Journal of Prevention (2022) 43:225–240
https://doi.org/10.1007/s10935-021-00657-w

ORIGINAL PAPER

# Knowledge and Awareness of Parents Towards Human Papillomavirus (HPV) and HPV Vaccines, and Vaccine Acceptability in Northern Cyprus

**Gulifeiya Abuduxike[1] · Ozen Asut[1] · Sanda Cali[1] · Songul Vaizoglu[1]**

Accepted: 7 December 2021 / Published online: 28 January 2022


## Abstract

The human papillomavirus (HPV) vaccine is one of the most cost-effective public health measures for preventing cervical cancer and other HPV-related diseases. However, the vaccine uptake in many countries remains suboptimal. This cross-sectional study aimed to assess the knowledge and awareness of parents towards HPV, related diseases, and HPV vaccines, as well as to examine the effect of brief educational information on parents' vaccine acceptability. We used a structured interviewer-administered questionnaire to collect information from 227 outpatient visitors to a healthcare center who had children under the age of 19 years. We asked parents again about their acceptance of HPV vaccines after being provided brief educational information. Of all the parents, 43% were aware of HPV and related diseases, and 59% of those had sufficient knowledge regarding HPV while 45% of them reported that they were aware of HPV vaccines. Being Northern Cypriot was a predictor of having good knowledge, whilst being a female, having a higher education level, being 35 years or older, and being employed were the significant predictors of having greater awareness of HPV and related diseases. The HPV vaccine acceptance of the parents increased substantially in all sociodemographic groups after the provision of the educational information. The findings demonstrated that the vaccination rates of children of parents who have insufficient knowledge and awareness of HPV and vaccines are also very low. Effective educational interventions based on the specific sociodemographic characteristics of the patients should be given a stronger focus to improve vaccine acceptability among this population.

**Keywords** Human papillomavirus (HPV) · HPV vaccines · Parental knowledge · Parental awareness · Vaccine acceptability · Northern Cyprus

✉ Gulifeiya Abuduxike
gulpiya1@gmail.com; gulifeiya.abuduxike@neu.edu.tr

Extended author information available on the last page of the article

## Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) worldwide and the leading cause of cervical cancer (WHO, 2014, 2018). Globally, there were an estimated 604,127 new cervical cancer cases in 2020, and 90% of the 342,000 deaths occurred in low and middle-income countries (LMICs) (Sung et al., 2021; WHO, 2020). Among the more than 100 types of HPV, 14 are closely related to various conditions including cervical, vulvar, vaginal, penile, anal, and oropharyngeal cancers (WHO, 2017, 2020). Two types of HPV (16 and 18) are responsible for 70% of cervical cancer and other HPV-related cancers. HPV is commonly transmitted through skin-to-skin genital contact, vaginal, anal, and oral sex, and mucous membranes in the genital area (WHO, 2014, 2017, 2020). Some of the risk factors for persistent HPV infections are the types of HPV co-infection with other STIs, particularly with human immunodeficiency virus (HIV), parity, first-intercourse age, number of sexual partners, young age at first pregnancy, and tobacco smoking (Denny et al., 2012; WHO, 2017, 2020).

Although it is the second leading cause of cancer deaths among women and despite the inequitable disease burden in LMICs, cervical cancer is highly preventable by implementing a universal HPV vaccination program for both sexes, particularly girls, before they become sexually active (Sung et al., 2021; Wang et al., 2020; WHO, 2014). Three types of prophylactic vaccines, namely the quadrivalent HPV vaccine (Gardasil4®; HPV16,18,6,11), bivalent HPV vaccine (Cervarix®; HPV 16 &18), and 9-valent HPV vaccine (Gardasil9®; HPV 6, 11, 16, 18, 31, 33, 45, 52, 58), have been approved for use in many countries since 2006 (Clark & Trimble, 2020; de Sanjose et al., 2019; Lei et al., 2020; Wang et al., 2020; WHO, 2016, 2017). A number of studies and systematic reviews have reported the cost-effectiveness and high protection of HPV vaccination against major oncogenic types of HPV infections, precancerous lesions, and anogenital warts (Clark & Trimble, 2020; de Sanjose et al., 2019; Drolet et al., 2019; Fesenfeld et al., 2013; Lei et al., 2020; WHO, 2017). The WHO strongly recommends HPV vaccination as the most effective primary prevention measure for both sexes aged 9–14 years according to a 2-dose schedule. If the individual is aged 15 years or above, a 3-dose schedule should be followed and the schedule for the doses should vary based on the vaccine type (WHO, 2014, 2016, 2017).

The number of countries in which HPV vaccination was introduced had increased from 65 in 2015 to 124 by the end of 2019 (Lei et al., 2020; WHO, 2016). However, apart from the inequitable access to HPV vaccines in many LMICs, HPV vaccine uptake in many developed countries is suboptimal, with a decreasing trend even being observed over the years (Chido-Amajuoyi et al., 2021; Creed et al., 2021; Dang et al., 2020; Dixon et al., 2019; Gargano et al., 2013; Holman et al., 2014). One of the critical factors affecting uptake is parental knowledge and awareness towards HPV infections and HPV vaccination. To increase the HPV vaccine uptake, many recent studies have emphasized the importance of educating the parents with correct information through effective channels to improve their knowledge and reduce vaccine hesitancy (Creed et al.,

2021; Dang et al., 2020; Della Polla et al., 2020; Dixon et al., 2019; Holman et al., 2014).

HPV vaccination is not included in routine immunization programs in the Turkish Republic of Northern Cyprus (TRNC). However, the HPV vaccine (Gardasil4) is available in pharmacies and the price is not covered by any insurance plan in the country. There are no scientific publications or government statistics available in the TRNC regarding the prevalence of HPV infections, other disease burdens related to HPV, and HPV vaccination rates. In addition, we know nothing of the knowledge and awareness of the population towards HPV, related diseases, and HPV vaccines. Such a substantial gap in the basic knowledge on this important topic could ultimately negatively impact the development of an effective public health policy for the control and management of HPV infections and cervical cancer. In this study, we examined parental knowledge and awareness regarding HPV and related diseases, HPV vaccination, and vaccine acceptability to provide evidence-based information for further comprehensive studies.

## Materials and Methods

### Study Design and Duration

We administered a cross-sectional study among outpatient visitors who attended to the Trenyolu polyclinic of Nicosia city in Northern Cyprus. We approached outpatient visitors who attended this polyclinic between 1 and 5 April 2019 and invited those who had children under the age of 19 years to participate in the study. The number of parents who consented to participate was 227, which constituted a response rate of 90.8%.

### Study Setting and Sampling

Trenyolu polyclinic is the largest governmental primary health center located in Nicosia, which is the capital and the most populous city in the country, comprising about one-third of its total population (Statistical Institute, 2020). The polyclinic's primary health care services include antenatal and neonatal care, child health and women's health, immunization, dental, chronic diseases treatment and management, and other integrated health services. We applied a purposive sampling method (Etikan et al., 2016) to select the study participants.

### Study Tool

We constructed a structured interviewer-administered questionnaire through an extensive literature review and expert validation (Creed et al., 2021; Della Polla et al., 2020; Dixon et al., 2019; Gargano et al., 2013; George et al., 2020; Hansen et al., 2016; Holman et al., 2014; Marlow et al., 2013; Waller et al., 2013). We collected data by following the Helsinki Declaration ethical standards, as revised

in 2000, and ensured the anonymity of all study participants. We conducted a pretest by means of face-to-face administration of the questionnaire to 20 outpatient visitors (parents with children under the age of 19 years) who came to the Near East Hospital polyclinics, and then made revisions as indicated. The first section of the questionnaire consisted of seven questions on the socio-demographics of the participants and their children. Information on age (in years), sex (female/male), nationality (Northern Cyprus/the Turkish Republic (TR) /others), self-perceived income status (high/medium/low), and educational level of both parents (primary school/middle school/high school/university) was collected. We collected some self-reported important information from parents related to their children such as how many children they had under the age of 19, their sex, and details of their vaccination history.

The second section comprised 12 items related to participants' knowledge and awareness regarding HPV and related diseases. The first two questions were "*Have you ever heard of HPV?*" and "*Do you know that HPV causes diseases*" with the dichotomized options of "Yes" and "No." Then, the participants responded to 10-items assessing their knowledge of HPV, its transmission, diseases caused, and various risk factors. The response options for all items were "True/False/I don't know." For the analysis, a score of "1" was given for the correctly answered knowledge items, while a score of "zero" was given to the other responses. A total score was calculated by adding the scores for the correct answers, which ranged from zero to ten (0–10; see Table 1). The total scores of the participants' knowledge were dichotomized into "Sufficient" and "insufficient" categories based on a cutoff determined according to the mean score ($4.73 \pm SD$ 1.87). Those who scored 5 and above were considered to have sufficient knowledge level.

We asked the participants if they had ever heard of the HPV vaccine in order to measure their awareness of it. The following four items were about vaccine prices, whether HPV vaccines were included in the national immunization

**Table 1** Knowledge items to measure the frequency of the participants with the correct responses ($n = 97$)

| Items for knowledge regarding HPV and related diseases (correct = 1) | | *n* | % |
|---|---|---|---|
| Q1 | HPV is a virus | 85 | 87.6 |
| Q2 | HPV is a common infection | 61 | 62.9 |
| Q3 | HPV can cause genital warts | 71 | 73.2 |
| Q4 | HPV can be transmitted by common toilets. (F) | 29 | 29.9 |
| Q5 | HPV is a sexually transmitted disease | 82 | 84.5 |
| Q6 | HPV can cause cervical cancer | 64 | 66.0 |
| Q7 | HPV can cause other genital cancers among women | 27 | 27.8 |
| Q8 | HPV can cause penile cancer among men | 14 | 14.4 |
| Q9 | HPV can cause oropharyngeal cancer in both sexes | 9 | 9.3 |
| Q10 | HPV can cause anal cancer in both sexes | 17 | 17.5 |

Mean Knowledge Score $\pm SD = 4.73 \pm 1.868$; Minimum = 0; Maximum = 9

program, whether its costs were paid by the government, and the recommended age groups for HPV vaccines. The responses to these questions were "Yes," "No," and "I don't know."

We also asked the question of "*Have you ever been provided information on HPV by any health professional?"* to understand the role of the local health providers. We asked parents to tell us whether their children had been vaccinated with the HPV vaccine. We measured their willingness to vaccinate their children by means of the question "*Have you ever thought of vaccinating your child against HPV?*" The possible responses to these questions were "Yes," "No," and "I don't know." For the analysis, the answers for all the forgoing were classified into two groups as "Yes" and "No" (including "No" and "I don't know").

After completing the questionnaire, we verbally provided brief preconstructed educational information on HPV and again asked parents about their willingness to vaccinate their children with the HPV vaccine. The information provided to the participants was as follows:

> HPV causes infections and many types of cancers such as cervical, vulvar, vaginal, and other genital cancers in females, while it causes penile cancer in males; HPV causes anal and oropharyngeal cancers in both sexes. All of these diseases are vaccine-preventable. HPV vaccines are given between 9-26 years of age (preferably 11-12 years), and are recommended for both sexes globally (WHO, 2020).

## Data Analysis

We processed and analyzed the data using IBM SPSS version 25. We conducted analyses to describe the sociodemographic characteristics of the participants, as well as their knowledge level concerning and awareness of HPV, related diseases, and HPV vaccines. The outcome variables were respondents' level of knowledge and awareness towards HPV, related diseases, and HPV vaccines. We then used bivariate analyses to examine the relationships between categorical variables such as respondents' level of knowledge and awareness with sociodemographic factors considered in the study. We compared the parents' willingness to vaccinate their children with HPV vaccines before and after the provision of the educational information. We constructed the final model of a multivariable logistic regression analysis that included exposure variables, which we set a level of significance of $p < 0.05$. We present odds ratios (*OR*) and confidence intervals (*CI*) with the $p$ values similarly set at $< 0.05$.

## Ethical Considerations

We obtained official permission from the management of the polyclinic. Prior to data collection, we provided detailed information about the study and acquired written consent from the participants. The Near East University Ethical Committee approved the study (project ID:YDU/2019/67-766).

## Results

The study consisted of 227 participants who had a total of 381 children under the age of 19. Of the parents, 70% were women and all were either Turkish Cypriot or TR citizens. The mean age was 34.6, the majority (71.3%) of the participants were younger than 40 years, and 54.2% were originally from the TRNC. The majority (89.5%) had one or two children, of whom 46.6% were girls. More than half (68.7%) of the children were 9–19 years of age. Of all the children, 95% were vaccinated according to the TRNC's routine vaccination program, which was predominantly provided at government health facilities, and had been given a vaccination card.

The majority of the participants answered knowledge items correctly related to HPV, its transmission, and common diseases caused by HPV (e.g., 73.2% genital warts and 66.0% cervical cancer); however, very few knew that HPV can cause several other cancers for both sexes (9.3% oropharyngeal cancer and 17.5% anal cancer) as well as some gender-specific cancers (14.4% penile cancer and 27.8% other genital cancers; see Table 1 above).

As seen in Table 2, among the participants (42.7%) who were aware of HPV and related diseases, some socioeconomic characteristics such as sex (female), age ($\geq 35$), being a Turkish Cypriot, both parents' having a higher educational level, being employed, and having a higher economic status were significantly associated with having a higher awareness towards HPV and related diseases as compared to their counterparts. Less than half (45.4%) reported that they were aware of HPV vaccines. Participants who had a significantly higher awareness of HPV vaccines tended to be older, Turkish Cypriots, have a higher education level, and have one child. Furthermore, Turkish Cypriots and those who had higher education were more knowledgeable compared to the others.

We found that a significantly higher proportion of parents with sufficient knowledge of HPV and related diseases were more aware of HPV vaccines (see Table 3). Similarly, having sufficient knowledge was positively correlated with awareness of the recommended age groups for HPV vaccines and also willingness to get HPV vaccines for their children. A significantly higher proportion of parents who had good knowledge, relative to their counterparts, reported that they had received information on HPV from health professionals. The majority of the parents did not know whether HPV vaccination is included in the immunization program (87.6%), and whether the cost is covered by the government (93.8%). Moreover, most of them reported that they did not know the price of HPV vaccines.

Table 4 shows that Turkish Cypriots had 3.6 times higher odds of having a better knowledge compared to those from TR and other countries. Being a female ($OR = 2.669$), having a higher education level ($OR = 3.982$), being 35 years or older ($OR = 1.926$), and being employed ($OR = 2.684$) were significantly associated with greater awareness towards HPV and related diseases. Moreover, the Turkish Cypriots had nearly five times higher odds of having a higher awareness of HPV vaccines compared to TR citizens. Another significant factor associated

**Table 2** Relationships between sociodemographic characteristics of the participants by their Knowledge level and awareness towards HPV, related diseases and HPV vaccines ($n = 227$)

| Factors | Having heard about HPV and related disease<br>% (*n*) | Having heard about HPV vaccines<br>% (*n*) | Having good knowledge on HPV and related diseases<br>% (*n*) |
|---|---|---|---|
| Total | 42.7 (97/227) | 45.4 (44/97) | 58.8 (57/97) |
| *Gender* | * | *ns* | *ns* |
| Male | 30.9 (21) | 42.9 (9) | 57.1 (12) |
| Female | 47.8 (76) | 46.1(35) | 59.2 (45) |
| *Age (years)* | *** | * | *ns* |
| < 35 | 33.3 (42) | 33.3 (14) | 50.0 (21) |
| ≥ 35 | 54.5 (55) | 54.5 (30) | 65.5 (36) |
| *Nationality* | *** | ** | *** |
| Turkish Republic (TC) | 23.7 (22) | 18.2 (4) | 31.8 (7) |
| TRNC | 56.1 (69) | 55.1 (38) | 71.0 (49) |
| Others | 54.5 (6) | 33.3 (2) | 16.7 (1) |
| *Education level* | *** | **[a] | **[a] |
| Secondary school and below | 13.1 (8) | 0.0 (0) | 12.5 (1) |
| High school and higher | 53.6 (89) | 49.4 (44) | 62.9 (56) |
| *Partner's education level* | *** | *ns*[a] | *[a] |
| Secondary school and below | 21.1 (12) | 25.0 (3) | 33.3 (4) |
| High school and higher | 49.7 (83) | 49.4 (41) | 63.9 (53) |
| *Employment status* | ** | *ns* | *ns* |
| Yes | 48.8 (81) | 37.1 (36) | 63.0 (51) |
| No | 26.2 (16) | 50.0 (8) | 37.5 (6) |
| *Economic status* | *** | *ns* | *ns* |
| High | 61.6 (45) | 48.9 (22) | 68.9 (31) |
| Medium | 39.8 (49) | 44.9 (22) | 51.0 (25) |
| Low | 9.7 (3) | 0.0 (0) | 33.3 (1) |
| *Number of children* | * | * | *ns* |
| One | 44.0 (44) | 59.1 (26) | 63.6 (28) |
| Two | 47.6 (49) | 32.7 (16) | 55.1 (27) |
| Three and above | 16.7 (4) | 50.0 (2) | 50.0 (2) |

*ns* = non-significant ($p > .05$). *$p < .05$. **$p < .01$; ***$p < .001$

[a]Fisher exact test. Raw percentages are presented

with a higher awareness of HPV vaccines was respondents' number of children, as those with two children were 74% less likely to be aware of HPV vaccines than those who had only one child.

We found significant differences in vaccine acceptability between all sociodemographic groups before and after the provision of educational information (see Fig. 1). There were no significant changes in vaccine acceptability among the participants who responded "do not agree to vaccinate"; however, there were substantial decreases

**Table 3** Distribution of the parents' awareness towards HPV vaccines by their level of knowledge regarding HPV and related diseases ($n=97$)

| | Knowledge towards HPV and related diseases | | | | Total | | $\chi^2$ | $p$ |
|---|---|---|---|---|---|---|---|---|
| | Good | | Poor | | | | | |
| | *n* | % | *n* | % | *n* | % | | |
| Overall | 57 | 58.8 | 40 | 41.2 | 97 | 100 | | |
| *Have ever heard of HPV vaccines* | | | | | | | | |
| Yes | 37 | 64.9 | 7 | 17.5 | 44 | 45.4 | 21.319[a] | 0.000* |
| No | 20 | 35.1 | 33 | 82.5 | 53 | 54.6 | | |
| *Have ever been provided information on HPV by any health professional* | | | | | | | | |
| Yes | 21 | 36.8 | 4 | 10.0 | 25 | 25.8 | 8.853[a] | 0.004* |
| No | 36 | 63.2 | 36 | 90.0 | 72 | 74.2 | | |
| *Knowing the recommended age groups for HPV vaccines* | | | | | | | | |
| Yes | 22 | 38.6 | 5 | 12.5 | 27 | 27.8 | 7.969[a] | 0.006* |
| No | 35 | 61.4 | 35 | 87.5 | 70 | 72.2 | | |
| *Have ever vaccinated their children with HPV vaccine* | | | | | | | | |
| Yes | 9 | 15.8 | 2 | 5.0 | 11 | 11.3 | 2.722[a] | 0.117 |
| No | 48 | 84.2 | 38 | 95.0 | 86 | 88.7 | | |
| *Have ever thought of having the HPV vaccine for their child* | | | | | | | | |
| Yes | 38 | 66.7 | 16 | 40.0 | 54 | 55.7 | 6.773 | 0.009* |
| No | 19 | 33.3 | 24 | 60.0 | 43 | 44.3 | | |
| *Knowing whether HPV vaccine cost is covered by the government* | | | | | | | | |
| Yes | 3 | 5.3 | 3 | 7.5 | 6 | 6.2 | 0.203[a] | 0.688 |
| No | 54 | 94.7 | 37 | 92.5 | 91 | 93.8 | | |
| *Knowing whether HPV vaccine is included in the country's immunization program* | | | | | | | | |
| Yes | 9 | 15.8 | 3 | 7.5 | 12 | 12.4 | 1.490[a] | 0.349 |
| No | 48 | 84.2 | 37 | 92.5 | 85 | 87.6 | | |
| *Knowing the cost of HPV vaccines* | | | | | | | | |
| Yes | 10 | 17.5 | 2 | 5.0 | 12 | 12.4 | 3.412[a] | 0.115 |
| No | 47 | 82.5 | 38 | 95.0 | 85 | 87.6 | | |

[a]Fisher's exact test

*$p<0.05$

among the participants who answered that they had "no idea" regarding HPV vaccination after receiving the information. This trend was similar for all participants from different sociodemographic groups.

**Table 4** Factors related to good level of knowledge, having higher awareness towards HPV, related diseases and HPV vaccines—multivariable logistic regression analysis

| Factors | Having good knowledge on HPV and related diseases | | Having heard about HPV and related disease | | Having heard about HPV vaccine | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Gender (female vs male) | | | 2.669 | (1.292, 5.516)** | | |
| Age (years) (≥ 35 vs < 35) | | | 1.926 | (1.029, 3.606)*[a] | 1.866 | (0.692, 5.027) |
| Educational level (high school and above vs secondary and below) | 6.008 | (0.611, 59.080) | 3.982 | (1.416, 11.196)** | | |
| Partner's education level (high school and above vs secondary and below) | 1.910 | (0.431, 8.456) | 0.821 | (0.311, 2.171) | | |
| Employment status (Yes vs no) | | | 2.684 | (1.230, 5.858)* | | |
| *Economic status* | | | | | | |
| High | | | Ref | | | |
| Medium | | | 0.641 | (0.325, 1.262) | | |
| Low | | | 0.288 | (0.065, 1.268) | | |
| *Nationality* | | | | | | |
| Turkish | Ref | | Ref | | Ref | |
| TRNC | 3.566 | (1.155, 11.012)* | 1.443 | (0.681, 3.054) | 4.754 | (1.256, 17.993)* |
| Others | 0.294 | (0.027, 3.243) | 3.711 | (0.746, 18.453) | 1.806 | (0.204, 15.998) |
| *Number of children* | | | | | | |
| One | | | Ref | | Ref | |
| Two | | | 1.054 | (0.540, 2.054) | 0.265 | (0.099, 0.713)** |
| Three and above | | | 0.585 | (0.155, 2.208) | 1.352 | (0.098, 18.641) |

*OR* = odds ratio: Exp(B); CI = confidence interval

*$p < .05$; **$p < .01$

[a]Model adjusted for employment status, economic status and number of children

## Discussion

Our study is the first of its kind to provide information on parental knowledge and awareness towards HPV, HPV-related diseases and HPV vaccines in Northern Cyprus. We found that 42.7% of the participants had heard about HPV and, among them, only 45.4% were aware of HPV vaccines. The HPV awareness of the parents in our study was much lower than were comparable findings from other studies conducted in the UK and Australia (Marlow et al., 2013), the United States (Adjei Boakye et al., 2017; Chido-Amajuoyi et al., 2021; Marlow et al., 2013), Italy (Bianco et al., 2014; Della Polla et al., 2020), Georgia (Davis et al., 2004), and Panama (Gantz et al., 2019). We suspect that the reason that people in these countries

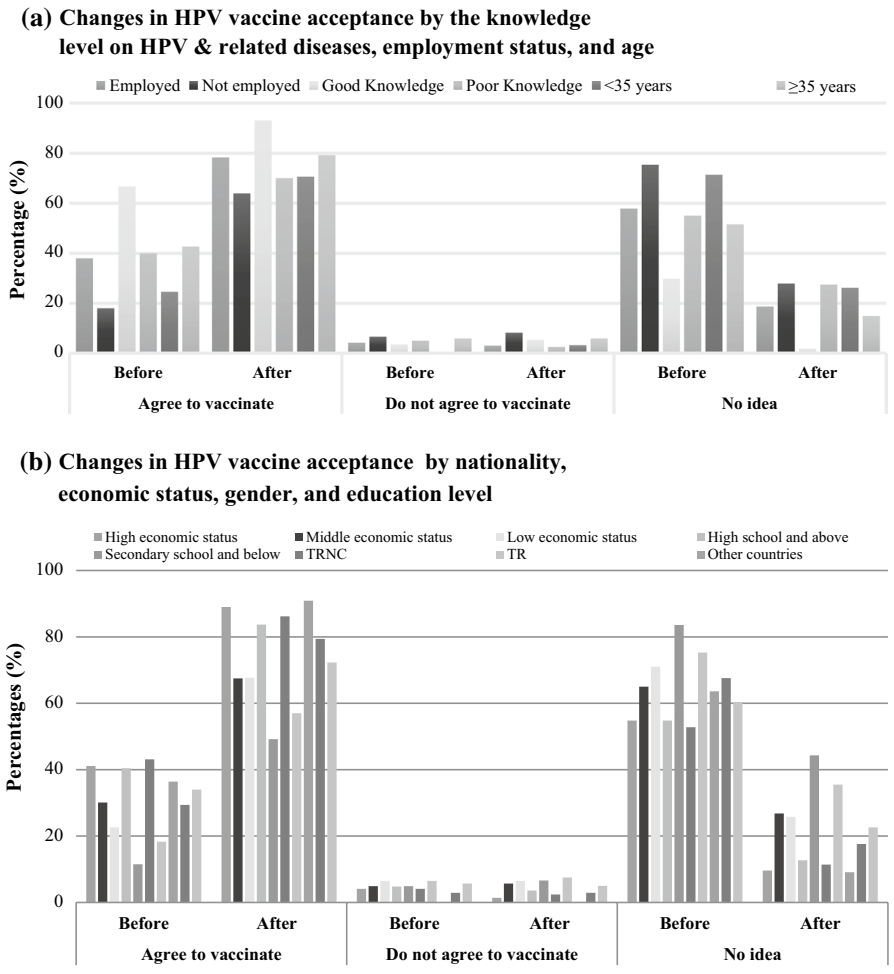


**Fig. 1** Distribution of the changes in HPV vaccine acceptance among the participants before and after the educational information about HPV and vaccines that was provided verbally by the researcher ($n=227$) The acceptance of HPV vaccines among participants in all categories were shown statistically significant differences between groups before the educational information provided ($p<0.05$). The increase in HPV vaccines acceptance between groups after the educational information was also statistically significant for all categories, except for the employment status and age groups

had higher awareness towards HPV and HPV vaccines was probably that these studies were conducted after the implementation of a HPV vaccination program accompanied by nationwide marketing campaigns (Marlow et al., 2013). Nevertheless, the awareness of our study participants was higher than those indicated by two studies conducted among UK women (Marlow et al., 2007a, 2007b), which reported awareness rates of 26.3% and 24.2%, respectively.

The results from a systematic review that included 39 studies revealed that HPV awareness ranges from 15 to 31% among women of all ages (Klug et al., 2008).

These studies were conducted prior to the establishment of an HPV immunization program (before 2006), which supported the above assumption that awareness increases after a national immunization campaign. However, another systematic review, which included 14 studies that were conducted in various African countries after 2006, found that the awareness levels towards HPV and related diseases, as well as HPV vaccines, were still very low (Cunningham et al., 2014).

The results of our bivariate analysis revealed that all sociodemographic characteristics (such as being a female, being 35 years and older, being employed, being a Turkish Cypriot, both parents having higher education, having high-income status, and having two children) were associated with a higher awareness towards HPV and related diseases among parents. Some of our results were consistent with those of an international comparison between the UK, the US, and Australia conducted by Marlow et al. (2013) to examine the factors related to the knowledge and awareness of HPV and HPV vaccines across these countries. Among other country-specific sociodemographic factors, sex and education were shown to be the significant factors related to HPV awareness. On the other hand, age was found to be a significant factor for US women, while having a daughter aged 9–17 was associated with higher awareness among UK women (Marlow et al., 2013). As a result of our multivariable logistic regression analysis, being a female, being older, and having higher education were significantly associated with having higher HPV awareness. These findings were in line with several other studies (Fisher et al., 2013; Gantz et al., 2019; Klug et al., 2008; Marlow et al., 2007a, 2007b, 2013).

Of the parents who were aware of HPV and related diseases, 58.8% of them had sufficient knowledge about them. The moderate level of knowledge regarding HPV and related diseases was similar to the results of some other studies (Brewer & Fazekas, 2007; Gantz et al., 2019; Lin et al., 2021). A recent study conducted among Chinese mothers found that factors such as having a higher education, having a professional occupation, and having a higher income were associated with a high knowledge score (Lin et al., 2021). Although the results of our bivariate analysis demonstrated that Turkish Cypriot citizenship and a high parental educational level were significantly associated with having sufficient knowledge regarding HPV, the results of the logistic regression analysis did not show that education level is one of the predictors of having a better knowledge.

Nationality was found to be a predictor of having sufficient knowledge towards HPV among our study participants, as Turkish Cypriots were 3.5 times as likely to have sufficient knowledge as Turkish citizens. Moreover, being a Turkish Cypriot was also one of the determinants of having a higher awareness towards HPV vaccines. This might be related to the socio-economic characteristics of Turkish Cypriots in our study sample, of whom the majority were more highly educated, were employed, had a higher economic status, were older, and had fewer children than did Turkish citizens and others. In addition, historical exposure to British culture and western lifestyles may mean that Turkish Cypriots are more open to sexuality-related issues including sexually transmitted infections such as HPV, and consider them less taboo. There was no other study in the literature with which this finding could be compared, although a study conducted in Norway reported that country of birth was a factor in vaccine initiation, along with income and the age of the mother

(Hansen et al., 2015). This information might be helpful in the development of targeted interventions as well as the provision of HPV-related information to patients in clinical settings.

One of the key findings of the current study was the HPV vaccination rate among the study population. Among our study's participants, only 11.3% stated that their children were vaccinated. The vaccination rate was substantially lower than that reported by several other studies (Bianco et al., 2014; Della Polla et al., 2020; Lefevere et al., 2011). In our study, having sufficient knowledge towards HPV and related diseases was positively related to obtaining information from health professionals, awareness of the recommended age group for HPV vaccines, and having the intention to vaccinate their children. This finding is similar to that of a study by Bianco et al. (2014), which reported that parents who had a better knowledge of HPV have a higher level of acceptance of HPV vaccines than did their counterparts (Bianco et al., 2014).

A positive association between physicians' advice and parents' good knowledge and awareness were supported by some studies (Bianco et al., 2014; Marlow et al., 2013; Radisic et al., 2017). The importance of health professionals' (particularly physicians') role as a main source of information regarding HPV related diseases and vaccines was highlighted in a number of studies (Adjei Boakye et al., 2017; Bianco et al., 2014; Klug et al., 2008; Marlow et al., 2013; Radisic et al., 2017).

Even among those who had sufficient knowledge regarding HPV and related diseases, very few had information on the price of HPV vaccines, whether the vaccine was included in the national immunization program, and whether the government covers the cost of the vaccine. This information is essential for parents to make informed decisions about vaccinating their children (Brewer & Fazekas, 2007; Cunningham et al., 2014; Radisic et al., 2017). Our study has highlighted the gaps in knowledge among parents with regard to all aspects of HPV, related diseases, and vaccination. About 67% of the parents stated that they had considered vaccinating their children but only 11.3% had actually done so. Collectively these findings provide some insights on the low vaccination rate as it might be due to lack of knowledge regarding the benefits of the vaccine, vaccination process, costs, and facilities where the vaccine can be obtained.

We found that HPV vaccine acceptance increased substantially among parents in all sociodemographic categories after they received brief verbal educational information. Notably, parents who were employed and in the older age group reported significantly higher acceptance than did their counterparts; however, the differences were not seen after the educational session. Brewer and Fazekas (2007) conducted a systematic review that included 28 US studies on HPV vaccine acceptability and revealed the mixed effects of sociodemographic factors on acceptability due to different study methods and designs. Some studies have shown that factors such as age, sex, education, income, and employment are significantly associated with vaccine acceptability, which is congruent with our findings. On the other hand, some have shown reverse or no relationships between these factors and vaccine acceptability (Brewer & Fazekas, 2007).

Another recent systematic review that included 14 African studies also supported similar findings and highlighted the importance of having sufficient

knowledge regarding HPV and related diseases for higher vaccine acceptance (Cunningham et al., 2014). Although the verbal educational information provided in our study was brief, the positive effect on vaccine acceptability among parents cannot be underestimated. Our study results confirmed the importance of educational interventions to improve vaccine acceptability and the role of health professionals in helping parents make informed decisions regarding vaccinating their children (Adjei Boakye et al., 2017; Brewer & Fazekas, 2007; Davis et al., 2004; Klug et al., 2008; Lin et al., 2021; Marlow et al., 2013).

The study has several limitations. First, this was a descriptive cross-sectional study that was conducted in one primary care polyclinic in Nicosia by using a purposive sampling method. Thus, our study's findings have limited generalizability. Second, data were collected among a relatively small sample population using an interviewer-administered questionnaire, which may have been subject to relatively lower reliability compared to objective measurements due to selection bias and information bias.

However, the findings from this study provide tangible evidence for researchers, health care providers, and policymakers as an impetus to conduct systematic studies on all aspects of HPV to fill the gaps in knowledge and to evaluate the cost-effectiveness of HPV vaccines to be included in a national immunization program if needed. Most importantly, in order to improve the HPV knowledge and awareness of people, the government should initiate customized educational programs for different population groups based on their needs. Meanwhile, specific educational training should be provided for health professionals to build their professional skills to effectively consult with patients and their families about the purpose of HPV vaccinations and how to reduce patients' barriers to receiving them.

## Conclusion and Recommendations

In our sample, parental knowledge and awareness of HPV and related diseases as well as HPV vaccines were clearly insufficient. Although respondents' vaccination rate was low, vaccine acceptance increased significantly after the provision of educational information. This underscored the significant positive effect of educating people, especially those who have migrated from Turkey, with accurate information to improve vaccine acceptability. Moreover, our study emphasized the importance of the role of health professionals in improving the knowledge of HPV and vaccines. We recommend that targeted educational training for health professionals should be provided to increase their patients' knowledge and awareness. An effective educational intervention should also be developed for the parents and adolescents to improve their knowledge regarding HPV, vaccines, and vaccine acceptability. Furthermore, government and healthcare providers should use various media channels to spread awareness regarding HPV. Lastly, the provision of HPV vaccinations should be integrated into primary health services.

**Acknowledgements** The authors would like to thank intern doctors Feriha Tümer, Gülcihan Deniz, Cemal Özanalp, Deniz Aksoy, and Fikret Muhyi for their contribution in data collection process. Moreover, also thank the participants for participating the study and sharing their valuable information.

**Funding** No funding information to be declared.

## Declarations

**Conflict of Interest** The authors declare no conflicts of interest.

## References

Adjei Boakye, E., Tobo, B. B., Rojek, R. P., Mohammed, K. A., Geneus, C. J., & Osazuwa-Peters, N. (2017). Approaching a decade since HPV vaccine licensure: Racial and gender disparities in knowledge and awareness of HPV and HPV vaccine. *Human Vaccines and Immunotherapeutics, 13*(11), 2713–2722. https://doi.org/10.1080/21645515.2017.1363133

Bianco, A., Pileggi, C., Iozzo, F., Nobile, C. G. A., & Pavia, M. (2014). Vaccination against human papilloma virus infection in male adolescents: Knowledge, attitudes, and acceptability among parents in Italy. *Human Vaccines and Immunotherapeutics, 10*(9), 2536–2542. https://doi.org/10.4161/21645515.2014.969614

Brewer, N. T., & Fazekas, K. I. (2007). August 9). Predictors of HPV vaccine acceptability: A theory-informed, systematic review. *Preventive Medicine, 45*, 107–114. https://doi.org/10.1016/j.ypmed.2007.05.013

Chido-Amajuoyi, O. G., Jackson, I., Yu, R., & Shete, S. (2021). Declining awareness of HPV and HPV vaccine within the general US population. *Human Vaccines and Immunotherapeutics, 17*(2), 420–427. https://doi.org/10.1080/21645515.2020.1783952

Clark, K. T., & Trimble, C. L. (2020). Current status of therapeutic HPV vaccines. *Gynecologic Oncology, 156*(2), 503–510. https://doi.org/10.1016/j.ygyno.2019.12.017

Creed, S., Walsh, E., & Foley, T. (2021). A qualitative study of parental views of HPV vaccination in Ireland. *European Journal of General Practice, 27*(1), 1–9. https://doi.org/10.1080/13814788.2020.1851677

Cunningham, M. S., Davison, C., & Aronson, K. J. (2014). December 1). HPV vaccine acceptability in Africa: A systematic review. *Preventive Medicine, 69*, 274–279. https://doi.org/10.1016/j.ypmed.2014.08.035

Dang, J. H. T., Stewart, S. L., Blumberg, D. A., Rodriguez, H. P., & Chen, M. S. (2020). "There's always next year": Primary care team and parent perspectives on the human papillomavirus vaccine. *Human Vaccines and Immunotherapeutics, 16*(8), 1814–1823. https://doi.org/10.1080/21645515.2019.1710410

Davis, K., Dickman, E. D., Ferris, D., & Dias, J. K. (2004). Human papillomavirus vaccine 10- to 15-year-old adolescents. *Journal of Lower Genital Tract Disease, 8*(3), 188–194.

de Sanjose, S., Brotons, M., LaMontagne, D. S., & Bruni, L. (2019). Human papillomavirus vaccine disease impact beyond expectations. *Current Opinion in Virology, 39*, 16–22. https://doi.org/10.1016/j.coviro.2019.06.006

Della Polla, G., Pelullo, C. P., Napolitano, F., & Angelillo, I. F. (2020). HPV vaccine hesitancy among parents in Italy: A cross-sectional study. *Human Vaccines and Immunotherapeutics, 16*(11), 2744–2751. https://doi.org/10.1080/21645515.2020.1744367

Denny, L. A., Franceschi, S., de Sanjosé, S., Heard, I., Moscicki, A. B., & Palefsky, J. (2012). Human papillomavirus, human immunodeficiency virus and immunosuppression. *Vaccine, 30*, F168–F174. https://doi.org/10.1016/j.vaccine.2012.06.045

Dixon, B. E., Zimet, G. D., Xiao, S., Tu, W., Lindsay, B., Church, A., & Downs, S. M. (2019). An educational intervention to improve HPV vaccination: A cluster randomized trial. *Pediatrics, 143*(1), e20181457. https://doi.org/10.1542/peds.2018-1457

Drolet, M., Bénard, É., Pérez, N., Brisson, M., Ali, H., Boily, M. C., Yu, B. N., et al. (2019). Population-level impact and herd effects following the introduction of human papillomavirus vaccination

programmes: Updated systematic review and meta-analysis. *The Lancet, 394*(10197), 497–509. https://doi.org/10.1016/S0140-6736(19)30298-3

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016a). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Fesenfeld, M., Hutubessy, R., & Jit, M. (2013). Cost-effectiveness of human papillomavirus vaccination in low and middle income countries: A systematic review. *Vaccine, 31*(37), 3786–3804. https://doi.org/10.1016/j.vaccine.2013.06.060

Fisher, H., Trotter, C. L., Audrey, S., MacDonald-Wallis, K., & Hickman, M. (2013). Inequalities in the uptake of human papillomavirus vaccination: A systematic review and meta-analysis. *International Journal of Epidemiology, 42*(3), 896–908. https://doi.org/10.1093/ije/dyt049

Gantz, L., Calvo, A., Hess-Holtz, M., Gonzales, F., Alguero, L., Murphy, S., Baezconde-Garbanati, L., et al. (2019). Predictors of HPV knowledge and HPV vaccine awareness among women in Panama City, Panama. *World Medical and Health Policy, 11*(1), 95–118. https://doi.org/10.1002/wmh3.293

Gargano, L. M., Herbert, N. L., Painter, J. E., Sales, J. M., Morfaw, C., Rask, K., Hughes, J. M., et al. (2013). Impact of a physician recommendation and parental immunization attitudes on receipt or intention to receive adolescent vaccines. *Human Vaccines and Immunotherapeutics, 9*(12), 2627–2633. https://doi.org/10.4161/hv.25823

George, C., Roberts, R., Brennen, D., Deveaux, L., & Read, S. E. (2020). Knowledge and awareness of human papillomavirus (HPV) and HPV vaccines among Caribbean youth: The case of the Bahamas. *Human Vaccines and Immunotherapeutics, 16*(3), 573–580. https://doi.org/10.1080/21645515.2019.1661205

Hansen, B. T., Campbell, S., Burger, E., & Nygård, M. (2015). Correlates of HPV vaccine uptake in school-based routine vaccination of preadolescent girls in Norway: A register-based study of 90,000 girls and their parents. *Preventive Medicine, 77*, 4–10. https://doi.org/10.1016/j.ypmed.2015.04.024

Hansen, C. E., Credle, M., Shapiro, E. D., & Niccolai, L. M. (2016). "It all depends": A qualitative study of parents' views of human papillomavirus vaccine for their adolescents at ages 11–12 years. *Journal of Cancer Education, 31*(1), 147–152. https://doi.org/10.1007/s13187-014-0788-6

Holman, D. M., Benard, V., Roland, K. B., Watson, M., Liddon, N., & Stokley, S. (2014). Barriers to human papillomavirus vaccination among us adolescents a systematic review of the literature. *JAMA Pediatrics, 168*, 76–82. https://doi.org/10.1001/jamapediatrics.2013.2752

Klug, S. J., Hukelmann, M., & Blettner, M. (2008). Knowledge about infection with human papillomavirus: A systematic review. *Preventive Medicine, 46*(2), 87–98. https://doi.org/10.1016/j.ypmed.2007.09.003

Lefevere, E., Hens, N., Theeten, H., Van Den Bosch, K., Beutels, P., De Smet, F., & Van Damme, P. (2011). Like mother, like daughter? Mother's history of cervical cancer screening and daughter's Human Papillomavirus vaccine uptake in Flanders (Belgium). *Vaccine, 29*(46), 8390–8396. https://doi.org/10.1016/j.vaccine.2011.08.039

Lei, J., Ploner, A., Elfström, K. M., Wang, J., Roth, A., Fang, F., et al. (2020). HPV vaccination and the risk of invasive cervical cancer. *New England Journal of Medicine, 383*(14), 1340–1348. https://doi.org/10.1056/nejmoa1917338

Lin, Y., Su, Z., Chen, F., Zhao, Q., Zimet, G. D., Alias, H., et al. (2021). Chinese mothers' intention to vaccinate daughters against human papillomavirus (HPV), and their vaccine preferences: A study in Fujian Province. *Human Vaccines and Immunotherapeutics, 17*(1), 304–315. https://doi.org/10.1080/21645515.2020.1756152

Marlow, L. A. V., Waller, J., & Wardle, J. (2007a). Public awareness that HPV is a risk factor for cervical cancer. *British Journal of Cancer, 97*(5), 691–694. https://doi.org/10.1038/sj.bjc.6603927

Marlow, L. A. V., Waller, J., & Wardle, J. (2007b). Parental attitudes to pre-pubertal HPV vaccination. *Vaccine, 25*(11), 1945–1952. https://doi.org/10.1016/j.vaccine.2007.01.059

Marlow, L. A. V., Zimet, G. D., McCaffery, K. J., Ostini, R., & Waller, J. (2013). Knowledge of human papillomavirus (HPV) and HPV vaccination: An international comparison. *Vaccine, 31*(5), 763–769. https://doi.org/10.1016/j.vaccine.2012.11.083

Radisic, G., Chapman, J., Flight, I., & Wilson, C. (2017). Factors associated with parents' attitudes to the HPV vaccination of their adolescent sons: A systematic review. *Preventive Medicine, 95*, 26–37. https://doi.org/10.1016/j.ypmed.2016.11.019

Statistical Institute. (2020). *Turkish Republic of Northern Cyprus Statistical Yearbook 2019*. Nicosia.

Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36

cancers in 185 countries. *CA: A Cancer Journal for Clinicians, 71*(3), 209–249. https://doi.org/10.3322/caac.21660

Waller, J., Ostini, R., Marlow, L. A. V., McCaffery, K., & Zimet, G. (2013). Validation of a measure of knowledge about human papillomavirus (HPV) using item response theory and classical test theory. *Preventive Medicine, 56*(1), 35–40. https://doi.org/10.1016/j.ypmed.2012.10.028

Wang, R., Pan, W., Jin, L., Huang, W., Li, Y., Wu, D., et al. (2020b). Human papillomavirus vaccine against cervical cancer: Opportunity and challenge. *Cancer Letters, 471*(2019), 88–102. https://doi.org/10.1016/j.canlet.2019.11.039

WHO. (2014). *Comprehensive cervical cancer control: A guide to essential practice* (2nd edn). Retrieved from https://apps.who.int/iris/bitstream/handle/10665/144785/9789241548953_eng.pdf;jsessionid=68E7F784D21BFCB74C625DB7A6857484?sequence=1%0Ahttp://apps.who.int/iris/bitstream/10665/144785/1/9789241548953_eng.pdf. Accessed 5 May 2021

WHO. (2016). Scaling-up HPV vaccine introduction. In *National Health Programs. I.World Health Organization* (Vol. 1). Retrieved from http://www.who.int. Accessed 20 January 2019

WHO. (2017). Human papillomavirus vaccines: WHO position paper,May 2017. *Weekly Epidemiological Record*, *92*(19), 241–268. Retrieved from https://www.who.int/wer. Accessed 4 May 2021

WHO. (2018). *Human Papillomavirus: Vaccine-Preventable Diseases Surveillance Standards*. World Health Organization, Geneva Switzerland. Retrieved from: https://www.who.int/publications/m/item/vaccine-preventable-diseases-surveillance-standards-hpv. Accessed 10 May 2021

WHO. (2020). Human Papillomavirus (HPV) and Cervical Cancer. Retrieved from Key Facts website: https://www.who.int/en/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer. Accessed 15 May 2021



## Authors and Affiliations

**Gulifeiya Abuduxike[1] · Ozen Asut[1] · Sanda Cali[1] · Songul Vaizoglu[1]**

Ozen Asut
ozen.asut@neu.edu.tr

Sanda Cali
sanda.cali@neu.edu.tr

Songul Vaizoglu
songul.vaizoglu@neu.edu.tr

[1] Department of Public Health, Faculty of Medicine, Near East University, Yakin Dogu Bulvari, 99138 Nicosia, Northern Cyprus