

BMJ Open Knowledge towards human papilloma virus (HPV) infection and attitude towards its vaccine in the Kingdom of Bahrain: cross-sectional study

Yusra Husain,¹ Amal Alalwan,¹ Zakeya Al- Musawi,¹ Ghadeer Abdulla,¹ Khulood Hasan,¹ Ghufran Jassim²

To cite: Husain Y, Alalwan A, Al- Musawi Z, *et al.* Knowledge towards human papilloma virus (HPV) infection and attitude towards its vaccine in the Kingdom of Bahrain: cross-sectional study. *BMJ Open* 2019;**9**:e031017. doi:10.1136/bmjopen-2019-031017

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2019-031017>).

Received 22 April 2019
Revised 26 August 2019
Accepted 30 August 2019



© Author(s) (or their employer(s)) 2019. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Family Medicine, Kingdom of Bahrain Ministry of Health, Manama, Bahrain

²Family Medicine, Royal College of Surgeons in Ireland and Medical University of Bahrain, Busaiteen, Bahrain

Correspondence to

Dr Amal Alalwan;
amal.alalwan@gmail.com

ABSTRACT

Objectives To determine the level of awareness of human papilloma virus (HPV) infection and to assess attitudes towards receiving the vaccine among men and women in Bahrain.

Design A cross-sectional study. An interview-based questionnaire was used to measure HPV knowledge and attitude towards HPV vaccine.

Setting Ten randomly selected primary health centres (PHCs) in the Kingdom of Bahrain.

Participants 408 PHC attendees, including 268 women and 140 men aged 18–65 years. Only residents from Bahrain and English or Arabic speakers were invited to participate.

Primary and secondary outcome measures Extent of awareness of HPV infection, acceptance of HPV vaccine and describing the results in association to gender, educational level and other demographics.

Results A response rate of 91.4% was achieved, with a majority being female responders as opposed to male responders (65.7% vs 34.3%, respectively). Only 13.5% of the participants had heard of HPV, with female gender and employment in the health sector ($p<0.001$ for both) having a significant association with awareness of HPV. The majority of the participants (76%) were willing to take the vaccine if recommended, with 84.8% believing that both genders should be vaccinated. However, 48.5% were concerned about possible side effects from the vaccine and 83.6% wanted reassurance that the vaccine will protect against HPV. More than 90% of the participants agreed on the need for educating the community about the HPV infection.

Conclusion Despite the limited knowledge about HPV infection among the study's participants, there is a favourable attitude towards the HPV vaccine. These data can support the initiation of a nationwide HPV immunisation programme.

INTRODUCTION

Human papilloma virus (HPV) is the most common sexually transmitted infection (STI) globally.¹ HPV is a group of over 200 related viruses.² Usually, HPV genital infections are asymptomatic and 80% of infected people experience spontaneous recovery within

Strengths and limitations of this study

- One of the main strengths of our study is the inclusion of men in our study sample.
- The use of multistage cluster sampling, face-to-face interviews and a reasonably large sample increases the validity of our data.
- The low sample size of the male participants makes the comparison with their female counterparts a bit challenging.
- Inclusion of healthcare workers might have resulted in better knowledge about human papilloma virus.
- The impact of the brief intervention on the attitude towards vaccination cannot be excluded.

1 year.³ However, persistent infection with high-risk types may progress to cancer at the infection site, mainly of the genital tract, in both men and women.²

HPV infection is most common among young women (less than 25 years),^{2 3} with a worldwide prevalence of 11.7% among women with normal cervical cytology.² Twelve oncogenic types of HPV are classified as high risk, namely, types 16, 18, 31, 33, 35, 39, 45, 52, 56, 58 and 59, with HPV type 16 being the most virulent.² According to the American Academy of Paediatrics, around 15 000 women and 7000 men are diagnosed with cancers attributed to HPV types 16 and 18 each year in the USA.⁴ In addition, types 16 and 18 are responsible for about 70% of cervical cancer cases.⁵

HPV is principally related to cervical cancer, which ranks as the fourth most common cancer among women worldwide.⁵ Virtually all cases of cervical cancer are caused by HPV.⁵ In 2012, the number of cervical cancer cases was estimated to be around 530 000 globally, all of which were attributed to HPV.⁶ Also, HPV is involved in a range of anogenital malignancies in both genders.² It accounts

for 88% of anal, 15%–48% of vulvar, 78% of vaginal and 51% of penile carcinomas.² In addition, there is growing evidence of HPV being a relevant factor in head and neck cancers,⁵ with a prevalence rate of 13%–60% for HPV-related oropharyngeal cancers.² HPV is also a precursor for anogenital warts. Some studies suggest that types 6 and 11 account for up to 90% of the cases.⁷

Prevalence of HPV among women, attending outpatient clinics for routine cervical screening and postnatal check-ups in Bahrain was estimated to be 9.8% as of 2011.⁸ The most commonly occurring high-risk HPV types were 52, 16, 31 and 51, while types 6, 70 and 74 constituted the low-risk group.⁸ In the Kingdom of Bahrain, cervical cancer ranks as the seventh most common cancer among women, with an estimated 10-year incidence of 83 per 100 000 for the years 1998–2007.⁹ It was reported in 2012 that 22 new cases of cervical cancer are diagnosed every year in Bahrain, and it causes approximately five deaths annually.¹⁰

HPV vaccines are now available and have the potential to reduce the incidence of cervical and other anogenital cancers.⁵ Achieving a 70% coverage, HPV vaccine can prevent >4 million deaths in women in low-income to middle-income countries over the next decade.¹¹ Three prophylactic HPV vaccines are currently available: bivalent, quadrivalent and nonvalent. The vaccine may be given as early as 9 years of age through 26 years of age.¹² Vaccinating >80% of girls reduces the risk of HPV infection in boys.² Therefore, countries are recommended to prioritise vaccinations for girls aged 9–14 years, while women aged >15 years and men should be grouped as secondary target.² A two-dose schedule is recommended for age <15 years, and a three-dose schedule is recommended for age >15 years.²

Currently, the HPV vaccination is part of the national vaccination and immunisation programme of 87 countries, including the United Arab Emirates (UAE).¹³ In 2008, Abu Dhabi became the first city in the Middle East to introduce the HPV vaccine.¹⁴ In 2013, Australia became the first nation to vaccinate the male population against HPV.¹⁵ The vaccine is available only in some private hospitals in Bahrain as the country is yet to include the vaccine in its national immunisation schedule.

Literature published in the region has shown low levels of public knowledge about HPV and its health associations. However, most studies indicated that people by in large are in favour of using the vaccine.^{8 14 16 17} The positive attitude towards vaccination in some studies was observed to be driven by the fear of contracting HPV infection, cervical cancer and genital warts.^{18 19} Age and sexual activity were also noticed to be determining factors for parents agreeing to vaccinate their children.¹⁹ Nevertheless, parents also feared that vaccination would encourage sexual promiscuity among children.^{19 20}

As of December 2017, 20 countries globally have included boys in their national HPV immunisation programme.²¹ With the occurrence of HPV-related diseases and cancers in men and the increasing inclusion

of the gender in HPV vaccine programmes worldwide, this study included men to ensure a more comprehensive view on the infection and its vaccine.

The aim of this study was to provide insights on the knowledge status of HPV infection in the Bahraini society and their attitudes towards the HPV vaccine. This study can aid communication between health policy makers to include HPV vaccine in the national immunisation schedule.

METHODS

Study design and population

A cross-sectional study was conducted in the Kingdom of Bahrain, in February 2018, among attendees of primary healthcare centres. A cluster multistage sampling method was used. Two health centres from each of the five health regions in the country were chosen at random, yielding a total of 10 health centres (BBK Hidd HC, NBB Dair HC, Bilad Al Qadeem Health Centre, Hoorah HC, A'ali HC, Yousif Engnair HC, East Riffa HC, Sitra HC, Kuwait HC and Budaiya HC).

A predetermined sample size of 385 was derived using the Survey Monkey electronic calculator with 95% CI, 5% margin of error, 0.05 level of significance and 1.5 million population of Bahrain.²²

Using a systematic technique, every third person entering the reception area of the health centre was invited to participate and was screened for eligibility, including those working in health centres, with the exception of physicians.

Our inclusion criteria consisted of men and women aged 18–65 years. Both Bahraini and non-Bahraini citizens were included. Non-English or non-Arabic speakers were excluded.

Four hundred ninety-five people were recruited over a 2-week period in February 2018, 49 of whom were excluded due to age and language limitations. Four hundred forty-six people met the inclusion criteria, of which 408 agreed to participate in the study.

The Primary Healthcare Research Sub-committee in the Ministry of Health reviewed and approved the study protocol. Verbal consent was taken from all participants prior to data collection.

Data collection

Data were collected via a questionnaire adopted from two studies in the region.^{23 24}

Questions were asked in either English or Arabic, depending on the participants' preference.

The questionnaire consists of 32 questions, including demographic data, knowledge about HPV infection, and attitudes and beliefs about the HPV vaccine. Further information regarding the questions can be found in the tables in the Results section.

The Arabic translated version was piloted on 20 participants to test it for clarity and language suitability. The

reliability of the questionnaire was tested and showed a Cronbach alpha of 0.789.

The questionnaire was administered via a face-to-face interview by physicians.

Participants who had heard of HPV were required to answer the whole questionnaire. Those who had not heard of HPV were briefed about HPV infection and were asked to answer only the attitude and beliefs sections of the questionnaire.

The briefing provided was that HPV stands for human papilloma virus, which is the most common STI. It can lead to cervical cancer in women. Vaccines to prevent the infection are available and can be given as early as 9 years of age until 26 years of age.

Patient and public involvement

This research was done without patient or public involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or to interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

Statistical analysis

All data were entered and analysed via SPSS software V.23. The demographic and baseline variables were summarised using descriptive statistics, with mean, SD and median for continuous variables and frequencies and percentage for categorical variables.

The knowledge questions were recorded as 'correct' for option 'yes' and 'incorrect' for options 'no' and 'I don't know'.

χ^2 test was used to investigate the association between categorical variables. Statistical significance was set at a *p* value of <0.05.

RESULTS

Four hundred forty-six health centre attendees met the inclusion criteria of our study, of whom 408 agreed to participate, yielding a response rate of 91.47%. Of the 408 participants, 65.7% (268) were women. The mean (SD) age was 34.5 years (9.7), and the median age was 33 years (range 18–65 years). Most of the respondents were Bahrainis (80.1%, *n*=327), married (81.9%, *n*=334) and had a high school or diploma degree (53.7%, *n*=219). About 46.6% (190) of the respondents were reported to be employed in the non-health sector, while 13.7% (56) were health sector employees. Demographic characteristics are demonstrated in [table 1](#).

Knowledge about HPV infection

Of the 408 people interviewed, only 13.5% (55) had heard of HPV infection, with media being the most common source of knowledge (45.5%, *n*=25). The two variables, which had a significant association with awareness of HPV, were female gender and employment in the health sector (*p*<0.001 for both) ([table 2](#)).

Table 1 Demographic characteristics

Characteristics	n (%)
Gender	
Male	140 (34.3)
Female	268 (65.7)
Total	408 (100)
Age (years)	
<30	134 (32.8)
30–40	174 (42.6)
>40	100 (24.5)
Total	408 (100)
Nationality	
Bahraini	327 (80.1)
Non-Bahraini	81 (19.9)
Total	408 (100)
Marital status	
Married	334 (81.9)
Unmarried	74 (18.1)
Total	408 (100)
Number of children	
None	98 (24)
1	68 (16.7)
2	93 (22.8)
3	58 (14.2)
>3	91 (22.3)
Total	408 (100)
Educational level	
Below high school	31 (7.6)
High school or diploma	219 (53.7)
University degree	158 (38.7)
Total	408 (100)
Occupation	
Health sector	56 (13.7)
Non-health sector	190 (46.6)
Unemployed	162 (39.7)
Total	408 (100)

Values are numbers (%) (*n*=408).

Values are numbers (%) (*n*=408)

Out of those who had heard of HPV, 39 (70.9%) identified HPV to be an STI. When asked if both men and women were infected by the virus, the majority (80%, *n*=44) answered correctly. Sixty-nine per cent (*n*=38) knew that the persistence of the virus can lead to cervical cancer and that unsafe sexual practices can increase the probability of getting HPV infection, while 60% (*n*=33) were aware that HPV may lead to other genital cancers. More than two-thirds of the people (72.7%, *n*=40) believed that prevention against the virus can prevent cervical cancer

Table 2 Association between demographic data and awareness of HPV

	Knew about HPV infection before the survey		χ^2 P value
	n (%)		
Gender			
Male	7/140 (5)		<0.001
Female	48/268 (17.9)		
Age (years)			
<30	22/134 (16.4)		0.444
30–40	22/174 (12.6)		
>40	11/100 (11)		
Nationality			
Bahraini	43/327 (13.1)		0.694
Non-Bahraini	12/81 (14.8)		
Marital status			
Married	48/334 (14.4)		0.263
Unmarried	7/74 (9.5)		
Educational level			
Below high school	1/31 (3.2)		0.057
High school or diploma	26/219 (11.9)		
University degree	28/158 (17.7)		
Occupation			
Health sector	26/56 (46.4)		<0.001
Non-health sector	14/190 (7.4)		
Unemployed	15/162 (9.3)		

HPV, human papilloma virus.

as well (table 3). The lowest correct responses were noted for two items: 'HPV is common in Bahrain' and 'there is no treatment for HPV infection' (20% vs 21.8%, respectively).

Attitudes towards HPV vaccine

Table 4 demonstrates the attitude and beliefs towards HPV vaccine. More than half of the study sample (60%, 244) thought that the vaccine was safe, but 83.6% (341) wanted to be reassured that the vaccine will protect against HPV.

When enquired regarding the greatest concern about the vaccine, about half of the study population were concerned regarding side effects (n=198, 48.5%) rather than efficacy and cost (n=122, 29.9%, and n=50, 12.3%, respectively; table 5).

Table 6 shows beliefs regarding vaccination policy. Majority of the participants believed that both genders should be vaccinated (84.8%, 346). However, they were divided in agreement over the timing of the vaccination. While 41.7% (170) believed that the vaccine should be administered before marriage, 34.1% (139) preferred it to be given at school age. Similarly, a split was also noted

Table 3 Knowledge about HPV infection, risk factors and prevention

	Correct	
	n	%
HPV is a virus in the genital area that is sexually transmitted.	39	70.9
HPV is common in Bahrain.	11	20.0
Both men and women get infected.	44	80.0
Unsafe sexual relationships can increase the probability of HPV infection.	38	69.1
Most people infected with HPV have no symptoms.	22	40.0
There is no treatment for HPV infection.	12	21.8
Smoking increases the risk of virus persistence and causes the infected cells to become cancerous.	27	49.1
HPV causes genital warts.	32	58.2
In women, if the virus persists, it causes an abnormal cervical smear and cancer.	38	69.1
HPV may cause other genital cancers (penis and anus).	33	60.0
Prevention against HPV will prevent cervical cancer.	40	72.7

Values are numbers (%) (n=55).
HPV, human papilloma virus.

regarding who should make the decision about vaccination. While 38.5% (157) believed that vaccination should be a joint decision between parents and the young person, 33.6% (137) thought that it should be decided by the individual himself.

All participants (100%) thought that people need information about HPV infection. More than 90% agreed on providing information to adolescents about HPV infection, health sequelae and prevention, as well as educating the community as part of a reproductive health programme. Seventy-six per cent (313) of the participants also showed willingness to take the vaccine if recommended.

Table 4 Attitude and beliefs towards HPV vaccine

	Yes
	n (%)
Vaccine is safe.	244 (59.8)
Want reassurance that the vaccine will protect against HPV infection.	341 (83.6)
Worried about the short-term side effects.	196 (48.0)
Worried about the long-term side effects.	235 (57.6)

Values are numbers (%) (n=408).
HPV, human papilloma virus.

Table 5 Vaccine concerns

		n (%)
Greatest concern about human papilloma virus vaccine	Side effects	198 (48.5)
	Efficacy	122 (29.9)
	Cost	50 (12.3)
	Others	38 (9.3)

Values are numbers (%) (n=408).

DISCUSSION

This study explored the level of knowledge about HPV infection and attitude towards HPV vaccine among men and women in the Kingdom of Bahrain. Overall, the findings showed poor awareness of HPV, which is not surprising, considering the lack of public education regarding the virus and the absence of HPV vaccination in the national immunisation schedule.

A prior local survey done in 2011 reflected a higher, but still low, level of recognition of HPV (31.3%) among women.⁸ Regional studies conducted in Riyadh and Abu Dhabi also reported similar figures (34.5% and 29%, respectively).^{14 17} Comparatively, the higher level of knowledge noted in these studies could be due to the use of convenient sampling and inclusion of women only, and, in the case of the UAE, inclusion of the vaccine in the national immunisation schedule since 2008 could also explain the relatively higher level of knowledge about HPV in the country.

Furthermore, the limited awareness of HPV seen in our study and other regional studies might be underestimated because of the confusion among the public between HPV with other viruses, such as HIV and hepatitis B virus.

Table 6 Beliefs regarding vaccination policy

		n (%)
Group should be vaccinated.	Men	17 (4.2)
	Women	28 (6.9)
	Both genders	346 (84.8)
	Don't know	17 (4.2)
Timing of vaccination	Preschool	47 (11.5)
	School age	139 (34.1)
	Before marriage	170 (41.7)
	Any age	40 (9.8)
	Don't know	12 (2.9)
Decision maker on human papilloma virus vaccination	Person himself	137 (33.6)
	Joint decision of parents and young person	157 (38.5)
	Only the parents	89 (21.8)
	Don't know	25 (6.1)

Values are numbers (%) (n=408).

Systematic reviews done across Asian countries and sub-Saharan Africa also revealed poor knowledge of HPV and its vaccine.^{25 26} In contrast, a higher rate of awareness (61.1%) was reported in an online study across the USA, the UK and Australia, including 2409 participants, with USA in the lead.²⁷ HPV publicity and vaccine advertising campaigns done by pharmaceutical companies in the USA were a plausible explanation for this finding. However, some gaps in HPV knowledge were still present among the studied population.

Women were significantly more aware of HPV infection than men in our study (17.9% vs 5%, respectively). This is in line with the international online study, which also revealed less virus awareness among men compared with women (64% vs 88%, respectively) in the USA.²⁷ According to a worldwide systematic review, adolescent boys' knowledge of HPV and/or HPV vaccination was generally low to moderate, irrespective of the HPV vaccination programme status in the country of origin, and was significantly lower than that of their female counterparts.²⁸ One possible reason for this could be the association of the virus with cervical cancer, which is a female gender pathology. In addition, the presence of screening programmes such as cotesting and pap smears could have played a role also in educating women regarding the virus.

Our study marks employment in the health sector as a significant determinant of HPV awareness. A similar study showed adequate awareness about the virus among healthcare workers in New Zealand. However, significant gaps in knowledge were still noted.²⁹

Although demonstrating low knowledge of HPV, our population showed positive attitudes towards receiving the HPV vaccine. The same was reported in a previous local study where, despite never having heard about HPV, most women (91.3%) were willing to receive the vaccine.⁸ Similarly, more than half of Saudi female residents (64%) were found to be receptive of the vaccine in spite of low awareness of the virus.¹⁷ This is consistent with the findings of several other regional studies globally.^{16 25 26 30} Generally, in Bahrain, vaccine coverage reaches almost 100% for routine childhood vaccines as of 2016 reports.³¹

The majority of our study participants were against targeting only women for vaccination and believed it should be given to both genders. Thirty-four per cent of the participants agreed with the WHO recommendations and chose school age as the most appropriate age group to receive vaccination. On the other hand, about half of the participants (41.7%) believed that vaccination is best given before marriage. This is in line with the Iranian study where 88.4% of the participants also preferred administration of the vaccine just before marriage.¹⁶ Similar cultural and religious beliefs which prefer sexual activity to begin after marriage can justify these findings. A systematic review measuring parents' attitude towards HPV vaccine for their children revealed that the decision to vaccinate was dependent on the child's age.¹⁹ Some of the included studies showed that parents preferred not



to vaccinate their children if they believed them to be too young or sexually inactive, whereas parents were keener on vaccinating their children when they were older or sexually active.

Our study revealed side effects to be the most concerning factor regarding the vaccine, which probably stem from its novelty and unfamiliarity. Cost was not an obstacle to receiving the vaccine in our population. This could be because people are used to receiving free vaccination as part of routine healthcare in the country.

Twenty-four per cent of our study population disagreed to take the vaccine if recommended. We believe this could be due to distrust about a new vaccine and trusting their spouses to not give them sexually transmitted diseases. Although most of the participants agreed to vaccination, it may not necessarily reflect their true intent to receiving it even when the HPV vaccine is recommended and available. This indirectly relates to the lack of knowledge regarding the virus and its association with cervical and other cancers.

With the prevalence of immigration and the influx of Arab refugees into the Western world, our study can help familiarise physicians abroad with Arab immigrants' background about HPV infection and vaccine. This can aid physicians in using a tailored approach when dealing with such patients.

Strength and limitations

Strengths of this study include the large sample size and male representation. Our study is the first to include men compared with similar studies conducted in the Gulf Cooperation Council countries. However, their low sample size makes the comparison with the female participants a challenging task. Conducting face-to-face interviews also ensured the inclusion of illiterate participants and consequently higher response rates to all questions. One should note that the systematic sampling of participants, which led to the inclusion of healthcare workers, may have resulted in overestimation of the results.

We acknowledge the impact our intervention might have had on the attitudes towards vaccination that could have biased the results. However, the intervention was kept brief to avoid influencing participants' attitudes.

CONCLUSION

The results of this study revealed limited knowledge of HPV and its health implications. Predominance for accepting the vaccine was also accompanied with worries regarding possible side effects. Our findings demonstrate the need to provide education to the Bahraini community about HPV infection and the role of HPV vaccine. We have highlighted some significant gaps in HPV knowledge, which can be the target of future information campaigns. Poor awareness in men may pose a particular challenge as and when HPV vaccination for men becomes available.

Contributors All the authors contributed to the study design and participated equally in the acquisition of data, analysis and interpretation. YH, AEA, ZA-M, GA and KA-A were responsible for writing the manuscript, while GJ revised the manuscript for important intellectual content. All authors made the decision to submit the manuscript for publication.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

REFERENCES

1. CDC. Genital HPV infection. STD fact sheet, 2017. Available: <https://www.cdc.gov/std/hpv/stdfact-hpv.htm>
2. WHO. Human papillomavirus vaccines: who position paper. *Weekly Epidemiological Record* 2017;241:68.
3. Baseman JG, Koutsky LA. The epidemiology of human papillomavirus infections. *J Clin Virol* 2005;32 Suppl 1:16–24.
4. Committee on Infectious Diseases. HPV vaccine recommendations. *Pediatrics* 2012;129:602–5.
5. Bruni L, Barrionuevo-Rosas L, Albero G. Human papillomavirus and related diseases in the world. summary report ICO Information Centre on HPV and Cancer (HPV Information Centre); 2017.
6. Plummer M, de Martel C, Vignat J, et al. Global burden of cancers attributable to infections in 2012: a synthetic analysis. *Lancet Glob Health* 2016;4:e609–16.
7. Hu D, Goldie S. The economic burden of noncervical human papillomavirus disease in the United States. *Am J Obstet Gynecol* 2008;198:500.e1–500.e7.
8. Moosa K, Alsayyad AS, Quint W, et al. An epidemiological study assessing the prevalence of human papillomavirus types in women in the Kingdom of Bahrain. *BMC Cancer* 2014;14:905.
9. Madouj A, Eldali A, Zahrani A. 10 year cancer incidence among nationals of the GCC states 1998–2007.
10. Bruni L, Barrionuevo-Rosas L, Albero G. Human papillomavirus and related diseases in Bahrain. summary report ICO information centre on HPV and cancer (HPV information centre); 2017.
11. WHO. Sexually transmitted infections (STIs). Fact sheet. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5009883/#ref1> [Accessed 20 Feb 2017].
12. CDC. HPV vaccine recommendations; 2016.
13. Action CC. Global progress in HPV vaccination, 2017. Available: <http://www.cervicalcanceraction.org/comments/comments3.php> [Accessed 12 April 2017].
14. Ortashi O, Raheel H, Shalal M, et al. Awareness and knowledge about human papillomavirus infection and vaccination among women in UAE. *Asian Pac J Cancer Prev* 2013;14:6077–80.
15. Korostil IA, Ali H, Guy RJ, et al. Near elimination of genital warts in Australia predicted with extension of human papillomavirus vaccination to males. *Sex Transm Dis* 2013;40:833–5.
16. Farzaneh F, Shirvani HE, Barouti E, et al. Knowledge and attitude of women regarding the human papillomavirus (HPV) infection, its relationship to cervical cancer and prevention methods. *Med J Malaysia* 2011;66:468–73.
17. Hussain AN, Alkhenizan A, McWalter P, et al. Attitudes and perceptions towards HPV vaccination among young women in Saudi Arabia. *J Family Community Med* 2016;23:145–50.
18. Chen L, Song Y, Ruan G, et al. Knowledge and attitudes regarding HPV and vaccination among Chinese women aged 20 to 35 years in Fujian Province. *Cancer Control* 2018;25.
19. Trim K, Nagji N, Elit L, et al. Parental knowledge, attitudes, and behaviours towards human papillomavirus vaccination for their children: a systematic review from 2001 to 2011. *Obstet Gynecol Int* 2012;2012:1–12.
20. Holman DM, Benard V, Roland KB, et al. Barriers to human papillomavirus vaccination among US adolescents: a systematic review of the literature. *JAMA Pediatr* 2014;168:76–82.

21. Health Information and Quality Authority. Draft health technology assessment (HTA) of HPV vaccination of boys, 2018. Available: www.hiqa.ie
22. eGovernment, 2018. Available: <https://www.bahrain.bh>
23. Khan TM, Buksh MA, Rehman IU, *et al.* Knowledge, attitudes, and perception towards human papillomavirus among university students in Pakistan. *Papillomavirus Res* 2016;2:122–7.
24. Brabin L, Roberts SA, Farzaneh F, *et al.* Future acceptance of adolescent human papillomavirus vaccination: a survey of parental attitudes. *Vaccine* 2006;24:3087–94.
25. Oh H. Knowledge about HPV, and the attitudes toward HPV vaccination among adult women in Asian countries: a literature review. *Journal of Korean Oncology Nursing* 2011;11:171–8.
26. Perlman S, Wamai RG, Bain PA, *et al.* Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review. *PLoS One* 2014;9:e90912.
27. Zimet GD, McCaffery KJ, McCaffery KJ, *et al.* Knowledge of human papillomavirus (HPV) and HPV vaccination: an international comparison. *Vaccine* 2013;31:763–9.
28. Prue G, Shapiro G, Maybin R, *et al.* Knowledge and acceptance of human papillomavirus (HPV) and HPV vaccination in adolescent boys worldwide: a systematic review. *J Cancer Policy* 2016;10:1–15.
29. Sherman SM, Bartholomew K, Denison HJ, *et al.* Knowledge, attitudes and awareness of the human papillomavirus among health professionals in New Zealand. *PLoS One* 2018;13:e0197648.
30. Walsh CD, Gera A, Shah M, *et al.* Public knowledge and attitudes towards human papilloma virus (HPV) vaccination. *BMC Public Health* 2008;8.
31. WHO. National immunization coverage Scorecards estimates for, 2016. Available: http://www.who.int/immunization/sage/meetings/2017/october/6_GVAP2017_Coverage_scorecards.pdf [Accessed 23 Sep 2018].