RESEARCH ARTICLE

Awareness, attitudes and acceptability of the HPV vaccine among female university students in Morocco

A. Yacouti¹, N. Elkhoudri¹, A. El got¹, A. Benider², F. Hadrya¹, R. Baddou¹, A. Forster³*, M. Mouallif¹*

1 Laboratory of Health Sciences and Technologies, Epidemiology and Biomedical Unit, Higher Institute of Health Sciences, Hassan First University of Settat, Settat, Morocco, 2 Faculty of Medicine and Pharmacy, Hassan II University, Casablanca, Morocco, 3 Department of Behavioural Science and Health, Institute of Epidemiology & Health, University College London, London, United Kingdom

* These authors contributed equally to this work.
* m.mouallif@gmail.com (MM); alice.forster@ucl.ac.uk (AF)

Abstract

Background
In Morocco, cervical cancer is the second most common cancer affecting women behind breast cancer. The Human PapillomaVirus (HPV) vaccine has been available in Morocco since 2008 but its introduction in the national immunization program is still under discussion. There is limited data regarding acceptability and predictors of HPV vaccine acceptability among Moroccan young women. This study aimed to evaluate the awareness of female university students of HPV and the vaccine and to identify predictors of HPV vaccine acceptability.

Methods
We conducted a structured interviewer-administered questionnaire with 1087 participants in six Moroccan universities between May 2019 and June 2020.

Results
The awareness of HPV infection was 14.7% and of HPV vaccine was 7.8%. The rate of immunization coverage against HPV was less than 1%. Over 67% of participants were willing to receive the HPV vaccine. Awareness of cervical cancer ($p$-Value = 0.04) and the HPV vaccine ($p$-Value = 0.01), and acceptability of Pap smear test ($p$-Value <0.01) were significant predictors of HPV vaccine acceptability.

Conclusions
This study revealed an insufficient amounts of awareness of HPV and of HPV vaccine uptake in a sample of Moroccan university young women. This lack of awareness needs intervention, and it is important to develop an awareness program for young female
1. Introduction

Cervical cancer is the second most common cancer behind breast cancer affecting women worldwide, with approximately 570,000 new cases and 311,000 deaths annually [1]. In Morocco, cervical cancer is the second women’s cancer behind breast cancer, with an estimated 3388 new cases and 2465 deaths annually [1].

Human PapillomaVirus (HPV) infection is a common sexually transmitted infection. Virtually all cases of cervical cancer are linked to infection with high-risk oncogenic HPV [2]. The last decade has been marked by the introduction of a vaccine against this infection and over 80 countries have introduced the HPV vaccine into their national immunization program [3]. Although cervical cancer is one of the few preventable human cancers, its incidence is significantly high in developing countries [4].

Due to the high prevalence of HPV infection in girls from their first sexual intercourse [5], the most national program of different countries targeted young adolescent girls [6]. However, the specific age groups targeted vary from one country to another [6].

The possibility of preventing cervical cancer through vaccination is both an invaluable opportunity and a difficult challenge. A critical first step to tailoring strategies that can be adopted to increase HPV vaccine uptake is to understand the predictors of the acceptability of the HPV vaccine.

Many investigations have revealed a variable level of awareness, attitudes and acceptability of young populations towards the HPV vaccine in different countries [7, 8]. In Morocco, limited data is available regarding this subject. The only study done in a population of young Moroccans of both genders revealed a low level of acceptability of the HPV vaccine. However, the survey included males, which limits our understanding of the acceptability of the HPV vaccine among women (only 256 females took part of the survey). Moreover, the female population in this study included adolescents, a population of which vaccination decisions still depending on parents [9]. Thus, in the present study we aimed to better investigate this subject by carrying out a survey exclusively in female university students, a population more likely to be making immunization decisions themselves [10]. We specifically aimed to evaluate awareness of participants regarding cervical cancer and its prevention, and to identify predictors of HPV vaccine acceptability.

2. Methods

2.1. Study design

A cross-sectional study was conducted using a structured interviewer-administered questionnaire among female students between May 2019 and June 2020, in six universities among the twelve Moroccan public universities. This was within five various regions among the twelve Moroccan regions. A Purposive sampling technique was employed to choose regions to ensure that the sample is equally balanced across different Moroccan regions. The five regions are as follow: Souss-Massa (Agadir: southern atlantic of Morocco), Casablanca-Settat (Casablanca: center of the country and the economical capital, Settat: dominance of the rural population), Rabat-Salé-Kénitra (Rabat: the administrative capital), Marrakech-Safi (Marrakech: fourth largest city and the touristic capital located in the south of Morocco), and Tanger-Tétouan-Al...
Hoceïma (Tanger: the north west of Morocco). Quota sampling was used to calculate the representative sample size of each selected university. The choice of individuals was arbitrarily made within institutions belonging to each university. The interviews were conducted individually, in a separate lecture room within each university institution. Participants were invited to take part in this study after getting their consents and if they were Moroccans and aged between 17 and 26 years old.

2.2. Data measurement

A multidisciplinary staff developed the questionnaire, in English, based on previous studies [11–13]. The questionnaire was translated into Moroccan dialect Arabic, and was then back translated into the original language. Lastly, the questionnaire was piloted on a sample of thirty participants. The questionnaire is composed of three different parts; i) socio-demographic characteristics, ii) awareness of cervical cancer and HPV infection, and iii) awareness, attitude, and acceptability of HPV vaccine (S1 Fig in S1 File). To assess the level of awareness of cervical cancer, participants were asked if they had already heard of cervical cancer. Those who were aware of cervical cancer, were then asked if they had ever heard of HPV. After providing all participants with accurate information on cervical cancer HPV and Pap smear test, we asked them if they had ever heard previously of Pap smear test and HPV vaccine to evaluate their level of awareness of these two cervical cancer preventive measures. To evaluate the acceptability of HPV vaccine within the whole study population, we first provided all participants with accurate information about the HPV vaccine. We then evaluated whether they were willing to get vaccinated in the future. Participants who were reluctant to get the HPV vaccine in the future were asked to freely express why this was the case.

2.3. Statistical analysis

Data were analyzed via SPSS v 25. We carried out a descriptive analysis to describe the socio-demographic characteristics and the level of awareness of participants. To identify the attitudinal, awareness and socio-demographic predictors of HPV vaccine acceptability, we used the univariate logistic regression. We then used a multivariate model to assess the net effect of each socio-demographic and attitudinal covariate on acceptability of the HPV vaccine. Association was considered statistically significant at \( p < 0.05 \). The 95% confidence interval was used to estimate the precision of the Odds Ratio (OR). The multivariate model was evaluated using the Hosmer-Lemeshow goodness-of-fit test.

2.4. Statement of ethics

Participants were informed that the survey was anonymous and they all had volunteered to participate in the study. The study protocol was approved by the national committee on research ethics of the Faculty of Medicine and Pharmacy of Rabat, University Mohammed V (ref. 58/19). The national committee of the protection of personal data (CNDP) authorized the implementation of the survey.

3. Results

3.1. Socio-demographic characteristics of participants

We approached 1145 university women, among them 1087 completed the interview. The response rate was 95%. A summary of the socio-demographic characteristics of participants is provided in Table 1. The average age was 20.22 (range 17–26). The majority of participants followed non-health related studies (71.9%) and they were undergraduate students (88.3%).
More than half of participants (58.4%) declared a monthly family income greater than 5000 MAD (Moroccan Dirham) which represent a medium income for Moroccan population (5000 MAD = US $500). About half of respondents (49%) reported that their fathers had a high educational level and almost 42% of participants declared that their mothers were unschooled.

### 3.2. Cervical cancer, Pap smear test and HPV awareness

Only 18.1% of participants were unaware of cervical cancer. Over 74% of participants who were aware of cervical cancer reported that they knew that it can be screened at an early stage. The majority of those who were aware of cervical cancer were unaware of HPV (85.3%). Most participants, 82.8% and 92.2% were, respectively, unaware of the Pap smear test and the HPV vaccine (Table 2).

### 3.3. HPV vaccine and Pap smear test acceptability

Over 67% of participants were willing to receive the vaccine. The high cost of the vaccine was cited as the main barrier to willingness to get the HPV vaccine for those who were unwilling to receive the vaccine (48.1%) (Table 3). Furthermore, almost 83% of participants intended to have a regular Pap smear test in the future (Table 2).

---

Table 1. Socio-demographic characteristics of participants by HPV vaccine acceptability. Morocco between May 2019 and June 2020 (N = 1087).

| Categorical variables | Total sample of participants (N = 1087) | Univariate analysis | Multivariate analysis |
|-----------------------|----------------------------------------|---------------------|---------------------|
|                       |                                        | OR (95% CI)         | p-Value             |
| Age                   |                                        |                     |                     |
| 17–21                 | 76.4 (830)                             | 1                   | 1                   |
| 22–26                 | 23.6 (257)                             | 0.77 (0.58–1.04)    | 0.09                |
| Field of study        |                                        |                     |                     |
| Non Health-related    | 71.9 (782)                             | 1                   | 1                   |
| Health-related        | 28.1 (305)                             | 1.75 (1.29–2.36)    | <0.01               |
| Year of study         |                                        |                     |                     |
| Bachelor              | 88.3 (960)                             | 1                   | 1                   |
| Masters-Doctorate     | 11.6 (127)                             | 0.88 (0.60–1.31)    | 0.54                |
| Living area           |                                        |                     |                     |
| Rural area            | 10.6 (115)                             | 1                   | 1                   |
| Urban area            | 89.4 (972)                             | 0.68 (0.43–1.05)    | 0.08                |
| Income                |                                        |                     |                     |
| ≤ 2566 MAD            | 8.9 (97)                               | 1                   | 1                   |
| 2567–5000 MAD         | 19.4 (211)                             | 0.79 (0.74–1.33)    | 0.38                |
| >5000 MAD             | 58.4 (635)                             | 1.05 (0.66–1.67)    | 0.81                |
| I don’t want to answer/I don’t know | 13.2 (144) | 0.70 (0.40–1.21)    | 0.20                |
| Father’s educational level |                                   |                     |                     |
| No schooling          | 20.1 (219)                             | 1                   | 1                   |
| Elementary school     | 17.9 (195)                             | 1.09 (0.73–1.62)    | 0.66                |
| Secondary school      | 12.6 (137)                             | 1.42 (0.91–2.23)    | 0.11                |
| High school and more  | 49.3 (536)                             | 1.97 (1.41–2.74)    | <0.01               |
| Mother’s educational level |                                   |                     |                     |
| No schooling          | 41.9 (455)                             | 1                   | 1                   |
| Elementary school     | 12.5 (136)                             | 0.99 (0.67–1.48)    | 0.99                |
| Secondary school      | 11.0 (120)                             | 0.96 (0.63–1.46)    | 0.87                |
| High school and more  | 34.6 (376)                             | 1.87 (1.73–2.53)    | <0.01               |

https://doi.org/10.1371/journal.pone.0266081.t001
3.4. Predictors of willingness to get the HPV vaccine in the future

3.4.1. Socio-demographic predictors. The univariate logistic regression showed that participants’ current field of study at university and parent’s educational level were associated
with whether they were willing to get the HPV vaccine in the future. The participants who followed health-related studies were more likely to say they were willing to get the vaccine in the future compared to those who followed non-health related studies (OR: 1.75, 1.29–2.36 CI 95%). Participants whose mothers had a high level of education were more likely to be willing to get the HPV vaccine in the future compared to those with unschooled mothers (OR: 1.87, 1.73–2.53 CI 95%). Participants whose fathers had a high level of education were more likely to be willing to get the HPV vaccine in the future compared to those with unschooled fathers (OR: 1.97, 1.41–2.74 CI 95%) (Table 1). Results of multivariate logistic regression showed that no demographic variables were significantly associated with willingness to get the HPV vaccine in the future (Table 1).

3.4.2. Attitudinal and awareness predictors. The univariate logistic regression revealed that awareness of cervical cancer and of the HPV vaccine, willingness to get the Pap smear test in the future, and believing that cervical cancer is a deadly cancer were associated with willingness to get the HPV vaccine in the future. Participants who were aware of cervical cancer were more likely to be willing to get the HPV vaccine in the future compared to those who were unaware of this cancer (OR: 1.56, 1.13–2.14 CI 95%). Participants who were willing to have a Pap smear test in the future were more willing to get the HPV vaccine in the future than those who were unwilling to have a Pap smear test in the future (OR: 2.54, 1.85–3.49 IC 95%). Participants who were aware of HPV vaccine were more willing to get the vaccine in the future than those who had never heard of (OR: 3.11, 1.66–5.80 CI 95%) (Table 2). Data related to multivariate logistic regression showed that awareness of cervical cancer, HPV vaccine, and willingness to have a Pap smear test in the future were associated with willingness to get the HPV vaccine in the future (Table 2).

4. Discussion
This research aimed to investigate awareness and attitudes towards cervical cancer prevention, as well as the correlates of willingness to get the HPV vaccine in the future among female university students in Morocco.

A high proportion of participants were aware of cervical cancer (82%), which is similar to a previous study conducted in a comparable country; 69% of Lebanese students were aware of cervical cancer [14]. However, awareness was slightly lower than what was revealed in the study conducted by Mouallif et al [11] where 93.7% of mothers had heard of cervical cancer. This could be explained by the fact that the current ministry of health program aiming the early detection of cervical cancer does not reach young women. Indeed, a pilot program of
education and awareness towards cervical cancer targeting the young population is highly needed.

Despite this high level of awareness of cervical cancer, few people were aware of HPV, the cause of cervical cancer. Indeed, only 15% of participants who were aware of cervical cancer were aware of HPV. A similar figure was reported in a study of ethnically diverse female university students (21.7%) [15]. However, a far higher level of awareness of HPV (59.89%) was reported in a previous study conducted within a young population in Mainland China which is also considered as a developing country [16]. A higher levels of awareness of cervical cancer have been reported in college students in South Carolina (95.3%) [13]. This discrepancy could be closely associated to the availability of awareness campaigns in South Carolina, supporting that there is a need of awareness campaigns for Moroccan young females, which is in line with the National Cancer Prevention and Control Plan recommendations [17].

Awareness of the Pap smear test was also low, with only 17% of participants having heard of the test. Awareness among these Moroccan students was lower than what was revealed within a population of Muslim women in other Arab countries [18]. However, a previous Moroccan study conducted among a population of parents have revealed that 44.6% of mothers were aware of Pap smear test [11]. This result could be explained by the fact that mothers have benefited from a sensitization towards this test during their gynecological consultations. Nevertheless, the majority of participants (82%) expressed their willingness to undergo the Pap smear test in the future. This suggests, once again, that there is an urgent need to implement an educational program for cervical cancer suitable for young women.

Overall, the results showed very poor level of awareness of the HPV vaccine (8% had heard of it), which is likely related to the absence of education on HPV vaccine, and a national vaccine program. Moroccan parents have equally been found to have very low awareness of the HPV vaccine (14.3%) [11]. However, a study done in college students in South Carolina showed that more than 90% of them were aware of HPV vaccine, and this level of awareness was explained by the impact of multicomponent public health campaigns to promote cervical cancer prevention [13]. Furthermore, a recently published study on awareness of HPV vaccine within college students in China based on meta-analysis, concluded that awareness of HPV vaccine of a population of college students was relatively high in European countries compared with China [19]. These results underline the need to raise awareness of HPV and cervical cancer prevention in developing countries.

All but one of those who were aware of the HPV vaccine within our study population were unvaccinated. This finding was not surprising considering the absence of HPV vaccine in the national immunization program and the lack of public awareness campaigns to promote its acceptability. In this regard, a study conducted among a population of medical students in Lebanon reported also a low level of HPV vaccine uptake [20].

Interestingly, in the present study more than 67% of participants were willing to receive the HPV vaccine. A similar investigation conducted in Saudi Arabia reported similar figure; 64.3% of Saudi women were willing to receive the HPV vaccine [7]. However, a prior Moroccan survey conducted in 2015 with adolescents and young adults of both genders reported a low level of HPV vaccine acceptability (27%) [9]. The low level of acceptability in the later Moroccan study, could be mainly related to the fact it was evaluated either in males who may be less willing to have the vaccine than females.

In respect to the major barriers to willingness to get the HPV vaccine, our study showed that the cost of vaccine led to a negative intention to receive the HPV vaccine. This result corroborates with the finding of a meta-analysis done across South East Asian and Western Pacific regions [21]. However, others barriers have been raised more prominently in other
research compared to this research including lack of perceived risk for cervical cancer, logistical barriers and the concerns regarding safety and efficacy of the vaccine [8, 15].

Multivariate logistic regression revealed significant positive associations between willingness to get the HPV vaccine and awareness of this vaccine, and of cervical cancer. This finding was supported by many previous studies [22]. Moreover, our study revealed a positive association with willingness to get a Pap smear test in the future and willingness to get the HPV vaccine. Mothers’ screening behavior has previously been shown to be associated with their daughters’ vaccination acceptability [23] and in another study, girls of mothers who were engaged in the cervical screening program were more likely to initiate and complete the vaccination [24]. All these considerations point to the importance of education and awareness campaigns on cervical cancer prevention, with the aim of promoting willingness to attend for screening and get the vaccine. It is also recommended to implement an information system for the whole population and promote advocacy for cancer prevention mobilization [17].

Our study did not find any relationship between socio-economic background and HPV vaccine acceptability. Monthly income has been found to be positively associated with HPV vaccine acceptability in a previous Moroccan study, although done within a population of parents [11], and a systematic review focusing on European countries has also shown that low socio-economic status was correlated with individuals not getting the vaccine [25].

4.1. Strengths and limitations

Our study included a relatively large sample size and the study population was exclusively female (the group who are eligible for cervical cancer prevention program). Our investigation constitutes the first Moroccan study evaluating awareness of, attitudes towards, and factors associated with willingness to get the HPV exclusively in a population of young adult women. We used a structured interviewer-administered questionnaire for data collection whose results are described to be more reliable than self-administered interviewing [26]. We used non-probabilistic sampling which limits the generalization of our findings and our sample was limited to mainly urban dwelling students.

5. Conclusions

The awareness regarding HPV and HPV vaccine of female Moroccan university students seems to be not sufficient. The rate of vaccination coverage against HPV was almost zero. However, the vast majority of our study population was receptive to future HPV vaccination. Hence, the lack of awareness needs intervention. Therefore, developing an educational program on cervical cancer prevention seems to be a priority. The current rate of vaccine uptake is not sufficient in the absence of a vaccination program.

Supporting information

S1 File. Questionnaire used for data collection.

(DOCX)

Acknowledgments

The authors wish to thank Youssoufi. R, Oukalouch. C for their help during data collection. We would like to thank all students for their participation in this study.

Author Contributions

Conceptualization: A. Yacouti, A. Forster, M. Mouallif.
Data curation: A. Yacouti.

Formal analysis: A. Yacouti, N. Elkhoudri, A. Forster, M. Mouallif.

Funding acquisition: A. Yacouti, M. Mouallif.

Investigation: A. Yacouti, M. Mouallif.

Methodology: A. Yacouti, A. Forster, M. Mouallif.

Project administration: A. El got.

Supervision: A. Forster, M. Mouallif.

Validation: A. Yacouti, A. El got, A. Benider, A. Forster, M. Mouallif.

Visualization: A. Yacouti, A. El got, A. Forster, M. Mouallif.

Writing – original draft: A. Yacouti, A. Forster, M. Mouallif.

Writing – review & editing: A. Yacouti, A. El got, A. Benider, F. Hadrya, R. Baddou, A. Forster, M. Mouallif.

References

1. Arbyn M, Weiderpass E, Bruni L, de Sanjose S, Saraiya M, Ferlay J, et al. Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. The Lancet Global Health. 2020 Feb 1; 8(2): e191–203. https://doi.org/10.1016/S2214-109X(19)30482-6 PMID: 31812369

2. Walboomers JM, Jacobs MV, Manos MM, Bosch FX, Kummer JA, Shah KV, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. J Pathol. 1999 Sep; 189(1):12–9. https://doi.org/10.1002/(SICI)1096-9896(199909)189:1<12::AID-PATH431>3.0.CO;2-F PMID: 10451482

3. Gallagher KE, LaMontagne DS, Watson-Jones D. Status of HPV vaccine introduction and barriers to country uptake. Vaccine. 2018 06; 36(32 Pt A):4761–7. https://doi.org/10.1016/j.vaccine.2018.02.003 PMID: 29580641

4. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLO-BOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018; 68(6):394–424. https://doi.org/10.3322/caac.21492 PMID: 30207593

5. Dunne EF, Unger ER, Sternberg M, McQuillan G, Swan DC, Patel SS, et al. Prevalence of HPV infection among females in the United States. JAMA. 2007 Feb 28; 297(8):813–9. https://doi.org/10.1001/jama.297.8.813 PMID: 17327523

6. Markowitz LE, Tsu V, Deeks SL, Cubie H, Wang SA, Vicari AS, et al. Human papillomavirus vaccine introduction—the first five years. Vaccine. 2012 Nov 20; 30 Suppl 5:F139–148. https://doi.org/10.1016/j.vaccine.2012.05.039 PMID: 23199957

7. Hussain AN, Alkhenizan A, McWalter P, Qazi N, Alshmassi A, Farooqi S, et al. Attitudes and perceptions towards HPV vaccination among young women in Saudi Arabia. J Fam Community Med. 2016; 23 (3):145–50. https://doi.org/10.4103/2230-8229.189107 PMID: 27625580

8. Lim ASE, Lim RBT. Facilitators and barriers of human papillomavirus vaccine uptake in young females 18–26 years old in Singapore: A qualitative study. Vaccine. 2019 Sep 24; 37(41):6030–8. https://doi.org/10.1016/j.vaccine.2019.08.053 PMID: 31473002

9. Zouheir Y, Daouam S, Hamdi S, Alaoui A, Fechta R. Knowledge of Human Papillomavirus and Acceptability to Vaccinate in Adolescents and Young Adults of the Moroccan Population. J Pediatr Adolesc Gynecol. 2016 Jun; 29(3):292–8. https://doi.org/10.1016/j.jpag.2015.11.002 PMID: 26612116

10. Mintz E. The Effects of University Education on the Political Attitudes of Young Adults. Can J High Educ. 1998; 28(1):21–40.

11. Mouallif M, Bowyer HL, Festali S, Albert A, Filali-Zegzouti Y, Guenin S, et al. Cervical cancer and HPV: Awareness and vaccine acceptability among parents in Morocco. Vaccine. 2014 Jan 9; 32(3):409–16. https://doi.org/10.1016/j.vaccine.2013.10.069 PMID: 24186754

12. Christian T, Guell C. Knowledge and Attitudes of Cervical Cancer Screening Among Caribbean Women: A Qualitative Interview Study From Barbados. Women Health. 2015; 55(5):566–79. https://doi.org/10.1080/03630242.2015.1022816 PMID: 25833319
13. Kasymova S, Harrison SE, Pascal C. Knowledge and Awareness of Human Papillomavirus Among College Students in South Carolina. Infect Dis. 2019; 12:1178633718825077. https://doi.org/10.1177/1178633718825077 PMID: 30728723

14. Chalhoub W, Afiouni M, Chalhoub H, Daouk S, Matar M, Ashkar K. Awareness Regarding Cervical Cancer, Pap Smear Screening, HPV: Cross-Sectional Study in Lebanese Population. Biomed J Sci Tech Res. 2019 Nov 12; 22(4):16908–12.

15. Wong LP, Sam I-C. Ethnically diverse female university students’ knowledge and attitudes toward human papillomavirus (HPV), HPV vaccination and cervical cancer. Eur J Obstet Gynecol Reprod Biol. 2010 Jan; 148(1):90–5. https://doi.org/10.1016/j.ejogrb.2009.10.002 PMID: 19910102

16. Si M, Jiang Y, Su X, Wang W, Zhang X, Gu X, et al. Willingness to Accept Human Papillomavirus Vaccination and Its Influencing Factors Using Information–Motivation–Behavior Skills Model: A Cross-Sectional Study of Female College Freshmen in Mainland China. Cancer Control. 2021 Jan 1; 28:10732748211032899. https://doi.org/10.1177/10732748211032899 PMID: 34634207

17. National Cancer Prevention and Control Plan (French). [cited 2019 Oct 17]. Available from: https://www.sante.gov.ma/Documents/Synthese_PNPCC_2010-1019.pdf

18. Ali S, Skirton H, Clark MT, Donaldson C. Integrative review of cervical cancer screening in Western Asian and Middle Eastern Arab countries. Nurs Health Sci. 2017 Dec; 19(4):414–26. https://doi.org/10.1111/nhs.12374 PMID: 29058371

19. Yin G, Zhang Y, Chen C, Ren H, Guo B, Zhang M. Have you ever heard of Human Papillomavirus (HPV) vaccine? The awareness of HPV vaccine for college students in China based on meta-analysis. Hum Vaccin Immunother. 2021 Aug 3; 17(8):2736–47. https://doi.org/10.1080/21645515.2021.1899731 PMID: 33787459

20. Haddad SF, Kerbage A, Eid R, Kourie HR. Awareness about the human papilloma virus (HPV) and HPV vaccine among medical students in Lebanon. J Med Virol. 2021 Dec 7.

21. Santhanes D, Yong CP, Yap YY, Saw PS, Chaiyakunapruk N, Khan TM. Factors influencing intention to obtain the HPV vaccine in South East Asian and Western Pacific regions: A systematic review and meta-analysis. Sci Rep. 2018 Feb 26; 8(1):1–11. https://doi.org/10.1038/s41598-017-17765-5 PMID: 29311619

22. Loke AY, Kwan ML, Wong Y-T, Wong AKY. The Uptake of Human Papillomavirus Vaccination and Its Associated Factors Among Adolescents: A Systematic Review. J Prim Care Community Health. 2017 Oct; 8(4):349–62. https://doi.org/10.1177/2150131917742299 PMID: 29161946

23. Steens A, Wielders CCH, Bogaards JA, Boshuizen HC, de Greeff SC, de Melker HE. Association between human papillomavirus vaccine uptake and cervical screening in the Netherlands: implications for future impact on prevention. Int J Cancer. 2013 Feb 15; 132(4):932–43. https://doi.org/10.1002/ijc.27671 PMID: 22689326

24. Spencer Nee Pilkington AM, Brabin L, Verma A, Roberts SA. Mothers’ screening histories influence daughters’ vaccination uptake: an analysis of linked cervical screening and human papillomavirus vaccination records in the North West of England. Eur J Cancer Oxf Engl 1990. 2013 Apr; 49(6):1264–72. https://doi.org/10.1016/j.ejca.2012.12.001 PMID: 23390798

25. Fernández de Casadevante V, Gil Cuesta J, Cantarero-Arévalo L. Determinants in the Uptake of the Human Papillomavirus Vaccine: A Systematic Review Based on European Studies. Front Oncol. 2015; 5:141. https://doi.org/10.3389/fonc.2015.00141 PMID: 26157706

26. Online, face-to-face and telephone surveys—Comparing different sampling methods in wine consumer research—ScienceDirect [Internet]. [cited 2020 Apr 12]. Available from: https://www.sciencedirect.com/science/article/pii/S2212977413000331.