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# Awareness of human papillomavirus and acceptability of the vaccine among women in Palestine: is it time for policy adjustment?

Mohamedraed Elshami<sup>1,2\*†</sup>, Hanan Abukmail<sup>2,3†</sup>, Ibrahim Al-Slaibi<sup>4</sup>, Mohammed Alser<sup>2</sup>, Afnan Radaydeh<sup>5</sup>, Alaa Alfuhaha<sup>6</sup>, Mariam Thalji<sup>5</sup>, Salma Khader<sup>5</sup>, Lana Khatib<sup>7</sup>, Nour Fannoun<sup>8</sup>, Bisan Ahmad<sup>3</sup>, Lina Kassab<sup>2</sup>, Hiba Khrishi<sup>9</sup>, Deniz Houssaini<sup>10</sup>, Nour Abed<sup>3</sup>, Aya Nammari<sup>5</sup>, Tumodir Abdallah<sup>5</sup>, Zaina Alqudwa<sup>10</sup>, Shahd Idais<sup>5,11</sup>, Ghaid Tanbouz<sup>9</sup>, Ma'alem Hajajreh<sup>12</sup>, Hala Abu Selmiyh<sup>2</sup>, Zakia Abo-Hajouj<sup>5</sup>, Haya Hebi<sup>5</sup>, Manar Zamel<sup>7</sup>, Refqa Najeeb Skaik<sup>2</sup>, Lama Hammoud<sup>9</sup>, Saba Rjoub<sup>5</sup>, Hadeel Ayesh<sup>5</sup>, Toqa Rjoub<sup>5</sup>, Rawan Zakout<sup>5</sup>, Amany Alser<sup>13</sup>, Nasser Abu-El-Noor<sup>14†</sup> and Bettina Bottcher<sup>3†</sup>

## Abstract

**Background:** Progress has been made in the reduction of morbidity and mortality of cervical cancer by the implementation of human papillomavirus (HPV) vaccination programs. This study aimed to assess the awareness of Palestinian women about HPV as well as their knowledge and acceptability of the HPV vaccine and to examine the factors associated with good awareness.

**Methods:** This was a national cross-sectional study. Adult women were recruited from hospitals, primary healthcare centers, and public spaces in 11 Palestinian governorates using convenience sampling. A structured questionnaire was used for data collection. For each correctly answered question, one point was given. The total score was calculated and categorized into poor (0–10) and good awareness (11–21).

**Results:** The questionnaire was completed by 7223 women out of 8086 who were approached (response rate = 89.3%). A total of 7058 questionnaires were included in the final analysis; 4403 from the West Bank and Jerusalem (WBJ) and 2655 from the Gaza Strip. Women recruited from the Gaza Strip were younger, getting lower monthly incomes, and with fewer chronic diseases than women recruited from the WBJ.

Only 33 women (0.5%) displayed good awareness of HPV and its vaccine with 0.7% of women from WBJ and only 0.2% of women from the Gaza Strip. Completing post-secondary education, being employed or a student, and having a higher monthly income were associated with an increase in the likelihood of having good awareness.

<sup>†</sup>Mohamedraed Elshami and Hanan Abukmail contributed equally as a first co-author

<sup>†</sup>Nasser Abu-El-Noor and Bettina Bottcher contributed equally as a senior co-author

\*Correspondence: mohamedraed.elshami@gmail.com

<sup>1</sup> Division of Surgical Oncology, Department of Surgery, University Hospitals Cleveland Medical Center, 11100 Euclid Avenue, Lakeside 7100, Cleveland, OH 44106, USA

Full list of author information is available at the end of the article



Among women who had heard of HPV ( $n = 571$ , 8.1%), only 46 women (8.1%) reported familiarity with its vaccine. Women from the WBJ were more likely than women from the Gaza Strip to have heard about the HPV vaccine (0.9% vs. 0.2%). Most women agreed to receive the HPV vaccine themselves or for their daughters if it was given without cost or with a co-payment. No differences were found in the likelihood of agreeing to receive the HPV vaccine among women in the WBJ versus the Gaza Strip.

**Conclusion:** The overall awareness of HPV and its vaccine was extremely low. Inclusion of the HPV vaccine in the national immunization program could change this, especially as the HPV vaccine appeared to be acceptable.

**Keywords:** Human papillomavirus, Cervical cancer, Vaccine, Vaccination, Health education, Awareness, Palestine

## Introduction

Cervical Cancer (CC) is a major health problem among women with more than 300,000 deaths reported globally in 2020 [1]. The burden of CC is substantially higher in low- and middle-income countries, where nine out of 10 women with CC die [2, 3]. However, CC is considered one of the most preventable and treatable types of cancer if detected early and managed appropriately [4].

Human papillomavirus (HPV) infection has been identified as the most significant risk factor [5–8]. A previous study conducted in the Gulf Cooperation Council countries showed that the high-risk HPV genotypes 16 and 18 were found in 21.0% of women tested. Women in Qatar (31.3%) had the highest positivity rate, followed by women in Bahrain (20.0%), Saudi Arabia (17.2%), and the United Arab Emirates (14.7%) [9]. In Palestine, HPV infection was detected in 25% of non-pregnant women, 68% of pregnant women, and 89% of CC specimens [10]. Women's awareness about HPV infection as a risk factor for CC is crucial to facilitate engagement in cervical screening programs as well as acceptance of vaccination, particularly as HPV immunization programs have successfully reduced morbidity and mortality associated with CC [11, 12].

Vaccination against HPV is one of the primary prevention measures for CC [13]. Previous reports demonstrated this by finding 690,000 CC cases and 420,000 deaths prevented, mostly in low- and middle-income countries, by HPV vaccination of a cohort of 58 million 12-year-old girls in 179 countries [14]. HPV vaccination was found to be cost-effective in 156 (87%) of 179 countries included in the Papillomavirus Rapid Interface for Modelling and Economics [14]. Beside the preventive role of HPV vaccines, there has been a growing interest to extrapolate the clinical application of these vaccines to treat HPV infections and preinvasive HPV diseases. However, these vaccines are still under investigation and have not been introduced in clinical practice [15].

The HPV vaccine is not part of the national vaccination program in Palestine [16]. Understanding Palestinian women's awareness, attitudes, and acceptance of the HPV vaccine could be of value for healthcare decision makers

in proposing future policies to include the vaccine in the national program especially as no CC screening programs exist in Palestine [16].

This national study aimed to: (1) assess Palestinian women's awareness of HPV and its vaccine, (2) examine if there is a difference in awareness between women from the Gaza Strip versus the West Bank and Jerusalem (WBJ), and (3) identify the factors associated with good awareness.

## Materials and methods

### Study design, setting and target population

A cross-sectional study was conducted from July 2019 to March 2020 in the two main areas in Palestine: the Gaza Strip and the WBJ. About half of the female population in Palestine is of reproductive age (15–49 years) [17]. Therefore, adult women (aged  $\geq 18$  years) were the target population. Eligible women were recruited from governmental hospitals, primary healthcare centers, and public spaces. The public spaces included malls, markets, parks, restaurants, mosques, churches, and transportation stations. Exclusion criteria included women holding citizenship other than Palestinian, working or studying in a health-related field, and visiting oncology departments or clinics.

### Sampling methods

Eligible women were recruited from hospitals, primary healthcare centers, and public spaces in 11 Palestinian governorates using convenience sampling. The data collection sites were located across Palestine and covered widespread geographical areas to create a study cohort that resembled the Palestinian community [18–20].

### Questionnaire and data collection

A structured questionnaire was designed using questions from previous similar studies [21–32]. A back-to-back translation was done, where two bilingual healthcare professionals translated the questionnaire from English to Arabic, and then the Arabic version was back-translated to English by another two bilingual healthcare professionals. Those healthcare professionals had relevant clinical

and research experiences in gynecologic oncology, public health, and survey design. Then, different health experts and researchers assessed the content validity of the questionnaire. This was followed by conducting a pilot study ( $n=130$ ) to test the clarity of questions of the Arabic version of the questionnaire. Questionnaires from the pilot study were not included in the final analysis.

The questionnaire consisted of three sections. The first section described sociodemographic data including age, menarche, highest level of education, occupation, monthly income, marital status, knowing someone with cancer, place of residency, and having a chronic disease. The second section evaluated the awareness of HPV. The third section assessed the awareness and acceptability of the HPV vaccine.

Yes/no questions were used to assess the awareness of HPV including its transmission and relation to developing any type of cancer. The participant's knowledge of the availability of the HPV vaccine in the national vaccination program as well as their thoughts if the HPV vaccine could help in protecting against CC was assessed using yes/no/do not know questions. The open-ended recall questions were posed to specify the relationship of HPV with any cancer types, the age at which the HPV vaccine should be first given, and the number of HPV vaccine doses needed. The participants' responses were then converted to correct/incorrect responses based on the Centers for Disease Control and Prevention information [33, 34]. A 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) was used to evaluate the acceptability of the receipt of the HPV vaccine among study participants who had previously heard about it.

Eligible women were invited to complete the questionnaire in a face-to-face interview. Data collection was done utilizing the 'Kobo Toolbox', a secure, user-friendly tool that can be accessed by smartphones [35]. A special training had been run for all data collectors, who were all female and had a medical background, on how to use Kobo Toolbox, recruit participants, and facilitate the completion of the questionnaire.

### Statistical analysis

Descriptive statistics were used to summarize participants' characteristics. Continuous, non-normally distributed variables were summarized using the median [interquartile range (IQR)] with baseline comparisons performed using Kruskal–Wallis tests. Categorical variables were summarized using frequencies ( $n$ ) and percentages (%) with baseline comparisons performed using Fisher's exact test. Since 1450 NIS (about \$450) was the minimum wage of Palestinian employees [36], it was chosen to categorize monthly income into two categories:  $<1450$  and  $\geq 1450$  NIS.

To evaluate women's awareness of HPV and its vaccine, a scoring system was adapted from previous studies [18, 37–40]. Each correct answer was given one point. The total score (ranging from 0 to 21) was calculated and categorized into two categories: poor (0–10) and good awareness (11–21). The awareness of HPV and its vaccine was compared between women from the Gaza Strip versus the WBJ using Fisher's exact test. The 5-point Likert scale was converted into a 3-point scale to facilitate comparisons especially as it was difficult for participants to differentiate between 'agree' versus 'strongly agree' and 'disagree' versus 'strongly disagree'. Therefore, the responses of 'strongly agree' and 'strongly disagree' were recoded to 'agree' and 'disagree' respectively.

Missing data occurred completely at random. Therefore, a complete case analysis was utilized to handle missing data. Data were analyzed using Stata software version 16.0 (StataCorp, College Station, Texas, United States).

### Results

The questionnaire was completed by 7223 women out of 8086 who were approached (response rate = 89.3%). In total, 7058 questionnaires were included in the analysis (30 did not meet the inclusion criteria, 135 had missing data); 4403 from the WBJ and 2655 from the Gaza Strip.

The median age [IQR] for all women included in the study was 32.0 years [24.0, 42.0] (Table 1). Women recruited from the Gaza Strip were younger, getting lower monthly income, and with less chronic diseases than women recruited from the WBJ.

### Good awareness and its associated factors

Only 33 women (0.5%) displayed good awareness of HPV and its vaccine, defined as having a score of 11–21 (Table 2). Women living in the WBJ were 3.5 times more likely than women living in the Gaza Strip to have good awareness (0.7% vs. 0.2%).

Besides living in the WBJ, completing post-secondary education, being employed or a student, and having a higher monthly income were all associated with higher likelihood to have good awareness (Table 3). On the other hand, visiting governmental hospitals or primary health-care centers was associated with lower likelihood to have good awareness.

### Awareness of HPV

Out of the 7058 women included in the study, only 571 (8.1%) had heard about HPV; 339 of 4403 in the WBJ (7.7%) and 232 of 2655 women in the Gaza Strip (8.7%). When those 571 women were asked about the mode of transmission of HPV, 95 (16.6%) and 53 (9.3%) answered correctly with 'sexually' and 'mother to newborn', respectively (Table 4). Women from the

**Table 1** Characteristics of study participants

Characteristic	Total (n = 7058)	Gaza Strip (n = 2655)	WBJ (n = 4403)	p-value
Age, median [IQR]	32 [24, 42]	30 [24, 39]	33 [24, 44]	< 0.001
Age group, n (%)				
18–20	756 (10.7)	249 (9.4)	507 (11.5)	< 0.001
21–40	4331 (61.4)	1809 (68.1)	2522 (57.3)	
41 or older	1971 (27.9)	597 (22.5)	1374 (31.2)	
Educational level, n (%)				
Secondary or below	3893 (55.2)	1497 (56.4)	2396 (54.4)	0.11
Above secondary	3165 (44.8)	1158 (43.6)	2007 (45.6)	
Occupation, n (%)				
Housewife	4647 (65.8)	2008 (75.6)	2639 (59.9)	< 0.001
Employed	1476 (20.9)	348 (13.1)	1128 (25.6)	
Retired	69 (1.0)	11 (0.5)	58 (1.4)	
Student	866 (12.3)	288 (10.8)	578 (13.1)	
Monthly income $\geq$ 1450 NIS, n (%)	4666 (66.1)	693 (26.1)	3973 (90.2)	< 0.001
Marital status, n (%)				
Single	1657 (23.5)	527 (19.8)	1130 (25.7)	< 0.001
Married	5058 (71.6)	2025 (76.3)	3033 (68.8)	
Divorced/Widowed	343 (4.9)	103 (3.9)	240 (5.5)	
Having a chronic disease, n (%)	1397 (19.8)	417 (15.7)	980 (22.3)	< 0.001
Knowing someone with cancer, n (%)	4083 (57.9)	1483 (55.9)	2600 (59.1)	0.009
Site of data collection, n (%)				
Public spaces	2695 (38.2)	863 (32.5)	1832 (41.6)	< 0.001
Hospitals	1890 (26.7)	642 (24.2)	1248 (28.4)	
Primary healthcare centers	2473 (35.1)	1150 (43.3)	1323 (30.0)	

n, number of participants; IQR, interquartile range; WBJ, West Bank and Jerusalem

**Table 2** Awareness level of human papillomavirus and its vaccine among study participants

Level	Total (n = 7058)	Gaza Strip (n = 2655)	WBJ (n = 4403)	p-value
Poor (total score ranged from 1 to 10)	7025 (99.5)	2651 (99.8)	4374 (99.3)	0.002
Good (total score ranged from 11 to 21)	33 (0.5)	4 (0.2)	29 (0.7)	

n, number of participants; WBJ, West Bank and Jerusalem

Data are presented as frequencies and percentages

WBJ were more likely than women from the Gaza Strip to give correct answers about the HPV mode of transmission.

About two-thirds (n = 355, 62.1%) correctly answered that HPV can infect both males and females. About one-third (n = 214, 37.5%) had heard about a relationship between HPV and any type of cancer. Of those, 107 (50.0%) identified CC, 3 (1.4%) identified skin cancer and 2 (0.9%) identified penile cancer. Women from the Gaza Strip were more likely than women from the WBJ to give incorrect answers about HPV-related cancers.

#### Awareness and acceptability of HPV vaccine

Among women who had heard of HPV (n = 571), only 46 (8.1%) had also heard of the HPV vaccine: 40 in the WBJ (87.0%) and 6 in the Gaza Strip (13.0%). Women from the WBJ were more likely than women from the Gaza Strip to have heard about the HPV vaccine (0.9% vs. 0.2%).

Women who had heard of the HPV vaccine (n = 46) were asked some questions about it. No differences in the likelihood to give correct answers to these questions were found between women in the WBJ versus the Gaza Strip. When asked about the age at which the HPV vaccine is

**Table 3** Association between having a good awareness of human papillomavirus and its vaccine with participant characteristics

	Poor awareness (n = 7025)	Good awareness (n = 33)	p-value
<i>Age group</i>			
18–20	750 (10.7)	6 (18.2)	0.06
21–40	4308 (61.3)	23 (69.7)	
41 or older	1967 (28.0)	4 (12.1)	
<i>Educational level</i>			
Secondary or below	3883 (55.3)	10 (30.3)	0.005
Above secondary	3142 (44.7)	23 (69.7)	
<i>Occupation</i>			
Housewife	4635 (66.0)	12 (36.4)	0.003
Employed	1464 (20.8)	12 (36.4)	
Retired	69 (1.0)	0	
Student	857 (12.2)	9 (27.2)	
<i>Monthly income</i>			
< 1450 NIS	2389 (34.0)	3 (9.1)	0.001
≥ 1450 NIS	4636 (66.0)	30 (90.9)	
<i>Marital status</i>			
Single	1645 (23.4)	12 (36.4)	0.06
Married	5040 (71.7)	18 (54.5)	
Divorced/Widowed	340 (4.9)	3 (9.1)	
<i>Residency</i>			
Gaza Strip	2651 (37.7)	4 (12.1)	0.002
WBJ	4374 (62.3)	29 (87.9)	
<i>Having a chronic disease</i>			
No	5632 (80.2)	29 (87.9)	0.38
Yes	1393 (19.8)	4 (12.1)	
<i>Knowing someone with cancer</i>			
No	2961 (42.1)	14 (42.4)	0.99
Yes	4064 (57.9)	19 (57.6)	
<i>Site of data collection</i>			
Public spaces	2673 (38.0)	22 (66.7)	0.002
Hospitals	1883 (26.9)	7 (21.2)	
Primary healthcare centers	2469 (35.1)	4 (12.1)	

n, number of participants; WBJ, West Bank and Jerusalem

first given, 19 women (41.3%) answered correctly with a range from 9 to 14 years old (Table 5). In addition, 24 (52.1%) gave a correct answer for the number of HPV vaccine doses that should be taken (i.e., two or three doses). More than half of the women who had heard of the HPV vaccine (n = 25, 54.3%) correctly answered that the HPV vaccine can be given to both males and females. However, about one-third (n = 15, 32.6%) claimed that the HPV vaccine is part of the Palestinian Ministry of Health vaccination program, and 17 women (37.0%) did not know if the vaccine was part of the program or not.

**Table 4** Awareness of human papillomavirus among study participants who heard of it

Question	Total (n = 571)	Gaza Strip (n = 232)	WBJ (n = 339)	p-value
<i>Mode of transmission</i>				
Airborne infection	29 (5.1)	12 (5.2)	17 (5.0)	0.99
Blood transfusion	116 (20.3)	39 (16.8)	77 (22.7)	0.09
Contaminated food	16 (2.8)	10 (4.3)	6 (1.8)	0.12
Sexually	95 (16.6)	26 (11.2)	69 (20.4)	0.004
Mother to newborn	53 (9.3)	10 (4.3)	43 (12.7)	<0.001
Others	17 (2.9)	8 (3.4)	9 (2.7)	0.62
<i>HPV can infect</i>				
Males	9 (1.6)	3 (1.3)	6 (1.8)	0.93
Females	141 (24.7)	57 (24.6)	84 (24.8)	
Both	355 (62.1)	147 (63.3)	208 (61.3)	
Do not know	66 (11.6)	25 (10.8)	41 (12.1)	
<i>Heard about any relation between HPV and any type of cancer</i>	214 (37.5)	77 (33.2)	137 (40.4)	0.09
<i>Type of cancer caused by HPV<sup>#</sup></i>				
Cervical cancer	107 (50.0)	23 (29.9)	84 (61.3)	<0.001
Skin cancer	3 (1.4)	0	3 (2.2)	0.55
Penile cancer	2 (0.9)	0	2 (1.5)	0.54
Incorrect answers	89 (41.6)	49 (63.6)	40 (29.2)	<0.001
Do not know	25 (11.7)	8 (10.5)	17 (12.4)	0.83

n, number of participants; WBJ, West Bank and Jerusalem; HPV, human papillomavirus

<sup>#</sup>The denominator is the number of participants who recognized a relation between human papillomavirus and any type of cancer

Data are presented as frequencies and percentages

The vast majority of women who had heard of the HPV vaccine stated that it could help to protect against CC (n = 44, 95.6%).

No differences were found in the likelihood of agreeing to receive the HPV vaccine among women, who had heard about the vaccine, in the WBJ versus the Gaza Strip (Table 6). Forty-one women (89.1%) would agree to receive the HPV vaccine if it was given for free and 39 (84.8%) if they had to pay for it. In addition, 42 (91.3%) would agree for their daughters to receive the HPV vaccine, and 40 (87.0%) also if it incurred a cost.

### Discussion

The overall awareness of HPV and its vaccine in this study was extremely low with only 0.5% of the participants having good awareness. Participants from the WBJ demonstrated better awareness than participants from the Gaza Strip. Completing post-secondary education, being employed or a student, and having a higher monthly income were associated with an increase in the likelihood of having good awareness. Conversely, visiting

**Table 5** Awareness of human papillomavirus vaccine among study participants who heard about it

Question	Total (n = 46)	Gaza Strip (n = 6)	WBJ (n = 40)	p-value
<i>Age at which HPV vaccine is first given</i>				
Correct answers	19 (41.3)	1 (17.0)	18 (45.0)	0.38
Incorrect answers	27 (58.7)	5 (83.0)	22 (55.0)	
<i>Number of HPV vaccine doses that should be taken</i>				
Correct answers	24 (52.1)	4 (67.0)	20 (50.0)	0.67
Incorrect answers	22 (47.9)	2 (33.0)	20 (50.0)	
<i>HPV vaccine can be given to</i>				
Males	0	0	0	0.05
Females	19 (41.3)	0	19 (48.0)	
Both	25 (54.3)	6 (100.0)	19 (48.0)	
Do not know	2 (4.4)	0	2 (4.0)	
<i>HPV vaccine is a part of the Palestinian Ministry of Health vaccination program</i>				
No	14 (30.4)	4 (66.0)	10 (25.0)	0.22
Yes	15 (32.6)	1 (17.0)	14 (35.0)	
Do not know	17 (37.0)	1 (17.0)	16 (40.0)	
<i>HPV vaccine can help to protect against cervical cancer</i>				
No	2 (4.4)	0	2 (5.0)	0.99
Yes	44 (95.6)	6 (100.0)	38 (95.0)	
Do not know	0	0	0	

n, number of participants; WBJ, West Bank and Jerusalem; HPV, human papillomavirus

Data are presented as frequencies and percentages

governmental hospitals or primary healthcare centers was associated with a lower likelihood to display good awareness. A small proportion of women who had heard of HPV reported their familiarity with its vaccine. However, women from the WBJ were more likely than women from the Gaza Strip to have heard of the HPV vaccine. The majority of women in this study would agree to receive the HPV vaccine if it was given without cost as well as if they had to pay for it. In addition, most women would agree to their daughters receiving the HPV vaccine for free or at a cost to themselves.

Availability and uptake of the HPV vaccine could play a crucial role in the prevention and reduction of morbidity and mortality of CC [41, 42]. This study assessed the Palestinian women's awareness level of HPV in addition to its vaccine and examined the acceptability of the HPV vaccine to provide baseline information for the implementation of future awareness campaigns and to facilitate the launch of HPV immunization programs. HPV immunization programs could be critical, especially with the lack of CC screening programs in low-income settings accompanied by high mortality as in Palestine [2].

### Good awareness of HPV and its vaccine and the associated factors

Effective implementation of HPV vaccination programs is considered one of the cornerstones to reducing the burden of CC, particularly in low- and middle-income countries [14, 41–43]. For a vaccination program to be effective, both awareness of its benefits and availability are important to ensure wide uptake among the population [43]. This study demonstrated low awareness of HPV and its vaccine among Palestinian women with only 0.5% of participants displaying good awareness. Similar results were found in studies from India, Australia, Ghana, Saudi Arabia, Lebanon, Jordan, Qatar, the United Arab Emirates, and Iraq [30, 44–48]. Although the World Health Organization stated in its CC prevention and control guidelines that the prevention and early detection of CC should be the main objective especially in low- and middle-income countries, more efforts are needed to achieve this [49–52]. Effective vaccination programs coupled with greater awareness facilitating public engagement with a vaccination program could lead to a significant reduction in CC morbidity and mortality in low- and middle-income countries [43].

A contributing factor to the low awareness of HPV in this study could be the neglect of speaking of HPV, particularly by healthcare workers who are considered a good source of shaping women's knowledge during their visits to healthcare facilities [18–20]. Moreover, the lack of freedom of movement impacts the Palestinians' lives in the Gaza Strip, including health professionals' participation in conferences and fellowships [53]. This might restrict health professionals' exposure to the impact of HPV on CC and the effectiveness of the HPV vaccine, which might contribute to inadequate knowledge about it. This decreases the women's chance of hearing about HPV and its vaccine in healthcare facilities. Therefore, low awareness of HPV and its vaccine could be expected, considering the lack of the HPV vaccination from the national immunization program alongside the absence of public education interventions regarding HPV in Palestine, as in other regional countries [48].

In line with other studies [30, 45–47], completing post-secondary education was associated with a higher likelihood of having a good awareness of HPV and its vaccine. This emphasizes the need to enrich school curricula with more information about health-related topics including HPV-related infection and its vaccine. In addition, targeting university curricula could be an efficient approach to promoting women's awareness about HPV, its vaccine, and its relation to CC. Lambert and colleagues showed

**Table 6** Acceptability for the receipt of human papillomavirus vaccine among study participants who heard of it

Question	Total (n = 46)			Gaza Strip (n = 6)			WBJ (n = 40)			p-value
	Disagree	Not sure	Agree	Disagree	Not sure	Agree	Disagree	Not sure	Agree	
Would you like to receive the HPV vaccine if given for free?	1 (2.2)	4 (8.7)	41 (89.1)	0	1 (17.0)	5 (83.0)	1 (3.0)	3 (8.0)	36 (89.0)	0.52
Would you like to receive the HPV vaccine if you will have to pay for it?	4 (8.7)	3 (6.5)	39 (84.8)	1 (17.0)	0	5 (83.0)	3 (8.0)	3 (8.0)	34 (84.0)	0.65
Would you like your (future) daughters to receive the HPV vaccine if given for free?	1 (2.2)	3 (6.5)	42 (91.3)	0	1 (17.0)	5 (83.0)	1 (3.0)	2 (5.0)	37 (92.0)	0.44
Would you like your (future) daughters to receive the HPV vaccine if you will have to pay for it?	1 (2.2)	5 (10.8)	40 (87.0)	0	1 (17.0)	5 (83.0)	1 (3.0)	4 (10)	35 (87.0)	0.59

n, number of participants; WBJ, West Bank and Jerusalem; HPV, human papillomavirus  
Data are presented as frequencies and percentages

that a brief educational intervention increased college students' performance on an HPV knowledge assessment from 45 to 79% after three months from the intervention [54]. Such educational interventions can also be tailored to address the concerns women have about the HPV vaccine to increase its acceptability, which ultimately will lead to the successful integration of HPV immunization into the national program [55].

In this study, being employed and having a higher monthly income were associated with an increase in the likelihood to display good awareness, which is in concordance with a previous study among Lebanese women [47]. Employed women might be more able to interact with well-educated colleagues, where they can talk about their own and relatives' experiences including those related to health issues. In addition, women with higher monthly income might have better chances to access more health-related information through their visits to private healthcare facilities or other resources (e.g., searching the internet.)

Contrary to other studies that addressed CC awareness of symptoms and risk factors in Palestine, women recruited from healthcare centers were less likely to display good awareness of HPV and its vaccine [18, 19]. This could highlight that HPV is not well discussed in public discourse or health education in Palestine. In addition, religion and culture play a role in shaping a conservative attitude toward sexual behaviors as well as the popular practice of male circumcision in Palestine, which is considered a protective factor against HPV infection [56]. In addition, discussing sexual issues, including sexual health education, was shown to be relatively rare among people in Arab countries [48, 57, 58].

#### **Awareness level in the Gaza Strip versus the WBJ**

Several factors might contribute to the finding that participants from the WBJ were more likely than participants from the Gaza Strip to have a good awareness level. Firstly, women in the Gaza Strip are limited in their ability to travel, even to get treatment, compared with women in the WBJ. Since 2006, Palestinians in the Gaza Strip have suffered from increased movement restrictions, making it very difficult to leave or enter the Gaza Strip [53, 59]. The ability to travel as well as the travel distance and time were shown to be associated with a change in the utilization of healthcare services [60, 61]. Access to healthcare and interaction with healthcare professionals could play a key role in shaping women's health literacy [18–20, 37, 38]. Secondly, there is more digital deprivation in the Gaza Strip than in the WBJ. This is mainly because of the electricity crisis in the Gaza Strip, where power supplies are provided only for a few hours a day on a rolling black-out schedule affecting all aspects of daily life including

the interest to surf the internet for health-related information [62, 63]. Finally, the lower socioeconomic status in the Gaza Strip than in the WBJ and the higher unemployment rates (49.1% in Gaza vs. and 14.8% in the WBJ) and greater poverty (64% in Gaza vs. 36% in the WBJ) could add another layer to this difference in awareness between the two areas [64–66]. The decline in standards of living may have forced citizens in the Gaza Strip to think exclusively about fulfilling their daily basic needs, which could indirectly negatively impact their ability to read and educate themselves in health-related topics.

#### **Acceptability of HPV vaccine**

Low knowledge about HPV infection and the vaccine could be a contributor to the poor acceptability of the HPV vaccine [47, 67]. In contrast to previous studies [68–70], participants in this study had poor knowledge of HPV and its vaccine. However, there was a positive attitude among Palestinian women, in both the WBJ and the Gaza Strip, towards HPV vaccination. The reason for this acceptance could be that the small proportion of participants who were aware of HPV and its vaccine had the knowledge about the protective role of the vaccine against HPV infection and its related cancers [68]. To date, the HPV vaccine is not provided as part of the national vaccination program in Palestine [16]. The findings in this study encourage considering the inclusion of the HPV vaccine in the program. This is supported by the lack of difference in acceptance of the HPV vaccine among women in the Gaza Strip versus the WBJ. This also suggests that any standardized intervention across Palestine to mitigate the barriers to receiving the HPV vaccine might have a homogenous impact among all Palestinian women. This study did not look at those barriers and further research is needed to identify them in order to formulate reasonable interventions to address them.

#### **Future directions**

The findings of this study showed the substantial need to raise women's awareness of HPV and its vaccine in Palestine. Enhancing school and university curricula with more in-depth information about health-related topics, including HPV infection and vaccine, should be considered. In addition, targeted educational interventions are needed to promote the knowledge of women of the reproductive age visiting governmental hospitals and primary healthcare centers. Moreover, educating healthcare professionals about the impact of HPV on CC and the effectiveness of its vaccine might be vital to achieving a successful launch of the HPV vaccine campaign in Palestine. There is a need to include the HPV vaccine in the Palestinian national vaccination program supported



by the good acceptability among women demonstrated in this study [71].

### Strengths and limitations

The main strengths of this study include the large sample size and the inclusion of women from different places and governorates across Palestine to resemble the Palestinian community. In addition, the high response rate and the greater proportion of women included in their reproductive age showed a trend toward acceptance of such questionnaires by the target population. Furthermore, the low baseline knowledge about HPV and its vaccine in this study identifies an area for improvement to increase the chances of successful future inclusion of the HPV vaccine in the national vaccination program in Palestine.

Limitations of this study include convenience sampling, as it does not guarantee the generalizability of the findings. However, the large sample size, high response rate, and coverage of most geographical areas across Palestine may have mitigated this limitation. Another limitation could be that adolescents were not included, which could have provided an opportunity to explore their awareness and attitudes towards HPV and its vaccine. Nonetheless, assessing adolescents' awareness may need a different study design (e.g., a qualitative study). Finally, the exclusion of participants with medical backgrounds might possibly have reduced the number of participants with good awareness. Nevertheless, their exclusion was intended to increase the relevancy of this study to measure public awareness.

### Conclusion

The overall awareness of women about HPV and its vaccine was extremely low with only 0.5% demonstrating good awareness. Factors associated with good awareness included living in the WBJ, completing post-secondary education, being employed or a student, and having a higher monthly income. Only 8.9% of women who had heard of HPV knew about its vaccine. A low awareness level of HPV and its vaccine could be expected considering the lack of the HPV vaccination in the national immunization program coupled with the absence of public education interventions. Most women showed good acceptance of the HPV vaccine, despite the vaccine not being part of the national vaccination program, which supports the necessary inclusion of the HPV vaccine in the national immunization schedule.

### Abbreviations

CC: Cervical cancer; HPV: Human papillomavirus; WBJ: West Bank and Jerusalem; MoH: Ministry of health; IQR: Interquartile range; CI: Confidence interval; OR: Odds ratio.

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### Author contributions

ME, and HA contributed to design of the study, data analysis, data interpretation, and drafting of the manuscript. IA, MA, AR, AA, MT, SK, LK, NF, BA, LiK, HK, DE, NA, AN, TA, ZA, SI, GT, MH, HAS, ZAH, HH, MZ, RS, LH, SR, HaA, TR, RZ, and AmA contributed to design of the study, data collection, data entry, and data interpretation. NAE and BB contributed to design of the study, data interpretation, drafting of the manuscript, and supervision of the work. All authors have read and approved the final manuscript. Each author has participated sufficiently in the work to take public responsibility for the content.

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### Availability of data and materials

The data analyzed during the study is available from the corresponding author upon reasonable request.

### Declarations

#### Ethics approval and consent to participate

Ethical approval to conduct this study was obtained from the Helsinki Committee in the Gaza Strip, a committee within the Ministry of Health (MoH) that gives study approvals, and from the Islamic University of Gaza Ethics Committee. In addition, approval from the Human Resources Development department at the Palestinian MoH was obtained to collect data at governmental hospitals and primary healthcare centers. All methods were performed in accordance with the relevant guidelines and regulations. Written informed consent was obtained from each recruited woman before starting the completion of the questionnaire. A detailed explanation of the study and its purpose was given to all women with the emphasis on the confidentiality of obtained information and that participation is completely voluntary and it will not affect any treatment to be received.

#### Consent for publication

Not applicable.

#### Competing interests

All authors declare no competing interests.

#### Author details

<sup>1</sup>Division of Surgical Oncology, Department of Surgery, University Hospitals Cleveland Medical Center, 11100 Euclid Avenue, Lakeside 7100, Cleveland, OH 44106, USA. <sup>2</sup>Ministry of Health, Gaza, Palestine. <sup>3</sup>Faculty of Medicine, Islamic University of Gaza, Gaza, Palestine. <sup>4</sup>Almakassed Hospital, Jerusalem, Palestine. <sup>5</sup>Faculty of Medicine, Al-Quds University, Jerusalem, Palestine. <sup>6</sup>Faculty of Graduate Studies, An-Najah National University, Nablus, Palestine. <sup>7</sup>Faculty of Medicine, An-Najah National University, Nablus, Palestine. <sup>8</sup>Faculty of Pharmacy, Alazhar University of Gaza, Gaza, Palestine. <sup>9</sup>Faculty of Dentistry and Dental Surgery, Al-Quds University, Jerusalem, Palestine. <sup>10</sup>Faculty of Medicine, Alazhar University of Gaza, Gaza, Palestine. <sup>11</sup>Hebron Governmental Hospital, Hebron, Palestine. <sup>12</sup>Alia Hospital, Hebron, Palestine. <sup>13</sup>Al-Shiffa Hospital, Gaza, Palestine. <sup>14</sup>Faculty of Nursing, Islamic University of Gaza, Gaza, Palestine.

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