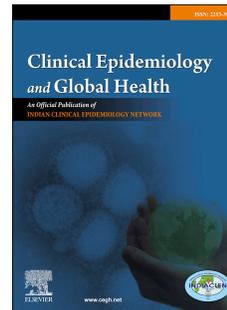


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Determinants of Human Papillomavirus Vaccine recommendation among Middle Eastern and Lebanese Healthcare Providers

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**-Keywords:** Papillomavirus Vaccines; Health Personnel; Attitude; Knowledge; Lebanon.

**-Type of article:** Clinical Article

**-Synopsis:** We report the status and association of knowledge, awareness, and attitude of health care providers regarding Human Papilloma Virus vaccination in 2009 and 2018.

- Research type: Original research article consisting of 2 surveys conducted on health care providers regarding Human Papilloma Virus vaccination attending the Lebanese Society of Obstetrics and Gynecology congresses in 2009 and 2018.

- Abstract word count: 200
- Word count without abstract, tables and references: 2408
- The number of tables: 6.
- Number of references: 25.

## **Determinants of Human Papillomavirus Vaccine recommendation among Middle Eastern and Lebanese Healthcare Providers**

### **Abstract**

**Objective:** To improve the knowledge, awareness, and attitude (KAA) among health care providers (HCPs) regarding Human Papilloma Virus vaccination (HPV-V), the Lebanese Society of Obstetrics and Gynecology (LSOG) has regularly organized educational meetings, symposia, and workshops.

**Methods:** We conducted two sets of surveys among attendees of the LSOG congresses in 2009 and 2018 to assess their KAA towards HPV-V.

**Results:** Around 30% (362) of LSOG attendees participated in our surveys in 2009 and 2018 (185 Vs.177 respectively). Most of them were obstetricians and gynecologists. Most HCPs considered that HPV-V can prevent cervical cancer (CC) [82% and 80% respectively,  $P=0.73$ ], however, around 60% were confident enough to convince their patients. HCPs who were confident about the efficacy of the HPV-Vs were more likely to believe that HPV-V can prevent CC (odds ratio=22.5,  $p$ -value=0.003). These HCPs were more likely to recommend HPV-V (OR= 6.6,  $p$ -value=0.009). About 20% of HCPs who usually recommend HPV-V, reported cost as a main barrier compared to 76% of those who did not.

**Conclusions:** Being familiar with HPV, HPV-related diseases, CC, HPV vaccines and their effectiveness significantly influence whether a HCP recommends HPV-V. The KAA of HCPs did not significantly improve from 2009 to 2018.

**Keywords:** Papillomavirus Vaccines; Health Personnel; Attitude; Knowledge; Lebanon.

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## Introduction

The lack of organized national HPV-V and CC screening programs in countries of the Middle East and Lebanon (MEL) is due to many factors including, but not limited to, financial constraints, competing priorities, and the low reported incidence of HPV and CC [1,2]. Most patients in MEL with CC present late with a resultant high mortality [3]. In most of these countries, the HPV disease burden and the national mortality data of CC, are poorly documented due to the absence of quality-assured surveillance programs and population-based registries [1]. In addition, HPV vaccines are still very expensive in the MEL. Although global funding for HPV-V has increased through support from the Global Alliance for Vaccines and immunization (GAVI), only three countries in the extended Middle East and North Africa (EMENA) are eligible (Pakistan, Afghanistan, and Yemen) [4]. Only Abu Dhabi in the United Arab Emirates has a national government-sponsored HPV immunization program in this region. Currently, HCPs in MEL practice limited opportunistic HPV-V in private family medicine, pediatrics, or gynecology health care clinics. Moreover, HPV-V is frequently offered beyond the universally recommended age groups. The suboptimal uptake of HPV-V among adolescents may be related to the lack of awareness among parents and their HCPs about HPV-related diseases and CC [5,6]. Therefore, there is a great need to improve the public and HCPs' knowledge and awareness on this subject. HCPs are essential for building public confidence in vaccination in general and HPV-V in particular. If HCPs lack the knowledge about HPV and HPV-related disease, they are not equipped to communicate the benefits and safety of HPV-V to their patients and their children [7]. It is important to provide HCPs with updated key information on the evolving epidemiology of HPV-related diseases and cancers in the MEL and on the efficacy and safety of the available HPV vaccines [8,9].

Moreover, they should be equipped with proper physician- patient communication skills especially when it concerns sexually transmitted diseases [10]. In the Middle East, there is a clear correlation between HCPs' knowledge and attitude toward HPV-V and their patients' KAA [11]. Thus, when HCPs seem hesitant and not knowledgeable enough about HPV-V, patients look for other less accurate and less reliable sources of information [10,12]. The HCPs' recommendation is one of the strongest predictors of HPV vaccine uptake,

and the lack of it is a key reason to refuse vaccination [12-17].

To improve the KAA among MEL HCPs toward HPV-V, the LSOG has regularly organized targeted educational meetings, workshops, and symposia. Our longitudinal study aimed to assess the change in the KAA among MEL HCPs attending LSOG meetings in 2009 and 2018 and to identify knowledge gaps and factors that affect the HCPs' attitude toward HPV-V

## **Materials and Methods**

HCPs attending the 2009 and 2018 LSOG congresses were voluntarily invited to participate in an institutional review board - approved standardized, anonymous questionnaire that was the same for both years except for the questions about the genotype composition of the new Q9V vaccine in the 2018 questionnaire. The socio- demographic module including variables such as age, gender, location, and years of practice. The survey included questions on the knowledge of HPV, the pathogenesis of HPV-related diseases, and the characteristics of the HPV vaccines (see appendix). We also incorporated questions on the physicians' attitude towards HPV-V and the relevant issues discussed with patients and their children.

## **Statistical Analysis**

ANOVA was used to assess the difference in means between two and more than two categories, respectively, Pierson's Chi-square was used to address associations between categorical variables. Logistic regression was used to calculate the association between the physician's characteristics, knowledge and attitude and the odds of HPV-V recommendation. Logistic regression was also used to calculate the association between the significant knowledge predictors of HPV recommendation and the significant attitude predictor of HPV recommendation. Statistical significance was set at an alpha of 5% for a two-sided P-value. All analyses were conducted using SPSS software (version 25.0).

## Results

Around 30% of LSOG attendees(362) agreed to participate in our surveys voluntarily. They were equally divided between the 2009 and 2018 LSOG congresses (185 Vs. 177 respectively). Most HCPs in 2009 and 2018 were obstetricians and gynecologists (80% and 86% respectively,  $p = 0.11$ ). Compared to 2009, in 2018, there were more females (66% Vs 37% respectively,  $P=0.11$ ), more single (29% Vs 20% respectively,  $P=0.11$ ), and more HCPs were in private practice (54% Vs 44% respectively,  $P=0.085$ ). Most Lebanese HCPs participating in the 2018 LSOG practiced in the capital Beirut (Table 1). The knowledge among HCPs concerning HPV, HPV pathogenesis, HPV vaccines and the preventive measures against HPV related diseases and CC did not differ between 2009 and 2018. However, HCPs became more knowledgeable as far as the number of HPV genotypes affecting the genital tract (43% Vs. 63% respectively,  $P=0.001$ ), and in how long the HPV vaccine remains effective in preventing CIN2+ lesions (36% Vs. 87% respectively,  $p<0.001$ ). In contrast, compared to 2009, HCPs attending the 2018 congress were less knowledgeable about the HPV types most frequently associated with cervical cancer (97% Vs. 91% respectively,  $P=0.015$ ), the prevalence of HPV infection among sexually-active adolescents in the US ( 23% Vs. 9%,  $P=0.005$ ) and which HPV genotypes are covered by the available HPV vaccines (82% Vs. 39%,  $p<0.001$ ). In 2018, only 69% of 94 HCPs knew the HPV genotypes covered by the nano- valent vaccine (Table 2).

In 2009 and 2018, few HCPs discussed issues related to sexuality with their patients (27% Vs. 26% respectively,  $P=0.82$ ) or with tparents about their young patients (14% Vs. 19% respectively,  $P=0.23$ ). So the majority of HCPs in 2009 and 2018 were confident

enough to talk about HPV and HPV-V with their patients (69% Vs 74% respectively,  $P=0.39$ ), they less were confident they could convince their patients in to actually take the vaccine (57% Vs 59% respectively,  $P=0.73$ ). Significantly more HCPs in 2018 recommended gender-neutral vaccination than in 2009 (67% Vs 42% respectively,  $p<0.001$ ). Most HCPs in both congresses expressed the need to improve their knowledge on the subject, 98% Vs 99% respectively,  $P=0.52$ ) (Table 3).

In general, there was no association between recommending HPV vaccination and the age, gender, relationship status, practice setting, years of practice, and the location of the practice (country or different Lebanese districts) of HCPs. Obstetricians and gynecologists were more likely to recommend HPV-V than pediatricians and family practitioners (unadjusted Odds Ratio= 2.2,  $P=0.027$ ). HCPs who had at least one daughter were surprisingly less likely to recommend HPV-V than those who only had sons (unadjusted Odds Ratio: uOR=0.3,  $P=0.013$ ) (Table 4).

There was no statistically significant difference among HCPs who usually recommended HPV-V and HCPs who did not usually recommended HPV-V or were hesitant about it as far as their level of knowledge of HPV, the role HPV in the pathogenesis of HPV-related diseases and CC, and the specifics of the available HPV vaccines. However, HCPs who were confident about the efficacy of the HPV-Vs in preventing future CIN2+ were more likely to believe that HPV-V can prevent CC when compared to those who did not know (odds ratio=22.5,  $P=0.003$ ). Consequently, these HCPs were more likely to recommend HPV-V (OR= 6.6,  $P=0.009$ ) (Table 5).

In 2009 and 2018, HCPs reported a similar attitude towards addressing sexuality issues with patients or their parents, their perceptions of their patients' interest in the HPV

vaccine, and their confidence level in talking to or convincing their patients to be vaccinated. However, HCPs who believed that HPV-V can prevent cervical cancer to a *great extent* were more likely to recommend vaccination than HCPs who thought that HPV-V can prevent CC to *some extent* (uOR=6.6, P=0.009) (Table 6).

76% of HCPs, who were hesitant about HPV-V reported the cost of the vaccines as a major barrier to HPV-V. While 80% HCPs who recommend HPV-V reported other obstacles to vaccination [patients' refusal to discuss sexual issues (15%), fear of adverse events (24%), and the patients' false perception of being at low risk to contract HPV (41%)], the other 20% reported the cost of the vaccine (Table 6),

HCPs who knew how effective HPV vaccines are in preventing more than 95% of CIN2+ were more likely to believe that HPV-V can actually prevent CC than HCPs who did not know [(98% vs. 72%0, uOR=22.5 (2.8-180.8), p-value=0.003]. However, it is worthwhile noting that this level of protection was observed in the per-protocol analysis of HPV DNA negative populations. In the intention-to-treat-analysis the efficacy was lower.

Fifty one percent (35/74) of HCPs who usually recommend HPV-V and knew the recommended age at vaccination (RAV) actually recommended vaccinating Middle Eastern women at 13 to 17 years instead and 49% advocated HPV-V at the RAV. In contrast, 75% (12/16) of HCPs who were hesitant on HPV-V believed HPV-V was best given at the RAV while 25% believed it is better at an age that was older than RAV. Only 2% of 113 participants in 2018 have reported HPV-V as not safe.

56% of the obstetricians and gynecologists thought that pediatricians and family practitioners are better at convincing their patients and/or their parents to be vaccinated, while 60% of pediatricians and family practitioners believed that obstetricians and gynecologists are better at it (P= 0.18).

## Discussion

This study shows that the educational sessions, workshops, and symposia conducted by the LSOG starting 2007 did not have the desired impact on the KAA of HCPs concerning HPV and HPV-V. These educational programs did not change the attitude of these HCPs as far as discussing sexual health-related issues with their patients or children and to recommend HPV-V. This may partly explain why vaccination rates and public awareness in Lebanon remain sub-optimal. Other factors may also be the campaign fatigue by companies and by society, which peaked in 2011 and 2012 then sharply declined in recent years, the lack of a national HPV-V program and the high cost of the HPV vaccines. Lack of awareness and knowledge are commonly cited reasons for hesitancy in recommending and receiving any vaccine despite the availability of vaccination services (WHO, 2014) [18]. This is especially true in the Eastern Mediterranean region [19]. In our study, obstetricians and gynecologists were more confident in recommending HPV-V than pediatricians and family practitioners although both pediatricians and family practitioners were more used to vaccination than obstetricians and gynecologists; this may be because CC is an adult cancer and is rarely encountered by pediatricians and family practitioners. In addition, our study is limited by the smaller number of pediatricians and family practitioners who attended these congresses. Nonetheless, HPV vaccine hesitancy among pediatricians has also been reported in other studies [20-21].

Unexpectedly, HCPs who only have sons were more likely to recommend HPV-V than HCPs who had at least one daughter. This may be related to cultural issues specific to our region [22]. However, we noticed a significant increase in recommending gender-

neutral HPV-V in 2018 compared to 2009 which reflects a societal change of attitudes which parallels the international trend towards equally vaccinating boys and girls.

Our current study confirms that HCPs who are confident about the efficacy of the HPV- V in preventing CIN 2+ cervical lesions are also more likely to recommend the use of HPV and CC primary or secondary preventive measures (uOR=22.5, P-value=0.003).

Failure of the repeated educational programs to improve vaccine uptake is shown in a systematic review of 33 educational interventions [23]. This emphasizes the need for evidence-based approaches targeting both providers and the community to improve the knowledge and the awareness and, consequently vaccine uptake. Perkins et al. reported a sustained improvement in the rates HPV-V in the Boston Healthcare System through a provider focused intervention that included repeated contacts, education, individualized feedback, and strong quality improvement incentives. These incentives included CME credits and maintenance of board certification [24].

In our study, 80% of HCPs who support HPV-V report psychosocial barriers as the major obstacles to HPV-V while only 20% report cost as the major barrier. In contrast 76% of HCPs who do not recommend or are hesitant in recommending HPV-V reported cost as the major hurdle. In Lebanon, we lack coordination among different medical societies, a national immunization registry, and funding for focused educational sessions. The high cost of the current HPV vaccines in the private sector and the unstable political and financial environment make it even more difficult to implement a national immunization program. In addition, our country is not eligible to obtain GAVI support.

Most patients visiting the clinics of obstetricians and gynecologists present at an age which is much older than the RAV. Twenty five % of HCPs, who did not recommend or were hesitant about vaccination and were aware of the RAV, advised vaccinating females at an older age. In contrast, 55% of HCPs, who were confident and usually recommended HPVV and were aware of the RAV, recommended HPV at an older age group ( $p < 0.001$ ). The reason which is usually cited is usually the much older age at initiation of sexual intercourse in our region [25]. However it should be emphasized that women presenting beyond age of 27 or non-sexually naïve will encounter a poor efficacy of HPV vaccine [26]. Gynecologists can rather have adolescent girls presenting for various reasons beyond cervical dysplasia (pelvic pain, menstrual disorders, Polycystic ovary syndrome, urinary tract infection, ovarian cysts, Endometriosis, Adolescent amenorrhea, vaginal discharge) as opportunities to recommend HPV vaccination. The advantage of gynecology clinic is rather having a potential of open sexuality conversation that would help navigate with young adults prevention measures and vaccination plan against STD. Also women giving birth to girls and those presenting with their daughters will present further opportunities for gynecologists to recommend HPV vaccine.

HPV-V in Lebanon is not among the pediatric immunization program, so it is up to parents, patients and their physicians to ask for it. This emphasizes the need to improve the knowledge and awareness of both HCPs and the public on the pros and cons of HPV-V. One third of HCPs in our surveys reports that parents were afraid of the adverse events of the HPV vaccines. This stresses the need for effective communication strategies between patients and their HCPs [27]. Lebanon has a diverse mix of liberal and conservative cultures, HCPs must address these culture-sensitive issues and include discussion of sexuality issues with their patients and their parents to their clinical armamentarium [28]. Here, the role of the government is essential since studies show that when governments take the lead and recommend HPV-V as part of their national immunization program, then parents become more receptive to the idea of vaccinating their children.

## Conclusions

Sub-optimal vaccine uptake in the EMENA region in general, and in Lebanon in particular, is multifactorial and complicated by political instability, competing priorities, the absence of screening programs, and the unwillingness of policymakers and stakeholders to invest in HPV-V in addition to the cultural and religious diversity. However, patients in this part of the world usually trust their physicians with their health-related issues. Therefore, in addition to trying to engage government officials and NGOs in the efforts to introduce HPV-V, it is also vital to invest in the education of our patients and their HCPs about HPV, HPV-related diseases, and CC [10]. To improve HPV vaccines' uptake, the LSOG and stakeholders should use more evidence-based approaches with proven efficacy.

### **Data Availability Statement**

The data that support the findings of this study are available from the corresponding author (MS) upon reasonable request.

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### **Conflict of interest**

The authors declare no conflict of interest.

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Table-1 Demographic data of health care providers (HCPs) who attended the Lebanese Society of Obstetrics and Gynecology (LSOG) congresses in 2009 and 2018

	2009	2018	P-value
<b>Age</b>			
25-35		34% (55/160)	-
36-45		24% (38/160)	
46-55		24% (38/160)	
56-65		13% (21/160)	
>65		5% (08/160)	
<b>Gender</b>			
Male	63% (117/185)	34% (57/168)	<0.01*
Female	37% (068/185)	66% (111/168)	
<b>Marital Status</b>			
Single	20% (040/185)	29% (49/169)	0.11
Married/Living with Partner/Widowed/Divorced	80% (148/185)	71% (120/169)	
<b>Having Children</b>			
Yes	82% (148/181)	66% (114/172)	<0.001*
No	18% (033/181)	34% (58/172)	
<b>Having at least one daughter:</b>			
Daughter		73% (83/114)	
Only Son(s)		27% (31/114)	
<b>Specialty</b>			
OBGYN	86% (159/185)	80% (141/177)	0.11
Pediatric/family	14% (26/185)	20% (36/177)	
<b>Setting of Practice</b>			
University Hospital	40.5% (73/180)	32% (49/154)	0.09
Private setting	44% (80/180)	54% (83/154)	
Public setting	13% (23/180)	9% (14/154)	
free walk in clinic	2% (4/180)	5% (08/154)	
<b>Year of Practice</b>			
2-19 years		63% (94/150)	-
20-50 years		37% (56/150)	
<b>Country of Practice</b>			
Lebanon	74% (86/117)	79% (134/169)	0.25
Other Middle Eastern	26% (31/117)	21% (35/169)	
<b>Location of practice</b>			
Beirut		63% (74/117)	-
North Lebanon		10% (11/117)	
South Lebanon		13% (15/117)	
Mount Lebanon		10% (12/117)	
Beqaa		4% (5/117)	

-\*: p-value &lt; 0.05

Table 2- Comparative analysis of the knowledge items regarding Human Papilloma Virus vaccination (HPV), HPV related diseases and HPV- vaccination (HPV-V) among health care providers (HCPs) attending the Lebanese Society of Obstetrics and Gynecology (LSOG) meetings in 2009 and 2018.

	2008	2018	P-value
<b>Knowledge of HPV</b>			
• Q1.How many HPV serotypes exist?	81% (133/165)	74% (109/148)	0.14
• Q2.How many HPV serotypes affect the genital	43% (65/150)	63% (80/128)	0.001*
• Q3.Which HPV types are more frequently associated with cervical cancer	97% (174/179)	91% (143/157)	0.015*
<b>Knowledge of HPV pathogenesis</b>			
• Q4.Which of these diseases are associated with	–	84% (137/164)	–
• Q5.How is HPV most commonly transmitted?	–	70% (115/164)	–
• Q6.The highest rates of genital HPV infection have been reported in sexually	65% (118/182)	47% (71/151)	0.001*
• Q7.The incubation period of an HPV infection is	28% (38/134)	36% (44/123)	0.202
• Q8.Approximately, what is the prevalence of HPV infection in the general population in the	27% (34/125)	19% (17/91)	0.15
• Q9.What is the prevalence of HPV infection in sexually active adolescents in the US?	23% (40/177)	9% (8/91)	0.005*
• Q10.What is the lifetime risk of acquiring a genital HPV infection?	11% (17/157)	12% (15/129)	0.83
<b>Knowledge of general characteristics of HPV vaccines and prevention strategies</b>			
• Q11.What are the commercially prophylactic HPV vaccines available? -	82% (140/170)	39% (51/131)	<0.001*
• Q12.What type of HPV serotypes does the Bivalent vaccine cover for?	95% (165/174)	92% (120/131)	0.26
• Q13. What type of HPV serotypes does the Quadrivalent vaccine cover for?	91% (155/171)	91% (115/126)	0.85
• Q14. What type of HPV serotypes does the Nano-valent vaccine cover for?	–	69% (65/94)	–
• Q15. At what stage is HPV vaccination recommended?	93% (170/182)	95% (124/131)	0.65
• Q16. In most countries, what is the first target age group for HPV vaccination?	52% (92/178)	66% (94/142)	0.008*
• Q17. How efficacious are present vaccines in preventing future CIN 2+ cervical lesions?	59% (98/166)	52% (65/124)	0.26
• Q18.With the evidence so far, how long do you think the present vaccines remain efficacious in preventing CIN2+ lesions?	36% (58/162)	87% (104/119)	<0.001*
• Q19.Do neutralizing antibodies play an important role in vaccine efficacy?	87% (124/143)	74% (61/94)	<0.001*
• Q20.Is vaccine boosting necessary now?	31% (49/160)	32% (39/123)	0.85

-\*: p-value < 0.05

Table 3- Comparative analysis of the attitude regarding discussion of sexual health related issues and Human Papilloma Virus (HPV), and HPV-vaccination (HPV-V) and the barriers to HPV-V among health care providers (HCPs) attending the Lebanese Society of Obstetrics and Gynecology (LSOG) meetings in 2009 and 2018

	% proper attitude		
	2009	2018	P-value
Q21 Do you speak about questions related to sexuality with your patients? (Always)	27% (48/177)	26% (34/131)	0.82
Q22. Do you speak about questions related to sexuality with your patients' parents? (always)	14% (24/171)	19% (23/119)	0.23
Q23. To what extent do you think that HPV vaccination would be useful for preventing cervical cancer? (Great extent)	82% (136/166)	80% (98/122)	0.73
Q24. Do you think your patients are interested in HPV vaccination? (Yes, all or most of them)	39% (65/165)	40% (50/126)	0.96
Q25. Do you think your patients' parents are interested in HPV vaccination? (Yes, all or most of them)	45% (69/152)	39% (45/115)	0.77
Q26. If you were to recommend HPV vaccination, which of your patients should receive it? both females and males	42% (71/169)	67% (63/94)	<0.001*
Q27. If you were to recommend HPV vaccination, how confident are you to talk to your patient about HPV vaccination? (Very confident)	69% (119/172)	74% (85/115)	0.39
Q28. If you were to recommend HPV vaccination, how confident are you that you can convince your patients to take the HPV vaccine? (Very confident)	57% (96/169)	59% (63/107)	0.73
Q29. Do you think it would be useful to improve your knowledge of HPV and its prevention? (yes)	98% (167/170)	99% (115/116)	0.52

\*: p-value < 0.05

Table 4- Univariate analysis of factors that affect the decision to recommend Human Papilloma Virus vaccination (HPV-V) among health care providers (HCPs) attending the Lebanese Society of Obstetrics and Gynecology (LSOG) meetings in 2009 and 2018.

Factors	Yes	No	P-value	uOR, CI	P-value
<b>Age</b>					0.799
25-35	63.6% (35/55)	36.4% (20/55)	0.79	-	-
36-45	60.5% (23/38)	39.5% (15/38)		0.90(0.40-2.00)	0.76
46-55	73.7% (28/38)	26.3% (10/38)		1.60(0.65-4.00)	0.31
56-65	66.7% (14/21)	33.3% (7/21)		1.14(0.40-3.30)	0.8
>65	62.5% (5/8)	37.5% (3/8)		0.95(0.20-4.40)	0.95
<b>Gender</b>					
Male	73.7% (42/57)	26.3% (15/57)	0.135	-	
Female	62.2% (69/111)	37.8% (42/111)		0.60(0.30-1.2)	0.137
<b>Marital Status</b>					
Single	67.3% (33/49)	32.7% (16/49)	0.649	-	
Married/ Divorced /Widowed / Living with Partner	64.2% (77/120)	35.8% (43/120)		0.87(0.40-1.70)	0.69
<b>Children</b>					
No	64% (37/58)	36% (21/58)	0.89	-	
Yes	65% (74/114)	35% (40/114)		1.10(0.54-2.00)	0.89
Only Son(s)	84% (26/31)	16% (5/31)	0.01*	-	
Daughter	58% (48/83)	42% (35/83)		0.30(0.10-0.80)	0.013*
<b>Specialty</b>					
Pediatric/family	50% (18/36)	50% (18/36)	0.035	-	
OBGYN	69% (97/141)	31.2% (44/141)		2.20(1.00-4.60) *	0.027*
<b>Setting of Practice</b>					
public	42.9% (6/14)	57.1% (8/14)	0.12	--	
Private	59% (49/83)	41% (34/83)		1.90(0.61-6.00)	0.264
University hospital	69.4% (34/49)	30.6% (15/49)		3.00 (0.90-	0.076
free walk in	87.5% (7/8)	12.5% (1/8)		9.30(0.90-	0.062
<b>Year of Practice</b>					
1-19	58.5% (55/94)	41.5% (39/94)	0.112	-	
20-50	71% (40/56)	29% (16/56)		1.10(0.99-1.00)	0.271
<b>Country of Practice</b>					
Other Middle Eastern	69% (24/35)	31% (11/35)	0.52	-	
Lebanon	63% (84/134)	37% (50/134)		0.77(0.35-	0.52
<b>Location of practice</b>					
South Lebanon	53.3% (8/15)	46.7% (7/15)	0.82	-	
North Lebanon	54.5% (6/11)	45.5% (5/11)		1.05(0.2-5.0)	0.95
Beqaa	60% (3/5)	40% (2/5)		1.30(0.17-10.20)	0.79
Beirut	61% (45/74)	39% (29/74)		1.30(0.45-4.15)	0.59
Mount Lebanon	75% (9/12)	25% (3/12)		2.60(0.5-13.70)	0.25

Abbreviations: uOR, Unadjusted Odds Ratio, 95% CI, 95%

Table 5- Univariate analysis of the elements of the knowledge of Human Papilloma Virus (HPV), and HPV-vaccination (HPV-V) among health care providers (HCPs) attending the Lebanese Society of Obstetrics and Gynecology (LSOG) meeting in 2018 which influence their decision to recommend Human Papilloma Virus vaccination HPV-V)

Knowledge Questions-2018	HPV recommendation		uOR, CI	P-value
		%(N)		
Q1.How many HPV serotypes exist?	No	67% (24/36)	--	0.80
	Yes	64% (70/109)	1.09(0.53-2.27)	
Q2.How many HPV serotypes affect the genital tract?	No	74% (59/80)	-	0.54
	Yes	69% (33/48)	0.78(0.36-1.70)	
Q3.Which HPV types are more frequently associated with CC	No	71% (10/14)	-	0.53
	Yes	63% (90/143)	0.67(0.2-2.27)	
Q4.Which of these diseases are associated with HPV?	No	63% (17/27)	-	0.42
	Yes	71% (97/137)	1.40(0.60-3.38)	
Q5.How is HPV most commonly transmitted?	No	76% (37/49)	-	0.28
	Yes	67% (77/115)	0.66(0.30-1.40)	
Q6.The highest rates of genital HPV infection have been reported in sexually active women of which age:	No	68% (54/80)	-	0.44
	Yes	73% (52/71)	1.3(0.65-2.67)	
Q7.The incubation period of an HPV infection is approximately:	No	70% (55/79)	-	0.87
	Yes	68% (30/44)	0.94(0.42-2.07)	
Q8.Approximately, what is the prevalence of HPV infection in the general population in the US?	No	78% (58/74)	-	0.24
	Yes	65% (11/17)	0.50(0.16-1.58)	
Q9.What is the prevalence of HPV infection in sexually active adolescents in the US?	No	80% (66/83)	-	0.76
	Yes	75% (6/8)	0.77(0.14-4.17)	
Q10.What is the lifetime risk of acquiring a genital HPV infection?	No	75% (86/114)	-	0.21
	Yes	60% (9/15)	0.49(0.16-1.49)	
Q11.What are the commercially HPV vaccines available? -	No	74% (59/80)	-	0.54
	Yes	78% (40/51)	1.30(0.56-2.98)	
Q12. What type of HPV serotypes does the Bivalent vaccine cover for?	No	73% (8/11)	-	0.77
	Yes	77% (92/120)	1.20(0.31-4.96)	
Q13. What type of HPV serotypes does the Quadrivalent vaccine cover for?	No	42% (26/62)	-	0.73
	Yes	77% (89/115)	1.30(0.32-5.20)	
Q14. What type of HPV serotypes does the Nano-valent vaccine cover for?	No	76% (22/29)	-	0.31
	Yes	85% (55/65)	1.80(0.59-5.18)	
Q15. At what stage is HPV vaccination recommended?	No	100% (7/7)	-	0.99
	Yes	78% (97/124)	0	
Q16. In most countries, what is the first target age group for HPV vaccination?	No	67% (32/48)	-	0.09
	Yes	80% (75/94)	1.97(0.9-4.30)	
Q17. How efficacious are present vaccines in preventing future CIN 2+ cervical lesions?	No	66% (39/59)	-	0.001*
	Yes	91% (59/65)	5.04(1.86-13.68)	
Q18. With the evidence so far, how long do you think the present vaccines remain efficacious in preventing CIN2+ lesions?	No	80% (12/15)	-	0.918
	Yes	79% (82/104)	0.93(0.24-3.59)	
Q19. Do neutralizing antibodies play an important role in vaccine efficacy?	No	68% (15/22)	-	0.058
	Yes	87% (53/61)	3.09(0.96-9.90)	
Q20. Is vaccine boosting necessary now?	No	82% (69/84)	-	0.49
	Yes	77% (30/39)	0.73(0.28-1.80)	

\*: p-value < 0.05

Table 6- Univariate analysis of the elements of the knowledge of Human Papilloma Virus (HPV), and HPV-vaccination (HPV-V) and how they perceive the knowledge and attitude of their patients which affects their recommendation and acceptance of HPV-V among health care providers (HCPs) attending the Lebanese Society of Obstetrics and Gynecology (LSOG) meeting in 2018.

Model-2		HPV recommendation			
Attitude Questions-2018		%(N)	uOR	P-value	
Q21. Do you speak about questions related to sexuality with your patients?	not always	81% (79/97)	--	0.79	
	<b>always</b>	79% (27/34)	0.88(0.30-2.30)		
Q24. Do you think your patients are interested in HPV vaccination?	few or none	81% (62/76)	-	0.62	
	<b>all and most of them</b>	78% (39/50)	0.80(0.33-1.90)		
Q22. Do you speak about questions related to sexuality with your patients' parents?	not always	80% (77/96)	-	0.83	
	<b>always</b>	78% (18/23)	0.89(0.29-2.70)		
Q25. Do you think your patients' parents are interested in HPV prevention?	No	80% (56/70)	-	0.55	
	<b>Yes</b>	84% (38/45)	1.36(0.50-3.70)		
23. To what extent do you think that HPV vaccination would be useful for preventing cervical cancer?	not great extent	78% (18/23)	-	* <0.05	
	<b>great extent</b>	96% (95/99)	6.60(1.60-26.97)		
Q27. If you were to recommend HPV vaccination, how confident are you to talk to your patient about HPV vaccination?	not very confident	87% (26/30)	-	0.30	
	<b>very confident</b>	93% (79/85)	2.00 (0.53-7.70)		
Q28. If you were to recommend HPV vaccination, how confident are you that you can convince your patients to take the HPV vaccine?	not very confident	87% (38/44)	-	0.12	
	<b>very confident</b>	95% (60/63)	3.20(0.75-13.4)		
Q30. What do you think about the safety of the available HPV vaccination?	not very safe	92% (54/59)	-	0.43	
	<b>very safe</b>	94% (51/54)	1.80(0.42-7.50)		
reasons for patients HPVV refusal	Refusal to discuss sexual issues	<b>Yes</b>	15% (14/95)	-----	reference
	Cost	<b>Yes</b>	20% (19/95)	0.34(0.06-1.90)	0.21
	Fear of adverse events	<b>Yes</b>	24% (23/95)	0.66(0.11-3.86)	0.64
	False perception of low risk	<b>Yes</b>	41% (39/95)	0.93(0.17-5.15)	0.93
reasons for parents' refusal to HPVV	Refusal to discuss sexual issues	<b>Yes</b>	27% (20/75)	-----	reference
	Fear of adverse events	<b>Yes</b>	33% (25/75)	1.50(0.40-5.60)	0.55
	False perception of low risk	<b>Yes</b>	40% (30/75)	1.30(0.38-4.40)	0.68
reasons for Physicians' refusal to HPVV	Doubts in efficacy	<b>Yes</b>	6% (3/55)	-----	reference
	Fear of adverse events	<b>Yes</b>	6% (3/55)	0.50(0.03-8.95)	0.64
	difficulty in adequate counseling	<b>Yes</b>	13% (7/55)	0.78(0.06-10.90)	0.85
	Cost	<b>Yes</b>	76% (42/55)	14.00(0.69-284.00)	0.08

\*: p-value < 0.05