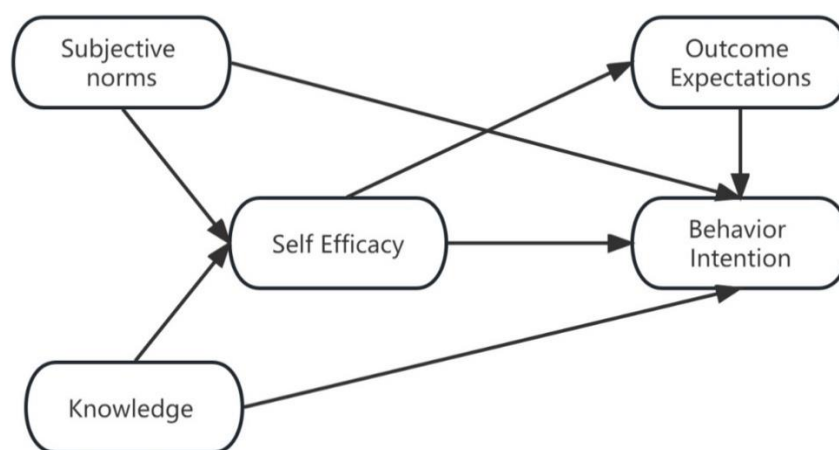


Fig. 1 Five variables

3.3.1 Behavioral intention to be vaccinated against HPV

Behavioral intention is crucial for assessing the actual behavior of the vaccination variable, and it is generally believed that behavioral intention is a precedent and necessary condition for the implementation of the behavior, and when the behavioral outcome is difficult to measure directly, behavioral intention can be analyzed in the same way to give the preliminary results of the study. In this study, considering the practical difficulties that may be encountered in receiving HPV vaccination in China, the timeframe for the measurement of intention to vaccinate was expanded to two years, which means that the question was set up with the intention to receive HPV vaccine within the next two years as the criterion for behavioral intention. These practical difficulties include situations such as an oversupply of vaccine, queuing for scheduled vaccinations, and too many people of the right age for vaccination.

3.3.2 Self-efficacy for HPV vaccination

Self-efficacy indicates the degree to which a person trusts himself/herself to control his/her own behavior, and usually encompasses the degree to which an individual is confident in his/her ability to do something in spite of the challenges of his/her environment, namely confidence. According to existing research, the higher a person's self-efficacy, the greater the willingness to act. This means that the more confident a person is in their ability to accomplish something, the more willing they are to do it [19].

H1: Self-efficacy for HPV vaccination is positively associated with the behavioral intention to receive HPV vaccine among the research targets.

3.3.3 Knowledge of HPV and HPV Vaccine

Knowledge is related to factual elements learned and insights gained about actions, individuals, object perspectives, and environments. In general, the more knowledgeable a person is about something, the more confident he or she is in his or her ability to do it, and the more likely he or she is to accomplish the event in question. Previous studies have shown that knowledge of HPV and its vaccines is associated with the act of getting vaccinated, and that the greater the knowledge, the higher the intention to perform the act. Knowledge of HPV and its vaccines is also associated with higher self-efficacy.

H2: Knowledge of HPV and HPV vaccine is positively associated with the intention of the research targets to receive the vaccine.

H3: There is a positive correlation between knowledge of HPV and HPV vaccine and self-efficacy for this vaccination.

3.3.4 Outcome expectations for HPV vaccination

Expectation of outcomes is an important personal cognitive factor in SCT, which is an individual's expectation of particular outcomes, including the individual's values for those outcomes. Generally, if someone has more proactive aspirations of the outcomes, he or she will be more willing to perform the behavior. People tend to have more positive expectations of outcomes when they are confident in their abilities. According to some studies, outcome expectations have a positive effect on behavioral intentions [20].

H4: There is a positive correlation between outcome expectations for HPV vaccination and the intention to receive the vaccination.

H5: Self-efficacy for HPV vaccination is positively associated with the outcome expectations for HPV vaccination.

3.3.5 Subjective norms

Subjective norm is the degree of compliance of an individual to expectations or opinions from significant others. Generally, the more supportive the significant others around people the more confident they are to complete the behavior and at the same time the higher the willingness to complete the behavior. Their relationship has been studied and confirmed in the theory of planned

behavior (TPB), so based on the results of existing studies, it can be learned that under positive subjective norms, people are more willing to complete or continue the behavior. There are also some research results showing that subjective norms have a positive effect on self-efficacy [21].

H6: Subjective norms are positively related to the intention for the HPV vaccine.

H7: There is a positive correlation between subjective norms and self-efficacy toward receiving the feared vaccine.

4. Results

In this section, the overall distribution of the data and the results of descriptive statistics are reported first. The population of this study was a group of unvaccinated female college students in China, with an overall sample size of 405, including 363 (89.6%) current undergraduate students and 42 (10.4%) current graduate students, of whom 115 (28.4%) had experienced sexual intercourse and 290 (71.6%) had not experienced sexual intercourse.

The five variables involved in this study, knowledge, self-efficacy, subjective norms, outcome expectations, and behavioral intention, were measured using 5, 4, 3, 3, and 2 questions, respectively. After synthesizing the variables separately, the results of descriptive statistics for each variable were obtained as follows: (except for knowledge, each variable was measured using a seven-point Richter scale. One point was awarded for a correct answer to the knowledge-related question and two points for an incorrect answer.) (Table 1)

Table 1. Descriptive statistics for 5 variables

	Mean	Standard Deviation	Range
Knowledge	1.1990	0.092	1-2
Self-efficacy	4.9130	1.877	1-7
Subjective norms	5.7300	1.302	1-7
Outcome expectations	5.4206	1.502	1-7
Behavior intention	4.7901	2.198	1-7

According to Table 2, it is known that Cronbach's α for every variable is over 0.8, so the reliability of the data is sufficient. Factor analysis with the help of SPSS yielded factor loadings over 0.6. The combined reliability CR was calculated to be over 0.7 and the average variance extracted AVE was over 0.5, indicating that the scales used in this study have good internal consistency and convergence.

Table 2. Results of variable reliability analysis

Variable(Cronbach's α)	Indicators	Loading Factor	AVE	CR
Knowledge(0.819)	Q7	0.829	0.579	0.873
	Q8	0.760		
	Q9	0.749		
	Q10	0.742		
	Q11	0.719		
Self-efficacy(0.838)	Q12_Row1	0.835	0.628	0.871
	Q12_Row2	0.828		
	Q12_Row3	0.780		
	Q12_Row4	0.723		
Subjective norms(0.873)	Q13_Row1	0.880	0.734	0.892
	Q13_Row2	0.855		
	Q13_Row3	0.835		
Outcome expectation (0.854)	Q14_Row1	0.871	0.723	0.887
	Q14_Row2	0.856		
	Q14_Row3	0.823		
Behavior intention(0.877)	Q15_Row1	0.828	0.683	0.812
	Q15_Row2	0.825		

After determining the validity of the scale as well as the reasonableness of the data, this study used IBM SPSS Amos to test the structural equation model constructed based on the hypotheses and the following results were obtained. Table 3 is a report on the degree of model fit pairs and the validity of the hypotheses.

Table 3. Path analysis results

Hypotheses	Path Coefficient	p-value	Conclusion
H1	0.355	<0.001	Supported
H2	0.073	0.122	Not supported
H3	0.134	0.015	Supported
H4	0.249	<0.001	Supported
H5	0.369	<0.001	Supported
H6	0.284	<0.001	Supported
H7	0.400	<0.001	Supported

**CMIN=344.086, DF=145, CMIN/DF=2.373, GFI=0.912, AGFI=0.885, NFI=0.900, IFI=0.940, TLI=0.928, CFI=0.939, RMSEA=0.058.

5. Discussion

According to the results of descriptive statistics, the variable of knowledge about HPV and HPV vaccine-related is slightly less reliable than several other variables, but overall, it is still able to fulfill the criteria. Meanwhile, Table 1 shows that the Chinese female university student group's knowledge of HPV and its vaccine, subjective norms of vaccination, and outcome expectation scores are relatively high, but the scores of self-efficacy and intention to vaccinate are slightly lower, and the difference in scores of intentions to vaccinate is more obvious. This low score and discrepancy may come from the specificity of China's national situation. On the one hand, the popularity of the HPV vaccine in China is insufficient, and the publicity and promotion are not sufficient, resulting in many people of the appropriate age for vaccination not knowing the vaccination route, on the other hand, the large population base in China requires a very large number of people to receive this vaccine, resulting in a long queue or even more than two years on many occasions when it is possible to be vaccinated, so that some people may have the will to be vaccinated with the HPV vaccine but not be able to do so in a two-year period or less realized.

According to Table 3, it can be concluded that the model has a good fit and is reflective of the research question. However, the results show that there is no significant correlation between the related knowledge and the intention to receive the vaccine in hypothesis 2. Although this was preceded by some degree of correlation, it did not fulfill the research requirements. The following is an analysis of the results obtained for each research hypothesis.

For hypothesis 1, the results were as expected. Moreover, the self-efficacy of vaccination completed among these Chinese students had a relatively strong reciprocal interpretation of actual vaccination intention, namely, the correlation between the two was strong. It is true that having more comprehensive information about the vaccination would be more beneficial to these students in choosing to receive the vaccine, such as when and where they can receive the vaccine and following the doctor's instructions. After all, it gives them more confidence that they will be successful with the vaccine.

For hypothesis 2, according to the results of IBM SPSS Amos pair analysis, it is not valid because there is no significant correlation between the variables, so it does not indicate whether it is consistent with the positive correlation or not. After removing the last three in the question about knowledge pairs, the relationship between the two is consistent with the positive correlation in the hypothesis. However, this can be explained given the specificity of the variable knowledge itself. Subjects' knowledge of knowledge may be variable, and they know different things about different aspects of knowledge. The first two questions in the questionnaire were about the HPV vaccine, while the last

two were about HPV. This suggests that there may be a difference in the level of knowledge of the subjects about the two types of knowledge, which led to the results of this analysis.

For hypothesis 3, although it is valid, the correlation between the two variables is not as significant as the other hypotheses. The problem here may be similar to that of hypothesis 2. In removing this variable measurement after either of that problems can make the resultant correlation more significant. Therefore, while it can be shown that gaining more knowledge about HPV and its vaccine helps to increase self-efficacy, namely, empowering oneself to complete the vaccination, there could be better ways to measure the correlation between the two.

For hypothesis 4, there is relatively good explanatory power and impact between self-efficacy for HPV vaccination and expectations of the outcome of vaccination is among Chinese female college students. This suggests that higher recognition of self-efficacy in terms of receiving this vaccine does lead to more positive outcome expectations. It is further illustrated by the establishment of hypothesis 5 that after generating more positive outcome expectations, female college students are indeed more willing to get vaccinated. Therefore, in conjunction with Hypothesis 3, actively promoting and disseminating information about the HPV vaccine would be beneficial to the age-appropriate population to complete the immunization and increase the vaccination rate.

For hypotheses 6 and 7, the correlation coefficient between subjective norms and self-efficacy was the highest in this study, so increasing the level of positivity in an individual's attitude towards the behavior of those around them towards their vaccine immunization can be significantly beneficial in increasing the level of confidence in an individual's ability to complete the aspect of vaccination. Combined with Hypotheses 1, 4, and 5, it can be concluded that positive perceptions of environmental factors (the belief that one will be supported by the environment) are conducive to increased intention to vaccinate. Therefore, it is necessary to improve or promote society's perception of or support for HPV vaccination in the female college student population.

In this study, there was no significant relationship between having had sexual intercourse and the stage of study in the university (undergraduate or postgraduate) and intention to be vaccinated against HPV, using these as control variables. However, in terms of correlation coefficients, it can still be concluded that the higher the education level, the greater the intention to receive the vaccine and the relatively slight intention of those who have had sexual intercourse to receive the vaccine. The insignificant relationship between the stage of study and behavioral intention may be because of the small sample size of postgraduate students or the fact that they may have received the vaccine earlier because of their age. Theoretically, there should be a more significant relationship between having had sex and HPV vaccination, but on the one hand, due to the drawbacks of the online questionnaire collection, some people may not have filled in their experiences truthfully, and on the other hand, some of those who have already had sex may think that there is no need to receive HPV vaccine after they have already had sexual experiences. Therefore, more popularization should be implemented to raise people's awareness in this regard.

6. Conclusion

In summary, on the basis of the results of the statistics and analysis of the data, it can be concluded that the model constructed by the Social Cognitive Theory has explanatory power for the intention of the college student population to receive the HPV vaccine. Using this theory, it is possible to derive a relationship between knowledge about HPV and its vaccine, subjective norms about HPV vaccination, self-efficacy, outcome expectations, and intention to receive the HPV vaccine. The results of this study could help to further promote the HPV vaccine in China.

Nevertheless, this study still has some limitations. Firstly, this study studied knowledge about HPV and knowledge about HPV vaccine as one variable, and when analyzing the data, it was found that although the two met the reliability requirement of being combined into the same variable, they would show differences when analyzing further paths, so it would be more appropriate to measure the two separately and choose more observational indicators. Secondly, this study used a cross-sectional study,

which could only determine the correlation between the variables, but not the causality. Thirdly, this study only examined the intention to receive HPV vaccination as an outcome variable but not the actual vaccination, so it is not known whether the vaccination was completed or not. In fact, intention does not always mean behavior, so there is still a discrepancy between the results of this study and the final vaccination.

Future research could explore the causality between variables. Alternatively, long-term studies could also be conducted to obtain final behavioral results for a more accurate study.

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