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Knowledge towards Human Papilloma Virus (HPV) infection and attitude towards its vaccine: A cross sectional study

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Abstract

Background: Genital HPV is common and affects both men and women. Infection with the high-risk oncogenic HPV types 16 and 18 is a known cause of cervical cancer, and is also associated with cancers of the penis, anus, mouth, oropharynx, larynx, vulva, and vagina. HPV vaccines are currently licensed for prevention of cervical cancer. The objective of this study is to determine the level of awareness of HPV infection, and to assess attitudes towards receiving the vaccine amongst men and women in Bahrain.

Methods: A cross-sectional study of 408 attendees of primary health centers in the Kingdom of Bahrain, including 268 females and 140 males. An interview-based questionnaire was used to measure HPV knowledge and attitudes towards HPV vaccine. All data were analysed via Statistical Package for the Social Sciences (SPSS) software version 23. The association between categorical variables was tested using the Chi square test.

Results: A response rate of 91.4% was achieved, with majority being female responders as opposed to males (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 ($P = 0.00$ for both) having significant association with awareness of HPV. Majority of the participants (76%) were willing to take the vaccine if recommended, with 84.4% 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 favorable attitude towards the HPV vaccine. These data can support the initiation of a nationwide HPV immunization program.

Keywords: Human Papilloma Virus, Knowledge, Attitudes, Vaccination

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Strengths and limitations of this study

- One of the main strengths of our study is the inclusion of males 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.

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 one 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 amongst 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, 39,45,52,52,56,58 and 59, with HPV type 16 being the most virulent.⁽²⁾ According to the American Academy of Pediatrics, around 15,000 women and 7,000 men are diagnosed with cancers attributed to HPV types 16 and 18 each year in the United States.⁽⁴⁾ In addition, types 16 and 18 are responsible for about 70% cervical cancer cases.⁽⁵⁾

HPV is principally related to cervical cancer, which ranks as the fourth most common cancer amongst 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 to 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 to 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 amongst women, attending outpatient clinics for routine cervical screening and post-natal 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 the seventh most common cancer amongst females, with an estimated 10 year incidence of 83 per 100,000 for the years 1998-2007.⁽⁹⁾ It was reported in 2012 that twenty two new cases of cervical cancer are diagnosed every year in Bahrain and it causes approximately 5 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

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2
3 prevent >4 million deaths in women in low to middle-income countries over the next
4 decade.⁽¹¹⁾ Three prophylactic HPV vaccines are currently available: bivalent,
5 quadrivalent and the nonavalent. The vaccine may be given as early as 9 years of age
6 through age 26 years.⁽¹²⁾ Vaccinating >80% of girls reduces the risk of HPV infection in
7 boys.⁽²⁾ Therefore, countries are recommended to prioritize vaccinations for girls aged 9-
8 14 years, while females more than 15 years and males should be grouped as secondary
9 target.⁽²⁾ A two dose schedule is recommended for age <15 years and a three dose
10 schedule for age >15 years. ⁽²⁾
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14 Currently, the HPV vaccination is part of the national vaccination and immunization
15 program of 87 countries including the United Arab Emirates.⁽¹³⁾ In 2008, Abu Dhabi
16 became the first city in the Middle East to introduce HPV vaccine.⁽¹⁴⁾ In 2013, Australia
17 became the first nation to vaccinate the male population against HPV.⁽¹⁵⁾ The vaccine is
18 only available in some private hospitals in Bahrain as the country is yet to include the
19 vaccine in its national immunization schedule.

20 Literature published in the region has shown low levels of public knowledge about HPV
21 and its health associations. However, the majority of studies indicated that people by in
22 large are in favor of using the vaccine. ^(8, 14, 16, 17)
23
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25 As of March 2017, eleven countries (6%) globally have included boys in their national
26 HPV immunization programme.⁽²⁾ With the occurrence of HPV related diseases and
27 cancers in males and the increasing inclusion of the gender in HPV vaccine programmes
28 worldwide, this study included males to ensure a more comprehensive view on the
29 infection and its vaccine.
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31 The aim of this study is to provide insight on the knowledge status of HPV infection in
32 the Bahraini society and their attitudes towards the HPV vaccine. This study can aid
33 communication between health policy makers to include HPV vaccine in the national
34 immunization schedule.
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37 **Methods**

38 *Study design and population*

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42 A cross-sectional study was conducted in the Kingdom of Bahrain, in February 2018,
43 amongst attendees of primary healthcare centers. A cluster multistage sampling method
44 was used. Two health centers from each of the five health regions in the country were
45 chosen at random, yielding a total of 10 health centers (BBK Hidd HC, NBB Dair HC,
46 Bilad Al Qadeem health centre, Hoorah HC, A'ali HC, Yousif Engnair HC, East Riffa HC,
47 Sitra HC, Kuwait HC and Budaiya HC).
48

49 A predetermined sample size of 385 was derived using Survey Monkey® electronic
50 calculator with 95% confidence, 5% margin of error, 0.05 level of significance and 1.5
51 million population of Bahrain.⁽¹⁸⁾
52

53 Using a systematic technique, every 3rd person entering the reception area of the health
54 centre was invited to participate and screened for eligibility, including those working in
55 the health centers with the exception of physicians.
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Our inclusion criteria consisted of men and women aged 18 to 65 years. Both Bahraini and Non-Bahraini citizens were included. All non-English and non-Arabic speakers were excluded.

Four hundred ninety-five (495) people were recruited over a two-week period in February 2018. Forty-nine (49) of whom were excluded due to age and language limitations. Four hundred forty-six (446) people met the inclusion criteria, of which 408 agreed to participate in the study.

The Ethics 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 was collected via a questionnaire adopted from two studies in the region.^(16, 19)

The questionnaire consists of 32 questions including demographic data, knowledge about HPV infection and attitudes and beliefs about the HPV vaccine.

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 Cronbach's alpha of 0.789.

The questionnaire was administered via face to face interview.

Participants who had heard of HPV were required to answer the whole questionnaire.

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

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 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 Statistical Package for the Social Sciences (SPSS) software version 23. The demographic and baseline variables were summarised using descriptive statistics; using mean, standard deviation and median for continuous variables and as frequencies and percentage for categorical variables.

The knowledge questions were recoded to "correct" for option 'Yes' and "incorrect" for the 'No' and 'I don't know' options.

Chi square 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 (446) 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 females. The mean (SD) age was 34.5 years (9.7) and median age was 33 years (range 18-65 years). Most of the respondents were Bahrainis (80.1%, 327), married (81.9%, n=334) and had a high school or diploma degree (53.7%, n= 219). About 46.6% (190) reported to be employed in the non-health sector while 13.7% (56) were health sector employees. Demographic characteristics are demonstrated in *Table 1*.

Table1: Demographics characteristics. Values are numbers (%) (n=408)

	N (%)	
Sex	Male	140 (34.3)
	Female	268 (65.7)
	Total	408 (100)
Age	<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)
No of children	None	98 (24)
	One	68 (16.7)
	Two	93 (22.8)
	Three	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)

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 significant association with awareness of HPV were female gender and employment in the health sector ($P = 0.00$ for both) (*Table 2*).

Table 2: Association between demographic data and awareness of HPV. Values are numbers (%) (n=408)

		Knew about HPV infection before the survey		Chi-Squared P-value
		n	(%)	
Sex	Male	7	140 (5%)	0.000
	Female	48	268 (17.9%)	
Age	<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%)	0.000
	Non Health sector	14	190 (7.4%)	
	Unemployed	15	162 (9.3%)	

Out of those who had heard of HPV, thirty-nine (70.9%) identified HPV to be a sexually transmitted infection. 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 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).

Table 3: Knowledge about HPV infection, risk factors and prevention. Values are numbers (%) (n=55)

	Correct	
	n	%
HPV is a virus in 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 increase the risk of the virus persisting and it leads 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, anus)	33	60.0%
Prevention against HPV will prevent cervical cancer	40	72.7%

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 is safe but 83.6% (341) wanted to be reassured that the vaccine will protect against HPV.

Table 4: Attitude and beliefs towards HPV vaccine. Values are numbers (%) (n=408)

	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%)

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 5: Vaccine Concerns. Values are numbers (%) (n=408)

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

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

Table 6: Beliefs regarding vaccination policy. Values are numbers (%) (n=408)

		n (%)
Group should be vaccinated	Males	17 (4.2%)
	Females	28 (6.9%)
	Both sex	346 (84.8%)
	Don't know	17 (4.2%)
Timing of vaccination	Pre-school	47 (11.5%)
	School age	139 (34.1%)
	Before marriage	170 (41.7%)
	Any age	40 (9.8%)
Decision maker on HPV vaccination	Don't know	12 (2.9%)
	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%)

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.

Discussion

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

A prior local survey done in 2011 reflected a higher, but still low, level of recognition of HPV (31.3%) amongst 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, inclusion of women only, and in the case of UAE, inclusion of the vaccine in the national immunization schedule since 2007 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 amongst the public between HPV with other viruses such as Human immunodeficiency virus (HIV) and Hepatitis B virus (HBV).

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3 Systematic reviews done across Asian countries and the sub-Saharan Africa also
4 revealed poor knowledge of HPV and its vaccine.^(20, 21) In contrast, a higher rate of
5 awareness (61.1%) was reported in an online study across USA, UK and Australia
6 including 2409 participants with USA in the lead.⁽²²⁾ HPV publicity and vaccine
7 advertising campaigns done by pharmaceutical companies in the USA were a plausible
8 explanation for this finding. However, some gaps in HPV knowledge were still present
9 amongst the studied population.
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12 Women were significantly more aware of HPV infection than men in our study (17.9% vs
13 5% respectively). This is in line with the international online study which also revealed
14 less virus awareness amongst males compared to women (64% vs. 88% respectively) in
15 the USA.⁽²²⁾ According to a worldwide systematic review, adolescent males' knowledge
16 of HPV and/or HPV vaccination was generally low to moderate, irrespective of the HPV
17 vaccination program status in the country of origin, and was significantly lower than their
18 female counterparts.⁽²³⁾ One possible reason for this could be the association of the virus
19 with cervical cancer, which is a female gender pathology. In addition, presence of
20 screening programmes such as co-testing and pap smears could have also played a role
21 in educating women regarding the virus.
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25 Our study marks employment in health sector as a significant determinant of HPV
26 awareness. A similar study showed adequate awareness about the virus amongst health
27 care workers in New Zealand. However, significant gaps in knowledge were still
28 noted.⁽²⁴⁾
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31 Although demonstrating low knowledge of HPV, our population showed positive
32 attitudes towards receiving the HPV vaccine. The same was reported in a previous local
33 study, where despite never having heard about HPV, most women (91.3%) were willing
34 to receive the vaccine.⁽⁸⁾ Similarly, more than half of Saudi female residents (64%) were
35 found to be receptive of the vaccine in spite of low awareness of the virus.⁽¹⁷⁾ This is
36 consistent with the findings of several other regional studies globally.^(16, 20, 21, 25)
37 Generally, in Bahrain vaccine coverage reaches almost 100% for routine childhood
38 vaccines as of 2016 reports.⁽²⁶⁾
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41 The majority of our study participants were against targeting only females for vaccination
42 and believed it should be given to both genders. Thirty four per cent of the participants
43 agreed with the WHO recommendations and chose school age as the most appropriate
44 age group to receive vaccination. On the other hand, about half of the participants
45 (41.7%) believed that vaccination is best given before marriage. This is in line with the
46 Iranian study where 88.4 % of the participants also preferred administration of the
47 vaccine just before marriage.⁽¹⁶⁾ Similar cultural and religious beliefs which prefer sexual
48 activity to begin after marriage can justify these findings. A systematic review measuring
49 parents' attitude towards HPV vaccine for their children revealed that the decision to
50 vaccinate was dependent on the child's age.⁽²⁷⁾ Some of the included studies showed that
51 parents preferred not to vaccinate their children if they believed them to be too young or
52 sexually inactive whereas parents were keener on vaccinating their children when they
53 were older or sexually active.
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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 vaccinations as part of routine health care in the country.

Twenty-four percent 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 STD's. 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 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.

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 HVP 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 males becomes available.

Authorship Contribution

All the authors contributed in the study design and participated equally in the acquisition of data, analysis and interpretation. Y. Husain, A. Alalwan, Z.A. Musawi, G. Abdulla and K.A. Ahmed were responsible for writing the manuscript while G. Jasim revised the manuscript for important intellectual content. All authors made the decision to submit the manuscript for publication: Y. Husain, A. Alalwan, Z.A. Musawi, G. Abdulla, K.A. Ahmed and G. Jasim.

Competing Interests

The authors declare there are no conflicts of interest regarding the publication of this article.

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Data Sharing Statement

Data includes study questionnaire, study protocol, statistical analysis and results. Proposals can be directed to Dr. Amal Alalwan at amal.alalwan@gmail.com following publication, with no end date.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	1
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	1-2
Objectives	#3	State specific objectives, including any prespecified hypotheses	See note 1
Study design	#4	Present key elements of study design early in the paper	3
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of	3

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		selection of participants.	
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	N/A
Bias	#9	Describe any efforts to address potential sources of bias	NA
Study size	#10	Explain how the study size was arrived at	3
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	3
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	4
	#12b	Describe any methods used to examine subgroups and interactions	4
	#12c	Explain how missing data were addressed	N/A
	#12d	If applicable, describe analytical methods taking account of sampling strategy	N/A
	#12e	Describe any sensitivity analyses	N/A
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	See note 2
	#13b	Give reasons for non-participation at each stage	N/A
	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic,	4

clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.

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6		#14b	Indicate number of participants with missing data for each variable of interest
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10	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.
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15	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
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22		#16b	Report category boundaries when continuous variables were categorized
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26		#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
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30	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses
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34	Key results	#18	Summarise key results with reference to study objectives
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36	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.
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42	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.
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47	Generalisability	#21	Discuss the generalisability (external validity) of the study results
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51	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
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Author notes

- 1 1. NA (aim mentioned on page 3)
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- 3 2. 3 (mentioned in study design)
- 4
- 5 3. N/A (no missing data)
- 6

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Knowledge towards Human Papilloma Virus (HPV) infection and attitude towards its vaccine in the Kingdom of Bahrain: A cross sectional study

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Knowledge towards Human Papilloma Virus (HPV) infection and attitude towards its vaccine in the Kingdom of Bahrain: A cross sectional study

Yusra Husain¹, Amal AlAlwan¹, Zakeya Al-Musawi¹, Ghadeer Abdulla¹, Khulood Al-Ahmed¹, Ghufraan Jasim²

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Abstract

Objectives: To determine the level of awareness of HPV infection, and to assess attitude towards receiving the vaccine amongst 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 centers (PHC) in the Kingdom of Bahrain

Participants 408 PHC attendees, including 268 females and 140 males, aged 18 to 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 sex, educational level and other demographics.

Results: A response rate of 91.4% was achieved, with a majority being female responders as opposed to males (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 ($P < 0.01$ for both) having significant association with awareness of HPV. The Majority of the participants (76%) were willing to take the vaccine if recommended, with 84.4% 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 favorable attitude towards the HPV vaccine. This data can support the initiation of a nationwide HPV immunization program.

Keywords: Human Papilloma Virus, Knowledge, Attitudes, Vaccination

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Strengths and limitations of this study

- One of the main strengths of our study is the inclusion of males 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 health care workers might have resulted in better knowledge about HPV.
- The Impact of the brief intervention on the attitude towards vaccination cannot be excluded.

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 one 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 amongst 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, 39,45,52,52,56,58 and 59, with HPV type 16 being the most virulent.⁽²⁾ According to the American Academy of Pediatrics, around 15,000 women and 7,000 men are diagnosed with cancers attributed to HPV types 16 and 18 each year in the United States.⁽⁴⁾ In addition, types 16 and 18 are responsible for about 70% cervical cancer cases.⁽⁵⁾

HPV is principally related to cervical cancer, which ranks as the fourth most common cancer amongst 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 to 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 to 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 amongst women, attending outpatient clinics for routine cervical screening and post-natal 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 the seventh most common cancer amongst females, with an estimated 10 year incidence of 83 per 100,000 for the years 1998-2007.⁽⁹⁾ It was reported in 2012 that twenty two new cases of cervical cancer are diagnosed every year in Bahrain and it causes approximately 5 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 to middle-income countries over the next decade.⁽¹¹⁾ Three prophylactic HPV vaccines are currently available: bivalent, quadrivalent and the nonavalent. The vaccine may be given as early as 9 years of age through age 26 years.⁽¹²⁾ Vaccinating >80% of girls reduces the risk of HPV infection in boys.⁽²⁾ Therefore, countries are recommended to prioritize vaccinations for girls aged 9-14 years, while females more than 15 years and males should be grouped as secondary target.⁽²⁾ A two dose schedule is recommended for age <15 years and a three dose schedule for age >15 years.⁽²⁾

Currently, the HPV vaccination is part of the national vaccination and immunization program of 87 countries including the United Arab Emirates.⁽¹³⁾ In 2008, Abu Dhabi became the first city in the Middle East to introduce HPV vaccine.⁽¹⁴⁾ In 2013, Australia became the first nation to vaccinate the male population against HPV.⁽¹⁵⁾ The vaccine is only available in some private hospitals in Bahrain as the country is yet to include the vaccine in its national immunization 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 favor 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 amongst children.^(19,20)

As of December 2017, twenty countries globally have included boys in their national HPV immunization programme.⁽²¹⁾ As of March 2017, eleven countries (6%) globally have included boys in their national HPV immunization programme.⁽²⁾ With the occurrence of HPV related diseases and cancers in males and the increasing inclusion of the gender in HPV vaccine programmes worldwide, this study included males to ensure a more comprehensive view on the infection and its vaccine.

The aim of this study is 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 immunization schedule.

Methods

Study design and population

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

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3 A predetermined sample size of 385 was derived using Survey Monkey® electronic
4 calculator with 95% confidence, 5% margin of error, 0.05 level of significance and 1.5
5 million population of Bahrain.⁽²²⁾

6 Using a systematic technique, every 3rd person entering the reception area of the health
7 center was invited to participate and screened for eligibility, including those working in the
8 health centers with the exception of physicians.

9 Our inclusion criteria consisted of men and women aged 18 to 65 years. Both Bahraini and
10 Non-Bahraini citizens were included. Non-English or non- Arabic speakers were excluded.
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12

13 Four hundred ninety-five (495) people were recruited over a two-week period in February
14 2018. Forty-nine (49) of whom were excluded due to age and language limitations. Four
15 hundred forty-six (446) people met the inclusion criteria, of which 408 agreed to participate
16 in the study.
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19 The Primary Health Care Research Sub-committee (PHCRC) in the Ministry of Health
20 reviewed and approved the study protocol. Verbal consent was taken from all participants
21 prior to data collection.
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24 ***Data Collection***

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26 Data was collected via a questionnaire adopted from two studies in the region.^(16,23)
27 Questions were asked in either English or Arabic depending on the participants' preference.
28 The questionnaire consists of 32 questions including demographic data, knowledge about
29 HPV infection and attitudes and beliefs about the HPV vaccine. Further information
30 regarding the questions can be found in the tables in the results section.
31
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33 The Arabic translated version was piloted on 20 participants to test it for clarity and
34 language suitability. The reliability of the questionnaire was tested and showed Cronbach's
35 alpha of 0.789.

36 The questionnaire was administered via face to face interview by physicians.
37 Participants who had heard of HPV were required to answer the whole questionnaire.
38 Those who had not, were briefed about HPV infection and asked to answer only the attitude
39 and beliefs sections of the questionnaire.
40

41 The briefing provided was that HPV stands for Human Papilloma Virus, which is the most
42 common sexually transmitted infection. It can lead to cervical cancer in women. Vaccines
43 to prevent the infection are available and can be given as early as 9 years of age till 26
44 years.
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50 ***Patient and Public Involvement***

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52 This research was done without patient or public involvement. Patients were not invited
53 to comment on the study design and were not consulted to develop patient relevant
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outcomes or 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 was entered and analysed via Statistical Package for the Social Sciences (SPSS) software version 23. The demographic and baseline variables were summarised using descriptive statistics; using mean, standard deviation and median for continuous variables and as frequencies and percentage for categorical variables.

The knowledge questions were recorded as “correct” for option ‘Yes’ and “incorrect” for the ‘No’ and ‘I don’t know’ options.

Chi square 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 (446) 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 females. The mean (SD) age was 34.5 years (9.7) and median age was 33 years (range 18-65 years). Most of the respondents were Bahrainis (80.1%, 327), married (81.9%, n=334) and had a high school or diploma degree (53.7%, n= 219). About 46.6% (190) reported to be employed in the non-health sector while 13.7% (56) were health sector employees. Demographic characteristics are demonstrated in *Table 1*.

Table1: Demographics characteristics. Values are numbers (%) (n=408)

	N (%)	
Sex	Male	140 (34.3)
	Female	268 (65.7)
	Total	408 (100)
Age	<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)
No of children	None	98 (24)
	One	68 (16.7)
	Two	93 (22.8)
	Three	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)

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 significant association with awareness of HPV were female gender and employment in the health sector ($p < 0.001$ for both) (*Table 2*).

Table 2: Association between demographic data and awareness of HPV. Values are numbers (%) (n=408)

		Knew about HPV infection before the survey		Chi-Squared P-value
		n	(%)	
Sex	Male	7	140 (5%)	0.000
	Female	48	268 (17.9%)	
Age	<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%)	0.000
	Non Health sector	14	190 (7.4%)	
	Unemployed	15	162 (9.3%)	

Out of those who had heard of HPV, thirty-nine (70.9%) identified HPV to be a sexually transmitted infection. 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 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).

Table 3: Knowledge about HPV infection, risk factors and prevention. Values are numbers (%) (n=55)

	Correct
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	n	%
HPV is a virus in 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 increase the risk of the virus persisting and it leads 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, anus)	33	60.0%
Prevention against HPV will prevent cervical cancer	40	72.7%

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 is safe but 83.6% (341) wanted to be reassured that the vaccine will protect against HPV.

Table 4: Attitude and beliefs towards HPV vaccine. Values are numbers (%) (n=408)

	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%)

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 5: Vaccine Concerns. Values are numbers (%) (n=408)

		n (%)
Greatest concern about HPV vaccine	Side effects	198 (48.5%)

Efficacy	122 (29.9%)
Cost	50 (12.3%)
Others	38 (9.3%)

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

Table 6: Beliefs regarding vaccination policy. Values are numbers (%) (n=408)

		n (%)
Group should be vaccinated	Males	17 (4.2%)
	Females	28 (6.9%)
	Both sex	346 (84.8%)
	Don't know	17 (4.2%)
Timing of vaccination	Pre-school	47 (11.5%)
	School age	139 (34.1%)
	Before marriage	170 (41.7%)
	Any age	40 (9.8%)
Decision maker on HPV vaccination	Don't know	12 (2.9%)
	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%)

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.

Discussion

This study explored the level of knowledge about HPV infection and attitude towards HPV vaccine amongst 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 absence of HPV vaccination in the national immunization schedule.

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

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12 Furthermore, the limited awareness of HPV seen in our study and other regional studies
13 might be underestimated because of the confusion amongst the public between HPV with
14 other viruses such as Human immunodeficiency virus (HIV) and Hepatitis B virus (HBV).

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17 Systematic reviews done across Asian countries and the sub-Saharan Africa also revealed
18 poor knowledge of HPV and its vaccine.^(24,25) In contrast, a higher rate of awareness
19 (61.1%) was reported in an online study across USA, UK and Australia including 2409
20 participants with USA in the lead.⁽²⁶⁾ HPV publicity and vaccine advertising campaigns
21 done by pharmaceutical companies in the USA were a plausible explanation for this
22 finding. However, some gaps in HPV knowledge were still present amongst the studied
23 population.

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26 Women were significantly more aware of HPV infection than men in our study (17.9% vs
27 5% respectively). This is in line with the international online study which also revealed
28 less virus awareness amongst males compared to women (64% vs. 88% respectively) in
29 the USA.⁽²⁶⁾ According to a worldwide systematic review, adolescent males' knowledge of
30 HPV and/or HPV vaccination was generally low to moderate, irrespective of the HPV
31 vaccination program status in the country of origin, and was significantly lower than their
32 female counterparts.⁽²⁷⁾ One possible reason for this could be the association of the virus
33 with cervical cancer, which is a female gender pathology. In addition, presence of
34 screening programmes such as co- testing and pap smears could have also played a role in
35 educating women regarding the virus.

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38 Our study marks employment in health sector as a significant determinant of HPV
39 awareness. A similar study showed adequate awareness about the virus amongst health
40 care workers in New Zealand. However, significant gaps in knowledge were still noted.⁽²⁸⁾

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43 Although demonstrating low knowledge of HPV, our population showed positive attitudes
44 towards receiving the HPV vaccine. The same was reported in a previous local study,
45 where despite never having heard about HPV, most women (91.3%) were willing to receive
46 the vaccine.⁽⁸⁾ Similarly, more than half of Saudi female residents (64%) were found to be
47 receptive of the vaccine in spite of low awareness of the virus.⁽¹⁷⁾ This is consistent with
48 the findings of several other regional studies globally.^(16,24,25,29) Generally, in Bahrain
49 vaccine coverage reaches almost 100% for routine childhood vaccines as of 2016
50 reports.⁽³⁰⁾

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53 The majority of our study participants were against targeting only females for vaccination
54 and believed it should be given to both genders. Thirty-four per cent of the participants
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3 agreed with the WHO recommendations and chose school age as the most appropriate age
4 group to receive vaccination. On the other hand, about half of the participants (41.7%)
5 believed that vaccination is best given before marriage. This is in line with the Iranian study
6 where 88.4 % of the participants also preferred administration of the vaccine just before
7 marriage.⁽¹⁶⁾ Similar cultural and religious beliefs which prefer sexual activity to begin
8 after marriage can justify these findings. A systematic review measuring parents' attitude
9 towards HPV vaccine for their children revealed that the decision to vaccinate was
10 dependent on the child's age.⁽¹⁹⁾ Some of the included studies showed that parents preferred
11 not to vaccinate their children if they believed them to be too young or sexually inactive
12 whereas parents were keener on vaccinating their children when they were older or sexually
13 active.
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17 Our study revealed side effects to be the most concerning factor regarding the vaccine,
18 which probably stem from its novelty and unfamiliarity. Cost was not an obstacle to
19 receiving the vaccine in our population. This could be because people are used to receiving
20 free vaccination as part of routine health care in the country.
21
22

23 Twenty-four percent of our study population disagreed to take the vaccine if recommended.
24 We believe this could be due to distrust about a new vaccine and trusting their spouses to
25 not give them STD's. Although most of the participants agreed to vaccination, it may not
26 necessarily reflect their true intent to receiving it even when the HPV vaccine is
27 recommended and available. This indirectly relates to the lack of knowledge regarding the
28 virus and its association with cervical and other cancers.
29
30

31 With the prevalence of immigration and influx of Arab refugees into the western world,
32 our study can help familiarise physicians abroad with Arab immigrants' background about
33 HPV infection and vaccine. This can aid physicians in using a tailored approach when
34 dealing with such patients.
35
36

37 ***Strength and Limitations***

38
39 Strengths of this study include the large sample size and male representation. Our study is
40 the first to include males compared with similar studies conducted in the Gulf Cooperation
41 Council (GCC) countries. However, their low sample size makes the comparison to the
42 female participants a challenging task. Conducting face to face interviews also ensured the
43 inclusion of illiterate participants and consequently higher response rates to all questions.
44 One should note that the systematic sampling of participants which led to the inclusion of
45 health care workers may have resulted in overestimation of the results.
46

47 We acknowledge the impact our intervention might have had on the attitudes towards
48 vaccination that could have biased the results. However, the intervention was kept brief to
49 avoid influencing participants' attitudes.
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51

52 **Conclusion**

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54 The results of this study revealed limited knowledge of HPV and its health implications.
55 Predominance for accepting the vaccine was also accompanied with worries regarding
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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 males becomes available.

Authorship Contribution

All the authors contributed in the study design and participated equally in the acquisition of data, analysis and interpretation. Y. Husain, A. Alalwan, Z.A. Musawi, G. Abdulla and K.A. Ahmed were responsible for writing the manuscript while G. Jasim revised the manuscript for important intellectual content. All authors made the decision to submit the manuscript for publication: Y. Husain, A. Alalwan, Z.A. Musawi, G. Abdulla, K.A. Ahmed and G. Jasim.

Competing Interests

The authors declare there are no conflicts of interest regarding the publication of this article.

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Data Sharing Statement

Data includes study questionnaire, study protocol, statistical analysis and results. Proposals can be directed to Dr. Amal Alalwan at amal.alalwan@gmail.com following publication, with no end date.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	1
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	1-2
Objectives	#3	State specific objectives, including any prespecified hypotheses	See note 1
Study design	#4	Present key elements of study design early in the paper	3
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of	3

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		selection of participants.	
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	N/A
Bias	#9	Describe any efforts to address potential sources of bias	NA
Study size	#10	Explain how the study size was arrived at	3
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	3
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	4
	#12b	Describe any methods used to examine subgroups and interactions	4
	#12c	Explain how missing data were addressed	N/A
	#12d	If applicable, describe analytical methods taking account of sampling strategy	N/A
	#12e	Describe any sensitivity analyses	N/A
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	See note 2
	#13b	Give reasons for non-participation at each stage	N/A
	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic,	4

1		clinical, social) and information on exposures and potential	
2		confounders. Give information separately for exposed and	
3		unexposed groups if applicable.	
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6		#14b Indicate number of participants with missing data for each	See note
7		variable of interest	3
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10	Outcome data	#15 Report numbers of outcome events or summary measures.	5-7
11		Give information separately for exposed and unexposed	
12		groups if applicable.	
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15	Main results	#16a Give unadjusted estimates and, if applicable, confounder-	N/A
16		adjusted estimates and their precision (eg, 95% confidence	
17		interval). Make clear which confounders were adjusted for and	
18		why they were included	
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22		#16b Report category boundaries when continuous variables were	N/A
23		categorized	
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26		#16c If relevant, consider translating estimates of relative risk into	N/A
27		absolute risk for a meaningful time period	
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30	Other analyses	#17 Report other analyses done—e.g., analyses of subgroups and	N/A
31		interactions, and sensitivity analyses	
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34	Key results	#18 Summarise key results with reference to study objectives	8
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36	Limitations	#19 Discuss limitations of the study, taking into account sources of	1
37		potential bias or imprecision. Discuss both direction and	
38		magnitude of any potential bias.	
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42	Interpretation	#20 Give a cautious overall interpretation considering objectives,	10
43		limitations, multiplicity of analyses, results from similar studies,	
44		and other relevant evidence.	
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47	Generalisability	#21 Discuss the generalisability (external validity) of the study	N/A
48		results	
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51	Funding	#22 Give the source of funding and the role of the funders for the	10
52		present study and, if applicable, for the original study on which	
53		the present article is based	
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Author notes

- 1 1. NA (aim mentioned on page 3)
- 2
- 3 2. 3 (mentioned in study design)
- 4
- 5 3. N/A (no missing data)
- 6

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Knowledge towards Human Papilloma Virus (HPV) infection and attitude towards its vaccine in the Kingdom of Bahrain: A cross sectional study

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Knowledge towards Human Papilloma Virus (HPV) infection and attitude towards its vaccine in the Kingdom of Bahrain: A cross sectional study

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Abstract

Objectives: To determine the level of awareness of HPV infection, and to assess attitude towards receiving the vaccine amongst 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 centers (PHC) in the Kingdom of Bahrain

Participants 408 PHC attendees, including 268 females and 140 males, aged 18 to 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 sex, educational level and other demographics.

Results: A response rate of 91.4% was achieved, with a majority being female responders as opposed to males (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 significant association with awareness of HPV. The Majority of the participants (76%) were willing to take the vaccine if recommended, with 84.4% 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 favorable attitude towards the HPV vaccine. This data can support the initiation of a nationwide HPV immunization program.

Keywords: Human Papilloma Virus, Knowledge, Attitudes, Vaccination

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Strengths and limitations of this study

- One of the main strengths of our study is the inclusion of males 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 health care workers might have resulted in better knowledge about HPV.
- The Impact of the brief intervention on the attitude towards vaccination cannot be excluded.

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 one 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 amongst 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, 39,45,52,52,56,58 and 59, with HPV type 16 being the most virulent.⁽²⁾ According to the American Academy of Pediatrics, around 15,000 women and 7,000 men are diagnosed with cancers attributed to HPV types 16 and 18 each year in the United States.⁽⁴⁾ In addition, types 16 and 18 are responsible for about 70% cervical cancer cases.⁽⁵⁾

HPV is principally related to cervical cancer, which ranks as the fourth most common cancer amongst 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 to 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 to 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 amongst women, attending outpatient clinics for routine cervical screening and post-natal 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 the seventh most common cancer amongst females, with an estimated 10 year incidence of 83 per 100,000 for the years 1998-2007.⁽⁹⁾ It was reported in 2012 that twenty two new cases of cervical cancer are diagnosed every year in Bahrain and it causes approximately 5 deaths annually.⁽¹⁰⁾

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4 HPV vaccines are now available and have the potential to reduce the incidence of cervical
5 and other anogenital cancers.⁽⁵⁾ Achieving a 70% coverage, HPV vaccine can prevent >4
6 million deaths in women in low to middle-income countries over the next decade.⁽¹¹⁾ Three
7 prophylactic HPV vaccines are currently available: bivalent, quadrivalent and the
8 nonavalent. The vaccine may be given as early as 9 years of age through age 26 years.⁽¹²⁾
9 Vaccinating >80% of girls reduces the risk of HPV infection in boys.⁽²⁾ Therefore, countries
10 are recommended to prioritize vaccinations for girls aged 9-14 years, while females more
11 than 15 years and males should be grouped as secondary target.⁽²⁾ A two dose schedule is
12 recommended for age <15 years and a three dose schedule for age >15 years.⁽²⁾
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16 Currently, the HPV vaccination is part of the national vaccination and immunization
17 program of 87 countries including the United Arab Emirates.⁽¹³⁾ In 2008, Abu Dhabi
18 became the first city in the Middle East to introduce HPV vaccine.⁽¹⁴⁾ In 2013, Australia
19 became the first nation to vaccinate the male population against HPV.⁽¹⁵⁾ The vaccine is
20 only available in some private hospitals in Bahrain as the country is yet to include the
21 vaccine in its national immunization schedule.
22

23 Literature published in the region has shown low levels of public knowledge about HPV
24 and its health associations. However, most studies indicated that people by in large are in
25 favor of using the vaccine.^(8,14,16,17) The positive attitude towards vaccination in some
26 studies was observed to be driven by the fear of contracting HPV infection, cervical cancer
27 and genital warts.^(18,19) Age and sexual activity were also noticed to be determining factors
28 for parents agreeing to vaccinate their children.⁽¹⁹⁾ Nevertheless, parents also feared that
29 vaccination would encourage sexual promiscuity amongst children.^(19,20)
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32 As of December 2017, twenty countries globally have included boys in their national HPV
33 immunization programme.⁽²¹⁾ With the occurrence of HPV related diseases and cancers in
34 males and the increasing inclusion of the gender in HPV vaccine programmes worldwide,
35 this study included males to ensure a more comprehensive view on the infection and its
36 vaccine.
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38 The aim of this study is to provide insights on the knowledge status of HPV infection in
39 the Bahraini society and their attitudes towards the HPV vaccine. This study can aid
40 communication between health policy makers to include HPV vaccine in the national
41 immunization schedule.
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44 **Methods**

45 *Study design and population*

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49 A cross-sectional study was conducted in the Kingdom of Bahrain, in February 2018,
50 amongst attendees of primary healthcare centers. A cluster multistage sampling method
51 was used. Two health centers from each of the five health regions in the country were
52 chosen at random, yielding a total of 10 health centers (BBK Hidd HC, NBB Dair HC,
53 Bilad Al Qadeem health center, Hoorah HC, A'ali HC, Yousif Engnair HC, East Riffa HC,
54 Sitra HC, Kuwait HC and Budaiya HC).
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3 A predetermined sample size of 385 was derived using Survey Monkey® electronic
4 calculator with 95% confidence, 5% margin of error, 0.05 level of significance and 1.5
5 million population of Bahrain.⁽²²⁾

6 Using a systematic technique, every 3rd person entering the reception area of the health
7 center was invited to participate and screened for eligibility, including those working in the
8 health centers with the exception of physicians.

9 Our inclusion criteria consisted of men and women aged 18 to 65 years. Both Bahraini and
10 Non-Bahraini citizens were included. Non-English or non- Arabic speakers were excluded.
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13 Four hundred ninety-five (495) people were recruited over a two-week period in February
14 2018. Forty-nine (49) of whom were excluded due to age and language limitations. Four
15 hundred forty-six (446) people met the inclusion criteria, of which 408 agreed to participate
16 in the study.
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19 The Primary Health Care Research Sub-committee (PHCRC) in the Ministry of Health
20 reviewed and approved the study protocol. Verbal consent was taken from all participants
21 prior to data collection.
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24 ***Data Collection***

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26 Data was collected via a questionnaire adopted from two studies in the region.^(23,24)
27 Questions were asked in either English or Arabic depending on the participants' preference.
28 The questionnaire consists of 32 questions including demographic data, knowledge about
29 HPV infection and attitudes and beliefs about the HPV vaccine. Further information
30 regarding the questions can be found in the tables in the results section.
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33 The Arabic translated version was piloted on 20 participants to test it for clarity and
34 language suitability. The reliability of the questionnaire was tested and showed Cronbach's
35 alpha of 0.789.

36 The questionnaire was administered via face to face interview by physicians.
37 Participants who had heard of HPV were required to answer the whole questionnaire.
38 Those who had not, were briefed about HPV infection and asked to answer only the attitude
39 and beliefs sections of the questionnaire.
40

41 The briefing provided was that HPV stands for Human Papilloma Virus, which is the most
42 common sexually transmitted infection. It can lead to cervical cancer in women. Vaccines
43 to prevent the infection are available and can be given as early as 9 years of age till 26
44 years.
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50 ***Patient and Public Involvement***

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52 This research was done without patient or public involvement. Patients were not invited
53 to comment on the study design and were not consulted to develop patient relevant
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outcomes or 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 was entered and analysed via Statistical Package for the Social Sciences (SPSS) software version 23. The demographic and baseline variables were summarised using descriptive statistics; using mean, standard deviation and median for continuous variables and as frequencies and percentage for categorical variables.

The knowledge questions were recorded as “correct” for option ‘Yes’ and “incorrect” for the ‘No’ and ‘I don’t know’ options.

Chi square 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 (446) 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 females. The mean (SD) age was 34.5 years (9.7) and median age was 33 years (range 18-65 years). Most of the respondents were Bahrainis (80.1%, 327), married (81.9%, n=334) and had a high school or diploma degree (53.7%, n= 219). About 46.6% (190) reported to be employed in the non-health sector while 13.7% (56) were health sector employees. Demographic characteristics are demonstrated in *Table 1*.

Table1: Demographics characteristics. Values are numbers (%) (n=408)

	N (%)	
Sex	Male	140 (34.3)
	Female	268 (65.7)
	Total	408 (100)
Age	<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)
No of children	None	98 (24)
	One	68 (16.7)
	Two	93 (22.8)
	Three	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)

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 significant association with awareness of HPV were female gender and employment in the health sector ($p<0.001$ for both) (*Table 2*).

Table 2: Association between demographic data and awareness of HPV. Values are numbers (%) (n=408)

		Knew about HPV infection before the survey		Chi-Squared P-value
		n	(%)	
Sex	Male	7	140 (5%)	<0.001
	Female	48	268 (17.9%)	
Age	<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%)	

Out of those who had heard of HPV, thirty-nine (70.9%) identified HPV to be a sexually transmitted infection. 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 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).

Table 3: Knowledge about HPV infection, risk factors and prevention. Values are numbers (%) (n=55)

	Correct
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	n	%
HPV is a virus in 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 increase the risk of the virus persisting and it leads 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, anus)	33	60.0%
Prevention against HPV will prevent cervical cancer	40	72.7%

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 is safe but 83.6% (341) wanted to be reassured that the vaccine will protect against HPV.

Table 4: Attitude and beliefs towards HPV vaccine. Values are numbers (%) (n=408)

	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%)

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 5: Vaccine Concerns. Values are numbers (%) (n=408)

		n (%)
Greatest concern about HPV vaccine	Side effects	198 (48.5%)

Efficacy	122 (29.9%)
Cost	50 (12.3%)
Others	38 (9.3%)

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

Table 6: Beliefs regarding vaccination policy. Values are numbers (%) (n=408)

		n (%)
Group should be vaccinated	Males	17 (4.2%)
	Females	28 (6.9%)
	Both sex	346 (84.8%)
	Don't know	17 (4.2%)
Timing of vaccination	Pre-school	47 (11.5%)
	School age	139 (34.1%)
	Before marriage	170 (41.7%)
	Any age	40 (9.8%)
Decision maker on HPV vaccination	Don't know	12 (2.9%)
	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%)

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.

Discussion

This study explored the level of knowledge about HPV infection and attitude towards HPV vaccine amongst 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 absence of HPV vaccination in the national immunization schedule.

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

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12 Furthermore, the limited awareness of HPV seen in our study and other regional studies
13 might be underestimated because of the confusion amongst the public between HPV with
14 other viruses such as Human immunodeficiency virus (HIV) and Hepatitis B virus (HBV).

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17 Systematic reviews done across Asian countries and the sub-Saharan Africa also revealed
18 poor knowledge of HPV and its vaccine.^(25,26) In contrast, a higher rate of awareness
19 (61.1%) was reported in an online study across USA, UK and Australia including 2409
20 participants with USA in the lead.⁽²⁷⁾ HPV publicity and vaccine advertising campaigns
21 done by pharmaceutical companies in the USA were a plausible explanation for this
22 finding. However, some gaps in HPV knowledge were still present amongst the studied
23 population.

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

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38 Our study marks employment in health sector as a significant determinant of HPV
39 awareness. A similar study showed adequate awareness about the virus amongst health
40 care workers in New Zealand. However, significant gaps in knowledge were still noted.⁽²⁹⁾

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

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53 The majority of our study participants were against targeting only females for vaccination
54 and believed it should be given to both genders. Thirty-four per cent of the participants
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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 health care in the country.

Twenty-four percent 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 STD's. 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 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 males compared with similar studies conducted in the Gulf Cooperation Council (GCC) countries. However, their low sample size makes the comparison to 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 health care 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 males becomes available.

Authorship Contribution

All the authors contributed in the study design and participated equally in the acquisition of data, analysis and interpretation. Y. Husain, A. Alalwan, Z.A. Musawi, G. Abdulla and K.A. Ahmed were responsible for writing the manuscript while G. Jasim revised the manuscript for important intellectual content. All authors made the decision to submit the manuscript for publication: Y. Husain, A. Alalwan, Z.A. Musawi, G. Abdulla, K.A. Ahmed and G. Jassim.

Competing Interests

None declared.

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Data Sharing Statement

Data includes study questionnaire, study protocol, statistical analysis and results. Proposals can be directed to Dr. Amal Alalwan at amal.alalwan@gmail.com following publication, with no end date. The data can be used for any purpose.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	1
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	1-2
Objectives	#3	State specific objectives, including any prespecified hypotheses	See note 1
Study design	#4	Present key elements of study design early in the paper	3
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of	3

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		selection of participants.	
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	N/A
Bias	#9	Describe any efforts to address potential sources of bias	NA
Study size	#10	Explain how the study size was arrived at	3
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	3
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	4
	#12b	Describe any methods used to examine subgroups and interactions	4
	#12c	Explain how missing data were addressed	N/A
	#12d	If applicable, describe analytical methods taking account of sampling strategy	N/A
	#12e	Describe any sensitivity analyses	N/A
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	See note 2
	#13b	Give reasons for non-participation at each stage	N/A
	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic,	4

1		clinical, social) and information on exposures and potential	
2		confounders. Give information separately for exposed and	
3		unexposed groups if applicable.	
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6		#14b Indicate number of participants with missing data for each	See note
7		variable of interest	3
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9			
10	Outcome data	#15 Report numbers of outcome events or summary measures.	5-7
11		Give information separately for exposed and unexposed	
12		groups if applicable.	
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15	Main results	#16a Give unadjusted estimates and, if applicable, confounder-	N/A
16		adjusted estimates and their precision (eg, 95% confidence	
17		interval). Make clear which confounders were adjusted for and	
18		why they were included	
19			
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21			
22		#16b Report category boundaries when continuous variables were	N/A
23		categorized	
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25			
26		#16c If relevant, consider translating estimates of relative risk into	N/A
27		absolute risk for a meaningful time period	
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30	Other analyses	#17 Report other analyses done—e.g., analyses of subgroups and	N/A
31		interactions, and sensitivity analyses	
32			
33			
34	Key results	#18 Summarise key results with reference to study objectives	8
35			
36	Limitations	#19 Discuss limitations of the study, taking into account sources of	1
37		potential bias or imprecision. Discuss both direction and	
38		magnitude of any potential bias.	
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42	Interpretation	#20 Give a cautious overall interpretation considering objectives,	10
43		limitations, multiplicity of analyses, results from similar studies,	
44		and other relevant evidence.	
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47	Generalisability	#21 Discuss the generalisability (external validity) of the study	N/A
48		results	
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51	Funding	#22 Give the source of funding and the role of the funders for the	10
52		present study and, if applicable, for the original study on which	
53		the present article is based	
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Author notes

- 1 1. NA (aim mentioned on page 3)
- 2
- 3 2. 3 (mentioned in study design)
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- 5 3. N/A (no missing data)
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8 CC-BY. This checklist was completed on 26. March 2019 using <https://www.goodreports.org/>, a tool
9 made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)
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