Vaccine 33 (2015) 1001–1007

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Human papillomavirus vaccination: Assessing knowledge, attitudes, and intentions of college female students in Lebanon, a developing country

Mohammed Dany [a,b,*], Alissar Chidiac [a], Anwar H. Nassar [a]

[a] Department of Obstetrics and Gynecology, American University of Beirut Medical Center, Beirut, Lebanon
[b] College of Medicine, Medical University of South Carolina, Charleston, SC, USA

ARTICLE INFO

Article history:
Received 17 May 2014
Received in revised form 2 January 2015
Accepted 6 January 2015
Available online 15 January 2015

Keywords:
HPV vaccination
HPV infection
Student knowledge
Student attitudes
Student intentions
Developing country

ABSTRACT

Human papillomavirus (HPV) infection is a common cause for genital warts and cervical cancer. Developing countries in the Middle East such as Lebanon are traditionally considered to be conservative societies with low incidence of sexually transmitted infections. However, nowadays, there is an unexpected increase in the incidence of HPV infections among Middle Eastern females. Thus, the objective of this study is to assess the behavioral perceptions of HPV vaccination among female students attending an academic institution in Lebanon. This cross-sectional study invited 512 students to complete a self-administered questionnaire that assessed the knowledge, attitudes, and intentions towards HPV vaccination. Data analysis included the calculation of knowledge scores ranging from 0 to 100, attitude scores ranging from most positive (1) to most negative (5), and intention scores ranging from lowest intention (0) to highest intention (10). With a response rate of $n = 215$ (42%), 36.5% never heard of the vaccine before, and only 16.5% were already HPV vaccinated. The median knowledge score of 52.7% ± 1.71 reflects poor to moderate knowledge. Still, the median attitude score of 2.47 ± 0.05 shows a general positive attitude towards HPV vaccination where most of the participants agreed that female college students in Lebanon have a good chance of contracting HPV (62.1%) and that all gynecologists should recommend the vaccine (76.0%). Students in graduate programs, health related majors, and those who are vaccinated had significantly higher knowledge scores compared with students in undergraduate programs, non-health related majors, and HPV non-vaccinated students, respectively. Finally, the survey helped in increasing the intention to obtain HPV vaccine as the intention score increased significantly from 5.24 ± 0.27 before the students went through the survey to 6.98 ± 0.22 after the students completed the survey. Our study highlights the importance of offering guidance to female college students about HPV and its vaccination in developing countries where the incidence of sexually transmitted infections is on the rise.

1. Introduction

Infections with high-risk human papillomaviruses, particularly HPV types 16 and 18, promote the development of genital warts and cervical cancer, a leading cause of death in women [1–3]. HPV is usually transmitted through vaginal and anal sex but may also spread through oral sex and genital to genital contact [4]. HPV infection is a common sexually transmitted disease occurring in 10% of women worldwide with at least 50% of sexually active individuals contracting the infection during their lifetimes [5]. What is particular about HPV infection is its high incidence among female adolescents and young women (15–24 years) [5–8]. Indeed, female adolescents are at a higher risk of acquiring HPV infection when compared to adult women [9,10].

Two highly immunogenic HPV vaccines are currently available in the market: the quadrivalent Gardasil (HPV 6, 11, 16, 18) by Merk (Whitehouse Station, New Jersey) and the bivalent Cervarix (HPV 16 and 18) by GalaxoSmithKline (GSK, Brentford, Middlesex, UK) [11,12]. The HPV vaccine has been recommended as a series of three injections over a period of 6 months for adolescent females aging 9–26 years but can also be given to older women up to 55 years [13]. In Lebanon, the vaccine is not provided by the government and there is no form of assistance provided for those who cannot afford it. The price of one dose of the vaccine in Lebanon is 80$

* Corresponding author at: Medical University of South Carolina, Charleston, SC 29425, USA. Tel.: +1 843 489 1599.

E-mail addresses: dany@musc.edu (M. Dany), amc19@aub.edu.lb (A. Chidiac), an21@aub.edu.ln (A.H. Nassar).

http://dx.doi.org/10.1016/j.vaccine.2015.01.009
0264-410X/

(120,000 Lebanese Lira) for Cervarix and 173$ (260,000 Lebanese Lira) for Gardasil.

The Extended Middle East and North Africa (EMENA) region includes societies that share similar cultures and religions and that are considered to have a more conservative sexual behavior compared to western societies. The incidence of cervical cancer is difficult to assess precisely because systematic and national cancer registries are lacking in many countries of the EMENA region. In addition, nationwide programs of cervical cancer screening do not exist or are based on a limited opportunistic cytology-based screening, which often lacks quality assurance [14,15]. Lebanon is traditionally considered to be a conservative society with lower incidence of sexually transmitted infections. However, nowadays, the younger generation is more open and not strongly confined to its sociocultural norms as before. This is reflected in an unexpected high prevalence of HPV infections up to 25% in low risk Middle Eastern women with normal cytology and up to 98% in those with genital warts, pre-invasive, and invasive lesions [16]. Given this unexpected high prevalence of HPV infection, our aim in this study is to assess the knowledge and attitudes towards HPV infection and vaccination as well as the readiness for the uptake of HPV vaccine amongst female students attending an academic institution in Lebanon, a developing country in the Middle East. It is essential to learn about the behavioral perceptions towards HPV vaccination as a first step to develop a health policy that endorses HPV vaccination among females. The findings of this study may highlight the need of launching educational programs in developing countries that offer guidance to adolescents to increase their awareness of the risks associated with HPV infection regardless of whether they come from conservative families or not. This can then be followed by establishing a health policy in the country that requires females to be vaccinated at an early age. Eventually, all these interventions can help in effectively decreasing the incidence of HPV infections and cervical cancer.

2. Methods

2.1. Study design and participants

A cross-sectional survey about HPV and its vaccine was conducted between November 2013 and February 2014. The inclusion criteria consisted of female students above the age of 18 years attending American University of Beirut, an internationally acclaimed academic institution in Lebanon. Male students or female students below the age of 18 years were excluded. A computer based program in the university registrar's office generated a list of student emails that met our criteria ($n = 3000$). The same program then generated a random sample of 512 emails from the total number of emails that met our criteria. The sample of $n = 512$ was calculated based on a confidence level of 95%, significance level of 0.05, a power of 80%, and an inflation of 50%.

The survey instrument was an online self-administered anonymous questionnaire conducted using LimeSurvey software. LimeSurvey automatically populates and saves digital responses to a secure database protecting participant confidentiality throughout the surveying process. Participants were shown a consent page informing them of the study's aims and objectives as well as the participant's right to refuse or terminate their participation in the study at any time and without penalty.

The questionnaire included 38 items in a total of 4 sections. The first section asked about demographics such as age, smoking and drinking status, sexual experience, and college major. The first section also included a 10 point scale on how much the participant is willing to receive the HPV vaccine before going through the other sections of the survey. The second section included 16 True or False knowledge statements about HPV infection or HPV vaccination. After completing the knowledge section, participants were given information about HPV and its vaccine before they can proceed to the third section which assessed their attitudes using 9 statements with a 5 point Likert scale for each (Strongly agree – Strongly disagree). Finally, the last section was a 10 point scale for the willingness of the participant to get vaccinated after going through all of the sections of the survey.

2.2. Ethical considerations

In complying with the highest standards of ethical considerations, participants were informed that their participation is entirely voluntary and that they can omit questions they prefer not to answer. All data amounted from their participation was kept private and strictly confidential. In addition, an informed consent was obtained after explaining the nature of the study and the possible consequences of it. The study design and questionnaire content was approved by the Institutional Review Board at the American University of Beirut.

2.3. Statistical analysis

Data collected by LimeSurvey was exported to Statistical Package for Social Sciences SPSS 20.0. Data are presented as mean ± standard deviation for continuous variables and as percentages for categorical variables.

Based on the participants' responses, three scores were calculated:

2.3.1. Knowledge score

The knowledge score reflects the percentage of correct answers the participant had among the 16 knowledge statements. For every knowledge statement, one point was given for answering correctly (True or False) and no points were given for choosing the wrong answer or the "Do not know" option. The total points were added for every participant and a percentage was calculated: (number of points)/16 × 100. This percentage is the knowledge score. The higher the knowledge score, the more knowledgeable the participant is regarding HPV infection and HPV vaccination.

2.3.2. Attitude score

The attitude score was calculated using the participants' responses to the 9 statements with 5 point Likert scale: 1 point-Strongly Agree, 2 points-Agree, 3 points-Neutral, 4 points-Disagree, 5 points-Strongly Disagree.

The average of the total points was calculated for every participant to end up with an attitude score ranging from 1.0 to 5.0. The closer the attitude score to 1, the more positive the participant's attitude towards HPV vaccination.

2.3.3. Intention score

This score reflects the willingness of each participant to receive the HPV vaccine. Two intention scores were determined: one at the beginning of the survey and one after the participant went over all the sections of the survey including the one that contained information about HPV infection and vaccination. The score is a scale from 1 to 10: 1 reflects the least willingness to receive the vaccine while 10 reflects the highest willingness for HPV vaccine uptake.

Each score is presented as mean ± standard deviation and compared across several demographic characteristics by using one sample t test or ANOVA analysis of variance. The mean values of intention scores before and after the study were compared using paired sample t test. A p-value less than 0.05 was considered significant throughout the study.

Multivariate analysis was performed using linear regression in order to identify the predictors of having high knowledge score or positive attitude score towards HPV vaccination. Only the variables that had a p-value <0.2 in the univariate analysis were taken into account in the model.

3. Results

3.1. Participants' characteristics

The response rate was 42% (n = 215). Table 1 shows the demographic characteristics of the participants who completed the survey. The majority had no previous sexual experience (68.3%), were non-smokers (87.4%), and did not drink alcohol (63%). In addition, a minority (21.1%) was in health related fields such as medicine and nursing. Interestingly, only 16.5% was already vaccinated for HPV and a good number of participants (36.5%) have never even heard of HPV before the study. These participants were still asked to go through the knowledge and attitude questions.

3.2. Sources of information about HPV

For those who answered that they have heard of HPV and its vaccine, the major sources were personal physician or gynecologist, family or friends, university lectures, media, and internet.

Table 1
Baseline demographics and characteristics of the study's female participants.

	n (%)	Mean ± SD	Range
Number of participants	215 (100%)		
Age (years)		22.7 ± 4.3	18–46
College level			
Undergraduate	95 (48.7%)		
Graduate	100 (51.3%)		
Major			
Health related	41 (21.1%)		
Non-health related	153 (78.9%)		
Religion			
Muslim	95 (56.9%)		
Christians	51 (30.5%)		
Druze	17 (10.2%)		
Others	4 (2.4%)		
Smoking status			
Smoker	24 (12.6%)		
Non-smoker	167 (87.4%)		
Drinking status			
Drinks alcohol	70 (37%)		
Does not drink alcohol	119 (63%)		
Perceived economic status			
High and middle-high	56 (29.5%)		
Middle	108 (56.8%)		
Middle low and low	26 (13.7%)		
Sexual history			
No sexual experience	125 (68.3%)		
Sexual experience(s) always without the use of contraception	11 (6%)		
Sexual experience(s) always with the use of contraception	21 (11.5%)		
Sexual experience(s) sometimes with the use of contraception	26 (14.2%)		
HPV vaccination status			
Vaccinated	28 (16.5%)		
Not vaccinated	142 (83.5%)		
Awareness of HPV vaccine			
Heard about the vaccine before	120 (63.5%)		
Never heard about the vaccine before	69 (36.5%)		

3.3. Knowledge of HPV infection and vaccination

Most of the students answered correctly the statement that correlates HPV and cervical cancer (81.9%) and that HPV is sexually transmitted (66.5%). However, most of them did not know there are different types of HPV virus (89.2%) and whether HPV infection is restricted to females (82.0%). In addition, the majority did not know if positive females show symptoms (58.3%), whether a normal pap smear can rule out HPV infection (80.9%), and if there is a current cure or therapy for HPV infection (77.3%) (Table 2).

Regarding HPV vaccine, the participants' answers showed poor to moderate knowledge as only 44.3% knew that HPV vaccine is received as three injections over a six month period and only 30.6% knew that it costs much more than 30 US dollars. Also, the majority did not know the age at which HPV vaccine can be administered (55.6%). However, 52.6% knew that HPV vaccine does not have the same effect if taken before or after infection and 66.0% knew that HPV vaccine is best taken before starting to have sexual experiences (Table 2).

Statistically, the mean knowledge score was 52.7 ± 1.71 which reflects poor to moderate knowledge. Participants older than 21 years had more knowledge about HPV than those younger than 21. In addition, students in graduate programs or in health related majors had significantly higher knowledge scores compared with students in undergraduate programs or in non-health related majors. Also, participants who already received the vaccine or heard about it before the study had a significantly higher knowledge score compared with those who were not HPV vaccinated or who were not aware of its existence (Table 4).

3.4. Attitudes towards HPV vaccination

The majority of the participants did not believe that they are susceptible for the HPV infection (59.8%). However, the majority believes that based on the general sexual practice among females in Lebanon, female college students have a good chance of contracting HPV and therefore all college female students should receive the HPV vaccine (62.1%). This goes along with the result that 72% would recommend the vaccine to their college friends and 76% believe that all gynecologists should recommend the vaccine to their patients, whether or not they come from conservative families. Moreover, even though there was a general positive attitude that the HPV vaccine is effective in preventing the occurrence of cervical cancer (65.3%), a minority of participants found the vaccine to be affordable (23.9%) (Table 3).

Statistically, the mean attitude score was 2.47 ± 0.05 which reflects a general positive attitude towards HPV and its vaccine. As expected, the females who have already been vaccinated had significantly lower (more positive) attitude scores compared with those who did not receive the vaccine. In addition, participants who heard about the vaccine before had significantly more positive attitudes compared with those who never heard about it before. Interestingly, participants who perceive themselves belonging to High or Middle economic statuses had significantly more positive attitude scores compared with those who perceive themselves as belonging to Low economic status (Table 4).

3.5. Intentions of receiving HPV vaccination

The mean intention score before going through the other sections of the survey was only 5.24 ± 0.27. However, this score increased significantly to 6.98 ± 0.22 after the participants completed the survey and knew more about HPV infection and vaccination with a p-value of 0.00 (Table 5).

Interestingly, the participants who were not aware of HPV infection and vaccine before the study had a mean intention score of only

Table 2
Participants' answers to knowledge statements about human papillomavirus and its vaccination.

Knowledge statement	Correct answer	True *n* (%)	False *n* (%)	Do not know *n* (%)
The type of cancer highly associated with HPV infection is uterine cervical cancer	True	127 (81.9%)	28 (18.1%)	0 (0.0%)
Human papillomavirus can cause herpes	False	17 (33%)	58 (29.9%)	103 (53.1%)
Human papillomavirus can lead to genital warts (growths on the skin of the genitals)	True	98 (50.5%)	18 (9.3%)	78 (40.2%)
HPV can be transmitted through vaginal, anal, and oral sex as well as genital to genital contact	True	129 (66.5%)	12 (6.2%)	53 (24.7%)
In most cases, HPV infected women do not show symptoms	True	94 (48.5%)	23 (11.9%)	90 (46.4%)
All HPV infections are caused by the same type of virus	False	21 (10.8%)	83 (42.8%)	90 (46.4%)
HPV positive pregnant women can pass the virus to their babies	False	86 (44.3%)	21 (10.8%)	87 (44.8%)
Only females can be infected with HPV and show symptoms	False	35 (18.0%)	91 (46.9%)	68 (35.1%)
HPV can be transmitted from a carrier to his/her partner only if the carrier shows symptoms	False	12 (6.2%)	91 (46.9%)	66 (34.0%)
A normal pap smear implies that the woman is free of HPV	False	37 (19.1%)	45 (23.2%)	112 (57.7%)
There is no current cure or therapy for HPV infection	True	44 (22.7%)	58 (29.9%)	92 (47.4%)
HPV vaccines have the same effect whether the female takes it before or after being infected with HPV	False	9 (4.6%)	102 (52.6%)	83 (42.8%)
HPV vaccine is best taken before starting to have sexual activities	True	128 (66.0%)	12 (6.2%)	54 (27.8%)
HPV vaccine can only be taken after the age of 18 years	False	32 (16.5%)	90 (46.4%)	72 (37.1%)
HPV vaccination is taken as three injections over a period of six months	True	86 (44.3%)	7 (3.6%)	101 (52.1%)
HPV vaccination costs around 30 dollars	False	13 (6.7%)	60 (30.9%)	121 (62.4%)

3.62 ± 0.35 at the beginning of the study. This is significantly lower than those who heard about HPV before with a mean intention score of 5.87 ± 0.32 at the beginning of the study. After completing the study, both scores increased to 5.78 ± 0.35 and 7.39 ± 0.26 for those unaware and aware of the HPV infection and vaccination respectively. This again emphasizes the importance of awareness in shaping the female's decision to whether or not she is willing to get the HPV vaccine (Table 5).

3.6. Multivariate analysis

Multiple linear regression was performed to establish a model with more than one variable that can predict knowledge scores or attitude scores. Only the variables that had a *p*-value <0.2 in the univariate analysis of knowledge scores or attitude scores (Table 4) were taken into account in the linear regression model.

When it comes to predict high knowledge, the predictors in the model are age, college level, college major, drinking status, HPV vaccination status, and awareness of HPV vaccine prior to the study. This model with its predictors significantly help in predicting knowledge score since the *p*-value of the *F*-test is 0.000. More specifically, the analysis shows that if all the other variables are in the model, only college major (whether it is health related or not) and awareness of HPV vaccine are significant predictors for knowledge score with coefficients of 9.3 and 13.6 and *p*-values of 0.036 and 0.003, respectively (Table 6). This suggests that given all the other variables in the model, those who are in health related majors or who have heard of HPV vaccine before are predicted to obtain a higher knowledge scores after answering questions related to HPV infection and vaccination.

In a similar approach, the model to predict a positive attitude included the variables drinking status, perceived economic status, HPV vaccination status, and awareness of HPV vaccine. This model with its predictors significantly help in predicting attitude towards HPV vaccination since the *p*-value of the *F*-test is 0.000. More specifically, the analysis shows that if all the other variables

Table 3
Participants' attitudes towards HPV vaccination statements.

Attitude assessing statement	Strongly agree *n* (%)	Agree *n* (%)	Neutral *n* (%)	Disagree *n* (%)	Strongly disagree *n* (%)
Based on my lifestyle, I believe that I am susceptible for the HPV infection and must get the vaccine	9 (5.2%)	24 (13.8%)	37 (21.3%)	48 (27.6%)	56 (32.2%)
Based on the general sexual practice among females in Lebanon, I believe that female college students in Lebanon have a good chance of contracting HPV and therefore all college female students should receive the HPV vaccine	37 (21.3%)	71 (40.8%)	47 (27.0%)	18 (10.3%)	1 (0.6%)
I believe that contracting HPV virus is serious and life threatening	79 (44.1%)	72 (40.2%)	18 (10.1%)	9 (5.0%)	1 (0.6%)
I believe that the current HPV vaccine is capable of preventing the occurrence of cervical cancer	29 (16.5%)	86 (48.9%)	48 (27.3%)	12 (6.8%)	1 (0.6%)
I believe that the price of the vaccine is affordable given the benefits it offers	8 (4.7%)	33 (19.2%)	47 (27.3%)	60 (34.9%)	24 (14.0%)
I believe that the side effects of the vaccine are reasonable and will not deter me from taking the vaccine	29 (17.2%)	66 (39.1%)	44 (26.0%)	24 (14.2%)	3 (3.6%)
I believe that the HPV vaccine is different from other marketed vaccines produced by pharmaceutical companies with prime purpose of accumulating profit	14 (8.6%)	37 (22.8%)	87 (53.7%)	21 (13.0%)	3 (1.9%)
I believe that all gynecologists should recommend the vaccine to their patients, whether or not they come from conservative families	75 (42.9%)	58 (33.1%)	26 (14.9%)	13 (7.4%)	3 (1.7%)
I would recommend this vaccine for my female college friends whether or not they come from conservative families	67 (38.3%)	59 (33.7%)	32 (18.3%)	12 (6.9%)	5 (2.9%)

Table 4
Participants' knowledge and attitude score stratified by their characteristics.

	Knowledge score mean ± SEM	p-Value	Attitude score mean ± SEM	p-Value
All participants	52.7 ± 1.71		2.47 ± 0.05	
Age				
18–21 years	44.9 ± 2.6	0.000*	2.53 ± 0.07	0.398
22–46 years	58.2 ± 2.3		2.44 ± 0.07	
College level				
Undergraduate	44.5 ± 2.5	0.000*	2.50 ± 0.07	0.738
Graduate	58.4 ± 2.2		2.46 ± 0.07	
Major				
Health-related	63.2 ± 3.7	0.001*	2.46 ± 0.10	0.797
Non-health related	48.8 ± 1.9		2.49 ± 0.06	
Smoking status				
Smoker	52.6 ± 4.3	0.959	2.33 ± 0.18	0.290
Non-smoker	52.3 ± 2.0		2.50 ± 0.05	
Drinking status				
Drinks alcohol	57.3 ± 2.9	0.059	2.36 ± 0.08	0.080
Does not drink alcohol	50.4 ± 2.2		2.53 ± 0.04	
Perceived economic status				
High and middle-high	55.5 ± 3.0	0.366	2.47 ± 0.09	0.038*
Middle*	50.1 ± 2.5		2.40 ± 0.06	
Middle-low and low*	54.8 ± 1.8		2.75 ± 0.13	
Sexual history				
No sexual experience	50.3 ± 2.3	0.309	2.53 ± 0.06	0.482
Sexual experience(s) always without the use of contraception	52.5 ± 7.9		2.52 ± 0.17	
Sexual experience(s) always with the use of contraception	52.0 ± 5.8		2.31 ± 0.16	
Sexual experience(s) sometimes with the use of contraception	60.4 ± 3.2		2.41 ± 0.14	
HPV vaccination status				
Vaccinated	63.9 ± 3.1	0.003*	2.08 ± 0.10	0.000*
Not vaccinated	49.9 ± 2.1		2.56 ± 0.05	
Awareness of HPV vaccine				
Heard about the vaccine before	57.0 ± 1.8	0.000*	2.33 ± 0.06	0.000*
Never heard about the vaccine before	36.8 ± 4.0		2.76 ± 0.07	

* Signifies p-value < 0.05.

Table 5
Intention score to obtain HPV vaccine before and after the survey stratified by participants' characteristics.

	Intention score before survey mean ± SEM	p-Value	Intention score after survey mean ± SEM	p-Value	Paired t test p-value
All participants	5.24 ± 0.27		6.98 ± 0.22		0.000*
Age					
18–21 years	5.33 ± 0.38	0.420	6.63 ± 0.30	0.926	
22–46 years	4.91 ± 0.39		6.67 ± 0.33		
College level					
Undergraduate	5.30 ± 0.34	0.583	6.88 ± 0.28	0.179	
Graduate	5.02 ± 0.38		6.70 ± 0.33		
Major					
Health related	5.76 ± 0.50	0.176	6.69 ± 0.49	0.874	
Non-health related	4.94 ± 0.29		6.79 ± .24		
Religion					
Muslim	4.60 ± 0.33	0.298	0.43 ± 0.31	0.529	
Christians	5.57 ± 0.52		6.95 ± 0.43		
Druze	5.23 ± 0.80		6.87 ± 0.62		
Others	3.00 ± 2.00		8.33 ± 1.67		
Smoking status					
Smoker	5.50 ± 0.91	0.643	7.47 ± 0.77	0.247	
Non-smoker	5.13 ± 0.26		6.66 ± 0.23		
Drinking status					
Drinks alcohol	5.73 ± 0.46	0.099	7.15 ± 0.37	0.227	
Does not drink alcohol	4.85 ± 0.31		6.59 ± 0.27		
Perceived economic status					
High and middle-high	5.47 ± 0.51	0.343	6.79 ± 0.44	0.191	
Middle	5.24 ± 0.33		7.10 ± 0.28		
Middle low and low	4.24 ± 0.65		5.90 ± 0.57		
Sexual history					
No sexual experience	5.08 ± 0.30	0.959	6.62 ± .27	0.776	
Sexual experience(s) always without the use of contraception	5.13 ± 1.31		7.33 ± 0.93		
Sexual experience(s) always with the use of contraception	5.37 ± 0.89		7.00 ± 0.66		
Sexual experience(s) sometimes with the use of contraception	5.43 ± 0.77		7.10 ± 0.68		
Awareness of HPV vaccine					
Heard about the vaccine before	5.87 ± 0.32	0.000*	7.39 ± 0.26	0.000*	
Never heard about the vaccine before	3.62 ± 0.35		5.78 ± 0.35		

* Signifies p-value < 0.05.

Table 6
Multivariate analysis for predicting knowledge and attitude scores.

	Beta coefficient	*p*-Value
Knowledge score		
Age	4.585	0.354
College level	3.083	0.174
Major	9.283	0.036
Drinking status	4.789	0.221
Vaccination status	9.394	0.055
Awareness of HPV	13.626	0.003
Attitude score		
Drinking status	0.114	0.252
Perceived economic status	0.042	0.525
Vaccination status	0.281	0.027
Awareness of HPV	0.339	0.001

are in the model, only awareness of HPV vaccination and HPV vaccination status are significant predictors for knowledge score with coefficients of 0.34 and 0.28 and *p*-values of 0.027 and 0.001, respectively (Table 6). This suggests that given all the other variables in the model, those who are vaccinated and those who have heard of HPV before are predicted to have more positive attitudes towards HPV vaccination.

4. Discussion

This study is the first to quantitatively examine the behavioral perceptions of female college students in Lebanon, a developing country where there is no uniform HPV vaccination policy. The study's results reveal that even though there is low to moderate knowledge of HPV infection and vaccination, there is a general positive attitude towards the importance of obtaining the vaccine and the susceptibility to obtain the infection. In addition, even though the intention score to obtain the vaccine was low at the beginning of the study, it increased significantly after the participants completed all of the survey.

The response rate of 42% reflects that the results of the study have the potential to be representative of the target population of female students at the American University of Beirut. In the statistical calculations of sample size, a 50% inflation was accounted for to get a power of 80%. Thus, a response rate of 42% is close to the number required to give a power of 80%. A small subset of our population (16.7%) was already vaccinated before starting the study and this was also the case of other studies such as the one conducted in New Zealand where 7% of their participants were vaccinated [17]. When it comes to the knowledge of HPV infection and vaccination, it is peculiar that 63.5% of our participants were aware of HPV with a low-moderate mean knowledge score; this was not reported in other studies that took place in developed and developing countries. For instance, in Hungary, only 35% of the surveyed females reported that they had heard of HPV before [18]. In Korea, only 37.8% heard of HPV and the mean knowledge score was only 40.6% [19]. In other Asian countries, including Malaysia, Taiwan, and Thailand, 35% of the surveyed women heard about HPV [20]; and in South Africa, the percentage was 29% [21]. Studies done in Malaysia, a conservative country where the prevalence of HPV vaccine among school girls is high, show that previous knowledge about HPV vaccine is one of the important factors for vaccine uptake among school girls. In addition, Malaysian women in outpatient clinics had a very low level of knowledge of HPV and HPV vaccine [9,22].

When it comes to the attitudes towards HPV infection and vaccination, it was reassuring that the majority had positive attitudes and believed that female college students are susceptible to the infection and that the available vaccine is effective for primary prevention. This was also reported in the study conducted in Hungary where 86% of the adolescents believed in the effectiveness of the vaccination [18]. In addition, our study showed that students who perceived themselves as having a low economic status showed more negative attitude toward the infection and the vaccine. This might reflect on the affordability of the vaccine. In Lebanon and other developing countries, the vaccine costs close to 400 US dollars and there are no agencies that support the recipients in paying for this expensive vaccine. The vaccine can be purchased at a pharmacy or in some clinics where pediatricians, family medicine practitioners, or gynecologists can administer the vaccine.

This can also explain why a good percentage of our participants (48.9%) believed that the vaccine is not affordable even if it offers a lot of benefits. To solve this problem, a good health policy would include government affiliated agencies that fund the vaccine so that the financial barrier does not become a reason to avoid receiving it.

Spreading awareness about HPV and the available vaccines will also be a very effective strategy to promote HPV vaccination uptake. The results clearly show that those who heard about HPV infection and vaccination before the study have significantly higher knowledge scores, more positive attitude scores, and higher intention scores. Not only that, awareness of HPV by itself was a significant independent predictor of both knowledge and attitude in the multivariate analysis models. In addition, this study is by itself an example on the effectiveness of spreading awareness as it was also able to significantly increase the mean intention score after the participants went through all of its sections.

The burden of HPV infection is increasing in developing countries. Lebanon, for example, has always been considered to be a conservative country, where sex before marriage was long considered to be a taboo and not permitted by the vast majority of the families. Lately, however, there has been a change in the social and sexual behavior in Lebanon and the other countries in the extended Middle East and North Africa region. This might explain why recent reports show that HPV infection is positive in around 25% in low-risk women with normal cytology and up to 98% in those with genital warts and pre-invasive and invasive cervical lesions [16]. The increase in HPV and its related diseases calls for a public health policy intervention to implement the HPV vaccine in Lebanon and other countries of a similar situation.

5. Limitations

The study targeted female students attending American University of Beirut (AUB), a private academic institution in Lebanon. One could argue that a population from one university cannot be representative of the general Lebanese female population. Another limitation of our study is that a small percentage of the target population is of low socioeconomic status since AUB is a private institution with expensive tuition fees. Finally, the participants were not asked about their history of sexually transmitted infection. It would have been of benefit to check whether those with a positive history have more positive attitudes and higher intention scores to receive the vaccine compared with those with a negative history.

6. Conclusion

This study explored the knowledge, attitudes, and intentions of college female students towards HPV infection and vaccination as a first step in the process to establish a health policy that implements the HPV vaccine, at a time when Lebanon and other developing countries are having an increase in the incidence of HPV infection and its associated diseases. The study found that participants lacked knowledge about some aspects of HPV infection and vaccine and had positive attitudes regarding the susceptibility of college female students to the infection as well as the importance of the vaccine. Finally, the study increased the willingness for uptake of HPV vaccine suggesting that such cross-sectional surveys can be used as tools for intervention.

Authors' contributions

M. Dany was involved in conception and study design, acquisition, analysis, and interpretation of data, manuscript writing. A. Chidiac was involved in acquisition, analysis, and interpretation of data. A. Nassar was involved in conception and study design, manuscript writing. All authors have approved of the final version of the article.

Conflict of interest

The authors report no conflicts of interest.

Acknowledgments

The study was funded by the Issam Fares Institute for Public Policy and International Affairs (IFI). The funding source was not involved in the process of conducting the study.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.vaccine.2015.01.009.

References

[1] Nyitray AG, Iannacone MR. The epidemiology of human papillomaviruses. Curr Probl Dermatol 2014;45:75–91.
[2] Lynge E, Rygaard C, Baillet MV, Dugue PA, Sander BB, Bonde J, et al. Cervical cancer screening at crossroads. APMIS 2014;122(8):667–73.
[3] Baseman JG, Koutsky LA. The epidemiology of human papillomavirus infections. J Clin Virol 2005;32(Suppl. 1):S16–24.
[4] WHO/ICO Information Centre on HPV and Cervical Cancer. HPV and cervical cancer in the 2007 report. Vaccine 2007;25(Suppl. 3):C1-230.
[5] Bosch FX, de Sanjose S. Human papillomavirus and cervical cancer – burden and assessment of causality. J Natl Cancer Inst Monogr 2003;(31):3–13 [chapter 1].
[6] Ozyer S, Uzunlar O, Ozler S, Kaymak O, Baser E, Gungor T, et al. Awareness of Turkish female adolescents and young women about HPV and their attitudes towards HPV vaccination. Asian Pac J Cancer Prev 2013;14(8):4877–81.
[7] Sanchez Anguiano LF, Lechuga Quinones AM, Milla Villeda RH, Lares Bayona EF. Knowledge and acceptance of vaccine against human papillomavirus among mothers of students from Durango city, Mexico. Ginecol Obstet Mex 2013;81(2):77–85.
[8] Patel DA, Zochowski M, Peterman S, Dempsey AF, Ernst S, Dalton VK. Human papillomavirus vaccine intent and uptake among female college students. J Am Coll Health 2012;60(2):151–61.
[9] Al-Naggar RA, Bobryshev YV, Al-Jashamy K, Al-Musli M. Practice of HPV vaccine and associated factors among school girls in Melaka, Malaysia. Asian Pac J Cancer Prev 2012;13(8):3835–40.
[10] Patel DA, Zochowski M, Peterman S, Dempsey AF, Ernst S, Dalton VK. Human papillomavirus vaccine intent and uptake among female college students. J Am Coll Health 2012;60(2):151–61.
[11] Villa LL. HPV prophylactic vaccination: the first years and what to expect from now. Cancer Lett 2011;305(2):106–12.
[12] FUTURE I/II Study Group, Dillner J, Kjaer SK, Wheeler CM, Sigurdsson K, Iversen OE, et al. Four year efficacy of prophylactic human papillomavirus quadrivalent vaccine against low grade cervical, vulvar, and vaginal intraepithelial neoplasia and anogenital warts: randomised controlled trial. BMJ 2010;341:c3493.
[13] Centers for Disease Control and Prevention (CDC). FDA licensure of bivalent human papillomavirus vaccine (HPV2, Cervarix) for use in females and updated HPV vaccination recommendations from the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep 2010;59(20):626–9.
[14] Kim JJ, Sharma M, O'Shea M, Sweet S, Diaz M, Sancho-Garnier H, et al. Model-based impact and cost-effectiveness of cervical cancer prevention in the Extended Middle East and North Africa (EMENA). Vaccine 2013;31(Suppl. 6):G65–77.
[15] Vaccarella S, Bruni L, Seoud M. Burden of human papillomavirus infections and related diseases in the extended Middle East and North Africa region. Vaccine 2013;31(Suppl. 6):G32–44.
[16] Seoud M. Burden of human papillomavirus-related cervical disease in the extended middle East and north Africa-a comprehensive literature review. J Low Genit Tract Dis 2012;16(2):106–20.
[17] Chelimo C, Wouldes TA. Human papillomavirus knowledge and awareness among undergraduates in healthcare training in New Zealand. N Z Med J 2009;122(1304):33–45.
[18] Marek E, Dergez T, Rebek-Nagy G, Kricskovics A, Kovacs K, Bozsa S, et al. Adolescents' awareness of HPV infections and attitudes towards HPV vaccination 3 years following the introduction of the HPV vaccine in Hungary. Vaccine 2011;29(47):8591–8.
[19] Klionsky DJ, Abdalla FC, Abeliovich H, Abraham RT, Acevedo-Arozena A, Adeli K, et al. Guidelines for the use and interpretation of assays for monitoring autophagy. Autophagy 2012;8(4):445–544.
[20] Chow SN, Soon R, Park JS, Pancharoen C, Qiao YL, Basu P, et al. Knowledge, attitudes, and communication around human papillomavirus (HPV) vaccination amongst urban Asian mothers and physicians. Vaccine 2010;28(22):3809–17.
[21] Francis SA, Nelson J, Liverpool J, Soogun S, Mofammere N, Thorpe Jr RJ. Examining attitudes and knowledge about HPV and cervical cancer risk among female clinic attendees in Johannesburg, South Africa. Vaccine 2010;28(50):8026–32.
[22] Al-Naggar RA, Al-Jashamy K, Chen R. Perceptions and opinions regarding human papilloma virus vaccination among young women in Malaysia. Asian Pac J Cancer Prev 2010;11(6):1515–21.