

## ORIGINAL RESEARCH ARTICLE

# The relationship between individuals' knowledge of human papillomavirus, attitudes towards HPV vaccination, and vaccine hesitancy: A cross-sectional study

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## Abstract

There are more than 207 types of Human Papillomavirus (HPV), most of which do not cause symptoms, lesions, or warts, and cause more than 600,000 cases of cancer annually. Purpose: This study was planned to elucidate the relationship between individuals' HPV knowledge, attitudes towards the HPV vaccine, and vaccine hesitancy. The research was conducted with 1011 people using a descriptive and correlational research design. Data collection tools included socio-demographic information survey, HPV Knowledge Scale, Carolina HPV Vaccination Attitudes Scale, and Vaccine Hesitancy Scale. The data was analyzed using the SPSS 26.0 package program. The average score was  $11.68 \pm 7.23$  on the HPV Knowledge Scale,  $30.76 \pm 7.31$  on the HPV Vaccine Attitude Scale, and  $27.90 \pm 11.10$  on the Vaccine Hesitancy Scale. While there was a very weak negative relationship between the participants' HPV knowledge and HPV Vaccine Attitude scores, a weak positive relationship was found with vaccine hesitancy. A weak positive relationship was also detected between vaccine attitude and vaccine hesitancy ( $p < 0.05$ ). According to the regression model created in the study, HPV vaccination attitude was explained by the HPV Knowledge Scale and vaccine hesitancy at a rate of 22.5%. In line with the results, healthcare professionals need to raise awareness in the society and increase vaccination rates. (*Afr J Reprod Health* 2024; 28 [6]: 103-116).

**Keywords:** HPV; knowledge; HPV attitudes; vaccine hesitancy; public health

## Résumé

Il existe plus de 207 types de papillomavirus humain (HPV), dont la plupart ne causent pas de symptômes, de lésions ou de verrues, mais entraînent plus de 600 000 cas de cancer chaque année. Objectif : Cette étude a été planifiée pour élucider la relation entre les connaissances des individus sur le HPV, leurs attitudes envers le vaccin contre le HPV et l'hésitation vaccinale. La recherche a été menée auprès de 1011 personnes en utilisant un plan de recherche descriptif et corrélationnel. Les outils de collecte de données comprenaient un sondage d'informations sociodémographiques, l'Échelle de Connaissances sur le HPV, l'Échelle des Attitudes envers la Vaccination contre le HPV de la Caroline et l'Échelle d'Hésitation Vaccinale. Les données ont été analysées à l'aide du programme SPSS 26.0. Le score moyen était de  $11,68 \pm 7,23$  à l'Échelle de Connaissances sur le HPV, de  $30,76 \pm 7,31$  à l'Échelle des Attitudes envers la Vaccination contre le HPV, et de  $27,90 \pm 11,10$  à l'Échelle d'Hésitation Vaccinale. Bien qu'il y ait eu une très faible relation négative entre les connaissances des participants sur le HPV et les scores d'attitude envers le vaccin contre le HPV, une faible relation positive a été trouvée avec l'hésitation vaccinale. Une faible relation positive a également été détectée entre l'attitude envers la vaccination et l'hésitation vaccinale ( $p < 0,05$ ). Selon le modèle de régression créé dans l'étude, l'attitude envers la vaccination contre le HPV était expliquée par l'Échelle de Connaissances sur le HPV et l'hésitation vaccinale à un taux de 22,5 %. Conformément aux résultats, les professionnels de la santé doivent sensibiliser la société et augmenter les taux de vaccination. (*Afr J Reprod Health* 2024; 28 [6]: 103-116).

**Mots-clés:** HPV ; connaissances ; attitudes envers le HPV ; hésitation vaccinale ; santé publique

## Introduction

Human Papillomavirus (HPV) belongs to the Papillomaviridae family and is an enveloped,

icosahedral, circular DNA virus. HPV infects both cutaneous and mucosal epithelium, thus affecting a broad spectrum of formations such as skin, oral cavity, oropharynx, larynx, and the anogenital

system. There are more than 207 types of HPV, most of which do not cause symptoms, lesions, or warts, and they are classified as low oncogenic (types)<sup>1</sup>. These viruses are primarily transmitted through sexual contact, making HPV a frequently recurring sexually transmitted infection. However, transmission also occurs through cutaneous contamination (close skin-to-skin contact)<sup>2</sup>. The HPV family is divided into two groups based on their pathogenicity. Non-oncogenic HPVs, also known as low-risk HPVs, are associated with recurrent respiratory tract infections and anogenital warts. Oncogenic HPVs, also known as high-risk HPVs, cause anogenital cancers (penile, anal, cervical, vaginal, and vulvar) and head and neck squamous cell carcinomas (oral cavity, oropharyngeal, laryngeal, and pharyngeal cancers), affecting both genders<sup>2</sup>. Most HPV infections are transient and can be spontaneously cleared by the immune system within 1-2 years. However, some types persist for years or even decades, eventually leading to the specified cancers<sup>3</sup>. It is known that HPV infections cause over 600,000 cancer cases annually<sup>4</sup>. The most effective way to prevent HPV infection is through vaccination<sup>2</sup>. The HPV vaccine, approved by the U.S. Food and Drug Administration in 2006, has demonstrated its ability to prevent cancers associated with HPV<sup>5</sup>. The HPV vaccine was first introduced in Australia in 2007 and has since been adopted in many countries. In Turkey, HPV vaccine is not included in the national vaccination program. Individuals have access to the HPV vaccine by procuring it themselves. As of 2020, HPV vaccination has been initiated in 107 out of 194 WHO Member States 55%<sup>6</sup>. The WHO and most healthcare professionals recommend routine HPV vaccination, especially for girls aged 9-14, before becoming sexually active. The secondary target group includes girls and young women over the age of 15. However, the CDC recommends HPV vaccination for boys starting at 11 or 12 years old (can start as early as 9 years old) and up to 26 years old if not previously vaccinated<sup>1</sup>. Therefore, HPV vaccination is primarily recommended for young adults aged 26 and under of both genders<sup>2</sup>. However, HPV vaccination has not yet reached the targeted level worldwide. Vaccine hesitancy is defined as

"delay in acceptance or refusal of vaccination services despite the availability of vaccination services." The WHO has stated that individuals reluctance or refusal to vaccination is one of the top ten global threats to public health. Anti-vaccine movements have led to an increase in deaths from preventable diseases, posing a significant public health issue<sup>7</sup>. The factors that significantly influence parents' positive or negative attitudes towards HPV vaccines, thus affecting their vaccine hesitancy, include a lack of information about HPV vaccines (specific information about the virus, understanding the risks of potential diseases, the advantages and necessity of vaccination), insufficient income levels for HPV vaccination, and safety concerns related to the vaccine (infection, deadly side effects, potential long-term effects, concerns about fertility, fear of developmental disorders, potential to cause cancer, fear of changing sexual orientation)<sup>8-10</sup>. Establishing sufficient knowledge about HPV vaccination will prevent parents from experiencing vaccine hesitancy and break down all biases related to vaccination. We believe that it is essential to investigate the relationship between individuals knowledge of HPV, attitudes towards HPV vaccination, and vaccine hesitancy.

As far as the literature shows, there has been no other study investigating the relationship between individuals' knowledge of HPV, attitudes towards HPV vaccination, and vaccine hesitancy. Therefore, the aim of this study is to reveal the relationship between individuals' knowledge of Human Papillomavirus, attitudes towards HPV vaccination, and vaccine hesitancy.

## Methods

### *Type of research*

The research was conducted in a descriptive and correlational design.

### *Research questions*

- What is the level of individuals' knowledge about HPV?
- What are the attitudes of individuals towards HPV vaccination?

- What are the vaccine refusal scores of individuals?
- Is there a relationship between individuals' knowledge about the human papillomavirus, attitudes towards HPV vaccination, and vaccine hesitancy?

### ***Location and characteristics of the study***

The research was conducted online via Google forms with individuals over the age of 18 living in Turkey. Google forms were sent to participants on social media platforms (WhatsApp, Instagram).

### ***Population and sample***

The population of the study consists of individuals aged 18 and over, according to the Turkish Statistical Institute (TURKSTAT) (2022) Address-Based Population Registration System data, totaling 62,701,175<sup>11</sup>. The sample size was calculated as 385 using the sample calculation engine based on a known population (with a confidence level of 95% and a margin of error of 5%)<sup>12</sup>. The study was completed with a sample of 1011 individuals using the convenience sampling method. The convenience sampling method was preferred due to its advantages of being advantageous, fast, easy, and cost-effective for reaching a large audience<sup>13,14</sup>.

### ***Data collection instruments***

The study questionnaire consists of four sections: Socio-demographic Information Form, HPV Knowledge Scale, Carolina HPV Vaccination Attitudes Scale, and Vaccine Hesitancy Scale.

### ***Socio-demographic information form***

This questionnaire was created by the researchers based on a literature review. The questionnaire includes 11 questions regarding the individual's gender, age, marital status, presence of children, education level, knowledge about Human Papilloma Virus, HPV vaccination status, and vaccine hesitancy<sup>15-18</sup>.

***Human papilloma virus knowledge scale (HPV-KS):*** The HPV-KS was developed by Waller et al. in 2013 to measure individuals' knowledge levels about

HPV, HPV vaccines, and screening tests<sup>19</sup>. The 35-item HPV-KS includes three subscales of 29 items and an independent subscale of six items. The independent subscale was developed for three different types of HPV vaccination programs used in three different countries where the scale was applied. The Turkish validity and reliability of the scale were conducted by Demir (2019). Each correct answer is scored 1 point, while incorrect answers and "I don't know" responses receive no points. The total scores obtained from the scale range from 0 to 35, with higher scores indicating higher knowledge levels. Demir found the Cronbach's alpha value of the scale to be 0.96<sup>16</sup>. The Cronbach's alpha value for the scale in this study was found to be 0.93.

***Carolina HPV vaccination attitudes and beliefs scale (CHIAS):*** The scale was developed by McRee et al. (2010) to assess the attitudes and beliefs of parents with adolescents about HPV vaccination<sup>15</sup>. The original scale has four factors and consists of 16 items. The validity and reliability study in Turkey was conducted by Sunar and Kahyaoğlu in 2018. In the Turkish adaptation study of CHIAS, confirmatory factor analysis resulted in the insignificance of items 10 and 14 of the 16-item scale, and after removing these items, the confirmatory factor analysis of the remaining 14 items was found to be significant. The Cronbach's alpha reliability coefficient in the adaptation study of CHIAS was 0.62<sup>18</sup>. The four factors include: 1. "Harms," which consists of 6 items related to perceived potential harms of the vaccine, including health problems and the increased likelihood of girls becoming sexually active. 2. "Barriers," consisting of 4 items about perceived barriers in HPV vaccination, including cost and access to a healthcare provider. 3. "Effects," including 2 items related to the perceived effectiveness of HPV vaccine in protecting against genital warts and cervical cancer. 4. "Uncertainty," consisting of 2 items evaluating sufficient knowledge about HPV vaccine and perceived vaccination norms in society<sup>18</sup>.

***Vaccine hesitancy scale:*** The "Vaccine Hesitancy Scale" was utilized to assess participants' hesitations

regarding vaccines. Developed by the SAGE working group in 2014 and validated by Shapiro et al. (2018), this scale was originally designed to assess hesitancy in childhood vaccinations<sup>20</sup>. Luyten et al. (2019) adapted the scale to measure hesitancy in all vaccines and conducted validity and reliability studies. The scale is two-dimensional, consisting of a total of 9 items<sup>17</sup>. The first dimension is distrust (7 items), and the second dimension is risks (2 items). Responses to the scale were evaluated on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). The two items in the risks dimension were reverse-scored. The total score, obtained by summing the scores from relevant items, indicates that an increase in score corresponds to a decrease in reluctance towards vaccines. Although the scale does not have a cutoff point, the score that can be obtained is between 9-45<sup>21</sup>.

**Data collection process:** After obtaining ethical approval, data were collected by sending an online survey (via internet or phone).

**Data analysis:** The data were analyzed using the SPSS 26.0 software on a computer. Descriptive statistics, including numbers, percentages, mean, and standard deviation analysis, were employed. Skewness and kurtosis values were considered acceptable if they fell within  $\pm 1.5$  as an indicator of normality<sup>22</sup>. The relationship between scales was assessed using Pearson correlation analysis. Correlation coefficients were evaluated as very weak (0.00-0.25), weak (0.26-0.49), moderate (0.50-0.69), high (0.70-0.89), and very high (0.90-1.00)<sup>23</sup>. For two-factor data, independent t-tests were used, while three-factor data were analyzed using ANOVA tests (Posthoc; LSD, Tukey, and Bonferroni tests). A significance level of  $p < 0.05$  was employed in the statistical analysis of the data.

**Challenges and Limitations of the Research:** Since online surveys will be applied to individuals in the research, this may lead to low participation rates, refusal to participate, and variability in responses to misunderstood questions, which are common disadvantages of online survey applications.

### ***Ethical principles***

Ethical approval was obtained from the Non-Interventional Studies Ethics Committee of the University Faculty of Health Sciences on June 23, 2023, with the approval number 81829502.903/114. Permission for the use of measurement tools in the research was also obtained. Participants were informed about the study, and only those who agreed to participate after reading the explanation on the survey form were included in the study. Helsinki Declaration rules were adhered to during the study.

### ***Inclusion criteria for volunteers***

Those who are literate, aged 18 and above, and have access to social media were included in the study.

**Exclusion criteria for volunteers:** Those who wanted to withdraw from the study at any stage, those aged 17 and below, and those who were illiterate were excluded from the study.

### ***Expected benefits from the research***

This study was planned to investigate the relationship between individuals' knowledge about HPV, attitudes towards HPV vaccination, and vaccine hesitancy. Based on the results, counseling individuals, planning educational interventions, and thus changing individuals' attitudes towards HPV vaccination, increasing knowledge, and reducing vaccine hesitancy are anticipated. Additionally, the study aims to lay the foundation for further research on the relationship between individuals' knowledge about HPV, attitudes towards HPV vaccination, and vaccine hesitancy.

### ***Start and end date of the research and estimated duration***

The research data were collected between July 1 and August 31, 2023.

## **Results**

This study was completed with 1011 participants. The average age of the participants was

**Table 1:** Findings regarding descriptive characteristics of individuals (N=1011)

|   | <b>Min-Max</b>          | <b>Mean</b>   | <b>Standard deviation</b> |
|---|-------------------------|---------------|---------------------------|
| <b>Age</b>  | 18-80                   | 27.67         | 10.55                     |
|   |                         | <b>Number</b> | <b>Percent</b>            |
| <b>Gender</b>                                       | Female                  | 628           | 62.1                      |
|   | Male                    | 383           | 37.9                      |
| <b>Family structure</b>                             | Nuclear family          | 619           | 61.2                      |
|   | Extended family         | 335           | 33.1                      |
|   | Divorced family         | 57            | 5.6                       |
| <b>Income status</b>                                | Low                     | 160           | 15.8                      |
|   | Middle                  | 732           | 72.4                      |
|   | High                    | 119           | 11.8                      |
| <b>Marital Status</b>                               | Married                 | 315           | 31.2                      |
|   | Single                  | 696           | 68.8                      |
| <b>Having children between the ages of 9 and 26</b> | Yes                     | 314           | 31.1                      |
|   | No                      | 697           | 68.9                      |
| <b>Number of children (n=314)</b>                   | No children             | 697           | 68.9                      |
|   | One                     | 111           | 11.0                      |
|   | Two                     | 80            | 7.9                       |
|   | Three                   | 123           | 12.2                      |
| <b>Educational Status</b>                           | Primary School          | 118           | 11.7                      |
|   | High School             | 430           | 42.5                      |
|   | Associate Degree        | 336           | 33.2                      |
|   | Bachelor's Degree       | 127           | 12.6                      |
|   | Postgraduate            | 118           | 11.7                      |
| <b>Place of Residence</b>                           | Province                | 552           | 54.6                      |
|   | District                | 270           | 26.7                      |
|   | Village                 | 189           | 18.7                      |
| <b>Occupation</b>                                   | Healthcare Worker       | 242           | 23.9                      |
|   | Not a Healthcare Worker | 769           | 76.1                      |
| <b>Knowledge about HPV</b>                          | Yes                     | 280           | 27.7                      |
|   | No                      | 731           | 72.3                      |
| <b>Status of getting HPV vaccine</b>                | Yes                     | 141           | 13.9                      |
|   | No                      | 870           | 86.1                      |
| <b>Status of people around getting HPV vaccine</b>  | Yes                     | 261           | 25.8                      |
|   | No                      | 750           | 74.2                      |
| <b>Hesitation about vaccines</b>                    | Yes                     | 479           | 47.4                      |
|   | No                      | 532           | 52.6                      |

27.67±10.55. A total of 62.1% of the participants were female, 61.2% had nuclear families, 72.4% had a moderate income, 68.8% were single, 31.2% were parents, 12.2% of those with children had three children, 42.5% were high school graduates, 54.6% lived in urban areas, 76.1% were not healthcare workers, 72.3% had no knowledge about HPV, 86.1% were not vaccinated against HPV, 74.2% had no one around them who was vaccinated against

HPV, and 52.6% had no hesitations about the HPV vaccine (Table 1).

Participants scored an average of 11.68±7.23 on the HPV Knowledge Scale (HPV-KS), 30.76±7.31 on the HPV Vaccine Attitudes and Beliefs Scale, and 27.90±11.10 on the Vaccine Hesitancy Scale (Table 2).

There was a very weak negative correlation between participants' HPV knowledge and the total

**Table 2:** Participants' scores on HPV knowledge scale, HPV vaccine attitude and belief scale, vaccine hesitancy scale, and sub-dimensions

| Scales and Sub-dimensions              | Number of items | Min-Max            | Mean±SD            | Median       |
|--|-----------------|--------------------|--------------------|--------------|
| <b>HPV-KS</b>                          | <b>33</b>       | <b>3.00-31.00</b>  | 11.68±7.23         | 12.00        |
| <b>HPV Vaccine Attitude and Belief</b> | <b>14</b>       | <b>14.00-52.00</b> | <b>30.76±7.31</b>  | <b>30.00</b> |
| Harms                                  | 6               | 6.00-24.00         | 13.56±4.78         | 12.00        |
| Barriers                               | 4               | 4.00-14.00         | 8.63±2.213         | 9.00         |
| Effects                                | 2               | 4.00-8.00          | 6.03±4.26          | 6.00         |
| Uncertainty                            | 2               | 2.00-8.00          | 5.00±.60           | 5.00         |
| <b>Vaccine Hesitancy</b>               | <b>9</b>        | <b>9.00-45.00</b>  | <b>27.90±11.10</b> | <b>29.00</b> |
| Mistrust                               | 7               | 7.00-35.00         | 21.77±8.77         | 22.00        |
| Risks                                  | 2               | 2.00-10.00         | 6.12±2.52          | 6.00         |

**Table 3:** Relationships between participants' scores on HPV knowledge scale, hpv vaccine attitude scale, vaccine hesitancy scale, and their sub-dimensions

| Scales and Sub-dimensions                  |   | 1 | 2       | 2.1     | 2.2     | 2.3     | 2.4    | 3      | 3.1    | 3.2    |
|--|---|---|---------|---------|---------|---------|--------|--------|--------|--------|
| <b>(1) HPV-KS</b>                          | r | 1 | -.129** | -.119** | -.139** | .216**  | -.071* | .220** | .235** | .151** |
|  | p |   | .000    | .000    | .000    | .000    | .023   | .000   | .000   | .000   |
| <b>(2) HPV Vaccine Attitude and Belief</b> | r |   | 1       | .905**  | .870**  | -.310** | .068*  | .418** | .402** | .443** |
|  | p |   |         | .000    | .000    | .000    | .030   | .000   | .000   | .000   |
| (2.1) Harms                                | r |   |         | 1       | .687**  | .005    | .068*  | .407** | .388** | .442** |
|  | p |   |         |         | .000    | .864    | .031   | .000   | .000   | .000   |
| (2.2) Barriers                             | r |   |         |         | 1       | -.408** | .084** | .307** | .292** | .333** |
|  | p |   |         |         |         | .000    | .008   | .000   | .000   | .000   |
| (2.3) Effects                              | r |   |         |         |         | 1       | -.022  | .099** | .107** | .062*  |
|  | p |   |         |         |         |         | .486   | .002   | .001   | .047   |
| (2.4) Uncertainty                          | r |   |         |         |         |         | 1      | .042   | .032   | .076*  |
|  | p |   |         |         |         |         |        | .177   | .311   | .016   |
| <b>(3) Vaccine Hesitancy</b>               | r |   |         |         |         |         |        | 1      | .995** | .940** |
| <b>(3.1) Mistrust</b>                      | p |   |         |         |         |         |        |        | .000   | .000   |
|  | r |   |         |         |         |         |        |        | 1      | .902** |
| <b>(3.2) Risks</b>                         | p |   |         |         |         |         |        |        |        | .000   |
|  | r |   |         |         |         |         |        |        |        | 1      |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

HPV Vaccine Attitude, as well as the harm, barriers, and uncertainty sub-dimensions. A very weak positive correlation was found between the Effects sub-dimension of HPV Vaccine Attitude, total vaccine hesitancy, and the distrust and risks sub-dimensions. A weak positive correlation was observed between vaccine attitude and vaccine hesitancy and distrust, as well as uncertainty sub-dimensions (Table 3, p<0.005).

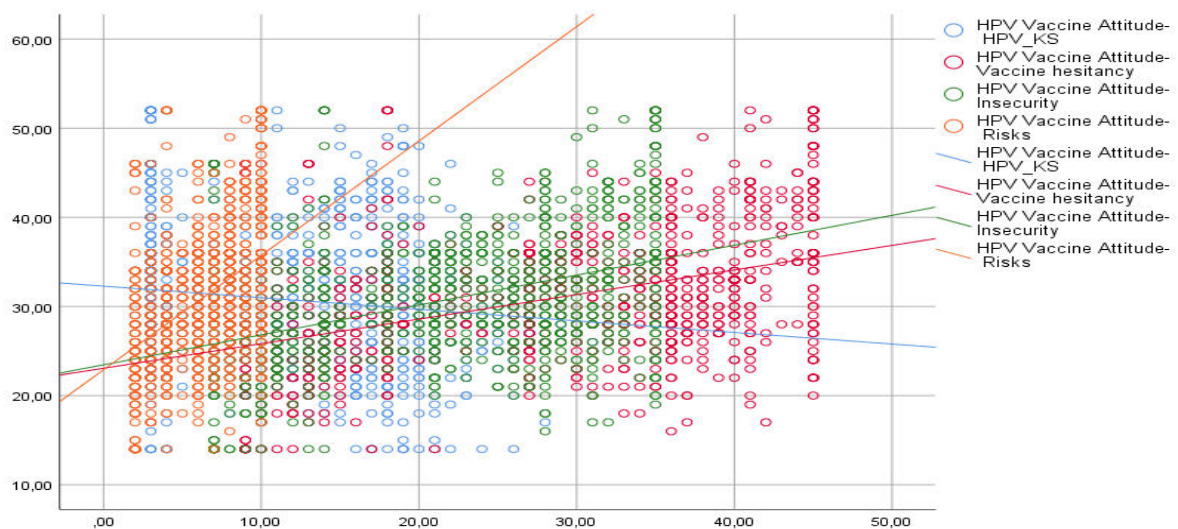
Participants' HPV-KS scores showed statistically significant relationships with gender, family structure, income, parental status, number of children, educational status, place of residence, occupation, knowledge about HPV, HPV vaccination status, presence of HPV vaccination in the surroundings, and vaccine hesitation status (p<0.005). Scores were statistically significantly higher for female than male, those with nuclear

**Table 4:** Participants' scores on HPV knowledge scale, HPV vaccine attitude, and vaccine hesitancy based on socio-demographic characteristics

|   | HPV-KS                                | HPV Vaccine Attitude and Belief        | Vaccine Hesitancy                   |
|---|---------------------------------------|--|-------------------------------------|
| <b>Gender</b>                                       |                                       |  |                                     |
| Famale  | 12.11±7.28                            | 30.55±6.78                             | 27.58±10.93                         |
| Male  | 10.98±7.11                            | 31.10±8.10                             | 28.41±11.37                         |
| <b>Test and p</b>                                   | t=2.406 <b>p=0.016</b>                | t=-1.157 p=0.248                       | t=-1.144 p=0.253                    |
| <b>Family structure</b>                             |                                       |  |                                     |
| Nuclear family (a)                                  | 12.28±7.39                            | 30.18±7.24                             | 28.35±11.14                         |
| Extended family (b)                                 | 10.77±6.82                            | 31.66±7.26                             | 27.07±10.95                         |
| Divorced family (c)                                 | 10.59±7.28                            | 31.71±7.88                             | 27.82±11.41                         |
| <b>Test and p</b>                                   | F=5.424, <b>p=0.005* a&gt;b</b>       | F=4.902, <b>p=0.007*** b,c&gt;a</b>    | F=1.438,p=0.238                     |
| <b>Income status</b>                                |                                       |  |                                     |
| Low (a)   | 10.45±7.15                            | 31.81±8.12                             | 25.38±11.58                         |
| Middle (b)  | 11.77±7.31                            | 30.37±6.91                             | 28.05±10.77                         |
| High (c)  | 12.81±6.70                            | 31.75±8.34                             | 30.35±11.86                         |
| <b>Test and p</b>                                   | F=3.832, <b>p=0.022** b,c&gt;a</b>    | F=3.805, <b>p=0.023* a&gt;b</b>        | F=7.174, <b>p=0.001** b,c&gt;a</b>  |
| <b>Marital Status</b>                               |                                       |  |                                     |
| Married   | 11.26±7.00                            | 32.34±8.22                             | 28.21±11.66                         |
| Single  | 11.87±7.34                            | 30.04±6.74                             | 27.75±10.84                         |
| <b>Test and p</b>                                   | t=-1.240 p=0.215                      | t=4.684 <b>p=0.000</b>                 | t=0.606 p=0.545                     |
| <b>Having children between the ages of 9 and 26</b> |                                       |  |                                     |
| Yes   | 10.49±6.63                            | 32.36±8.21                             | 27.32±11.60                         |
| No  | 12.22±7.43                            | 30.04±6.75                             | 28.16±10.87                         |
| <b>Test and p</b>                                   | t=-3.555 <b>p=0.000</b>               | t=4.715 <b>p=0.000</b>                 | t=-1.114 p=0.266                    |
| <b>Number of children (n=314)</b>                   |                                       |  |                                     |
| No children (a)                                     | 12.22±7.43                            | 30.04±6.75                             | 28.16±10.87                         |
| One (b)   | 11.37±6.87                            | 30.45±7.35                             | 26.40±10.71                         |
| Two (c)   | 11.72±6.65                            | 31.97±6.57                             | 28.73±10.91                         |
| Three (d)   | 8.88±6.09                             | 34.34±9.42                             | 27.22±12.75                         |
| <b>Test and p</b>                                   | F=7.658, <b>p=0.000*** a,b,c&gt;d</b> | F=13.330, <b>p=0.000** d&gt;a,b,c</b>  | F=1.102, p=0.347                    |
| <b>Educational Status</b>                           |                                       |  |                                     |
| Literate (a)  | 8.62±6.36                             | 34.07±9.78                             | 27.33±13.37                         |
| Primary School (b)                                  | 8.72±5.82                             | 30.62±7.72                             | 25.76±11.76                         |
| High School (c)                                     | 11.20±6.78                            | 29.93±6.54                             | 27.13±10.65                         |
| Bachelor's Degree and above (d)                     | 14.51±7.55                            | 30.62±6.67                             | 29.84±10.22                         |
| <b>Test and p</b>                                   | F=35.127, <b>p=0.000** c,d&gt;a;</b>  | F=10.910, <b>p=0.000*** a&gt;b,c,d</b> | F=5.777, <b>p=0.001* d&gt;a,b,c</b> |
| <b>Place of Residence</b>                           |                                       |  |                                     |
| Province (a)  | 12.22±7.43                            | 30.49±7.37                             | 29.09±11.00                         |
| District (b)  | 11.92±6.98                            | 30.46±6.20                             | 27.62±10.51                         |
| Village (c)   | 9.77±6.72                             | 31.96±8.43                             | 24.81±11.65                         |
| <b>Test and p</b>                                   | F=8.377, <b>p=0.000* a,b&gt;c</b>     | F=3.139, <b>p=0.041*** c&gt;a,b</b>    | F=10.749, <b>p=0.000* a,b&gt;c</b>  |

|  |                         |                         |                         |
|--|-------------------------|-------------------------|-------------------------|
| <b>Occupation</b>                                  |                         |                         |                         |
| Healthcare Worker                                  | 16.70±6.96              | 29.35±6.62              | 29.75±10.64             |
| Not a Healthcare Worker                            | 10.11±6.57              | 31.20±7.47              | 27.31±11.18             |
| <b>Test and p</b>                                  | <b>t=13.412 p=0.000</b> | <b>t=-3.442 p=0.001</b> | <b>t=-3.664 p=0.003</b> |
| <b>Knowledge about HPV</b>                         |                         |                         |                         |
| Yes  | 18.08±5.66              | 29.62±6.33              | 30.50±10.23             |
| No   | 9.23±6.21               | 31.19±7.61              | 26.90±11.26             |
| <b>Test and p</b>                                  | <b>t=20.721 p=0.000</b> | <b>t=-3.066 p=0.002</b> | <b>t=4.659 p=0.000</b>  |
| <b>Status of getting HPV vaccine</b>               |                         |                         |                         |
| Yes  | 14.15±6.20              | 30.01±7.24              | 27.42±10.62             |
| No   | 11.28±7.31              | 30.88±7.32              | 27.97±11.18             |
| <b>Test and p</b>                                  | <b>t=4.431 p=0.000</b>  | <b>t=-1.312 p=0.190</b> | <b>t=0.491 p=0.624</b>  |
| <b>Status of people around getting HPV vaccine</b> |                         |                         |                         |
| Yes  | 15.41±6.32              | 30.90±7.44              | 29.71±10.91             |
| No   | 10.39±7.09              | 30.71±7.27              | 27.26±11.10             |
| <b>Test and p</b>                                  | <b>t=10.111 p=0.000</b> | <b>t=0.351 p=0.726</b>  | <b>t=3.079 p=0.002</b>  |
| <b>Hesitation about vaccines</b>                   |                         |                         |                         |
| Yes  | 12.62±6.81              | 31.10±7.21              | 28.00±11.30             |
| No   | 10.85±7.51              | 30.46±7.40              | 27.81±11.30             |
| <b>Test and p</b>                                  | <b>t=3.906 p=0.000</b>  | <b>t=1.389 p=0.165</b>  | <b>t=0.269 p=0.788</b>  |

\* LSD test has been applied. \*\* Tukey test has been applied. \*\*\* Bonferroni test has been applied.

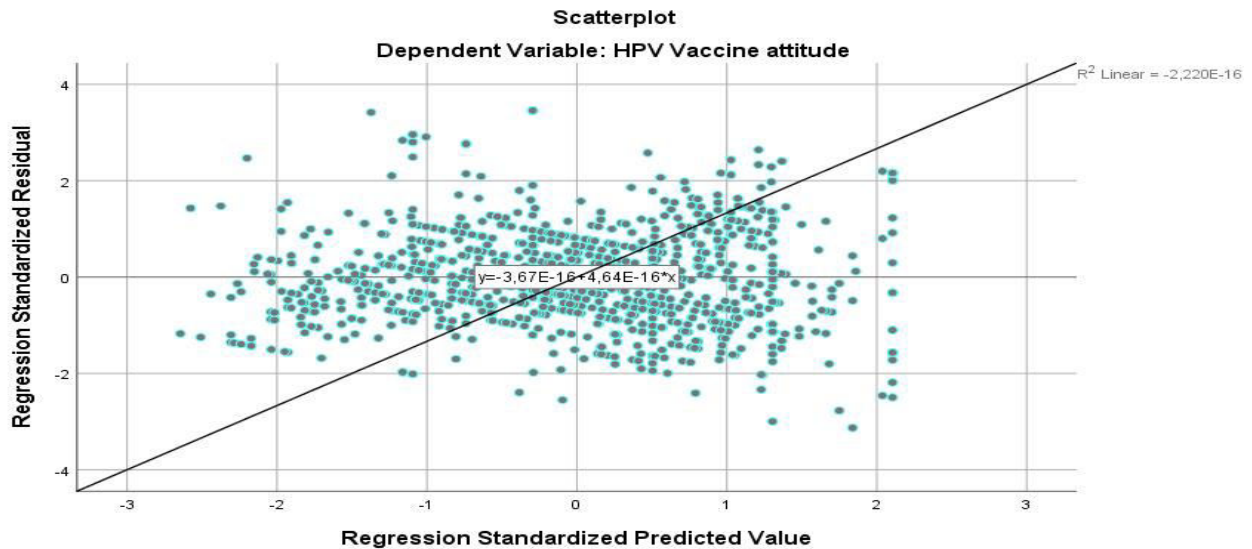


**Figure 1:** The relationship between vaccine attitude and HPV-KS, HPV vaccine attitude and its sub-dimensions

families compared to those with extended families, those with low income compared to those with moderate income, married individuals compared to singles, those with children compared to those without children, those with three children compared to those with one or two children, literate individuals compared to those with other educational levels,

those living in urban areas compared to those in rural areas, non-healthcare workers compared to healthcare workers, those with knowledge about HPV compared to those without any knowledge, those who were vaccinated against HPV compared to those who were not, those with HPV vaccination in their surroundings compared to those without, and





**Figure 2:** The relationship between vaccine attitude and HPV-KS, HPV vaccine attitude and its sub-dimensions

those who have vaccine hesitancy compared to those who do not (Table 4).

Participants' HPV vaccine attitude scores showed statistically significant relationships with family structure, income, marital status, parental status, number of children, educational status, place of residence, occupation, and knowledge about HPV ( $p < 0.005$ ). Scores were statistically significantly higher for those with extended and fragmented families compared to those with nuclear families, low-income individuals compared to moderate-income individuals, married individuals compared to singles, those with children compared to those without, those with three children compared to those with no children, one or two children, literate individuals compared to those with other educational levels, those living in rural areas compared to those in urban areas, non-healthcare workers compared to healthcare workers, those with knowledge about HPV compared to those without (Table 4,  $p < 0.005$ ).

Participants' vaccine hesitancy scores showed statistically significant relationships with income, educational status, place of residence, occupation, knowledge about HPV, and the presence

of HPV vaccination in the surroundings ( $p < 0.005$ ). Scores were statistically significantly higher for those with moderate and high incomes compared to those with low incomes, those with a university degree and above compared to those with lower education levels, those living in urban areas compared to those in rural areas, non-healthcare workers compared to healthcare workers, those with knowledge about HPV compared to those without, and those with HPV vaccination in their surroundings compared to those without (Table 4,  $p < 0.005$ ). To determine the effects of HPV-KS and vaccine hesitancy on HPV vaccine attitude, a multiple linear regression model was conducted, and statistical predictions related to the model demonstrated that the model is significant and usable ( $F(2, 1008) = 148.459$ ). The established model indicated that HPV-KS and vaccine hesitancy explained 22.5% of the variance in HPV vaccine attitude. Upon examining the regression coefficients in the model, a decrease in participants' HPV-KS score ( $t = -8.169$ ;  $p < 0.001$ ) and an increase in vaccine hesitancy ( $t = 16.535$ ;  $p < 0.001$ ) could statistically lead to an increase in HPV vaccine attitude (Figures 1 and 2).

## Discussion

HPV is a significant public health issue that concerns everyone worldwide, irrespective of gender. Particularly, if there is a lack of knowledge about HPV, hesitancy towards the HPV vaccine, and negative attitudes, it becomes even more crucial in a community. This study aimed to explore the levels of knowledge about HPV, attitudes towards the HPV vaccine, hesitations, and possible relationships among individuals in our society. Research results show that individuals do not have sufficient knowledge about HPV (Table 1). In a study conducted by Yılmaz *et al.* with young adults in Istanbul, it was seen that a total of 66.8% of them had knowledge<sup>24</sup>, while in a study by Polla *et al.* in Italy, 66.7% of parents had knowledge<sup>25</sup>. In a study with parents in Poland by Sobierajski *et al.*, 74.2% of parents had knowledge about HPV<sup>26</sup>. The differences in the literature are thought to stem from the socio-demographic characteristics of the study locations, education levels, countries' levels of development, health literacy, and the policies followed by health systems regarding HPV. In our study, the HPV vaccination rate of individuals is very low. At the same time, almost half of the individuals participating in the study were hesitant about the HPV vaccine (Table 1). In the study by Atlı and Göl with parents, 73.3% of parents did not have knowledge about the HPV vaccine, and only 9.3% of their children had received the HPV vaccine<sup>27</sup>. In a study with university students in the United States by Kitur *et al.*, 63.4% of students had received the HPV vaccine<sup>28</sup>, and in a study with Greek students by Koutrakou *et al.*, 33.7% of students had received the vaccine<sup>29</sup>. In a study in China with medical students by Zhou *et al.*, the vaccine hesitancy rate was 62.36%<sup>30</sup>. Another study in China targeting parents reported that 53.9% of parents had hesitations about the HPV vaccine<sup>31</sup>. Studies show variations in vaccine uptake and hesitancy. These differences are believed to be influenced by the policies pursued by countries regarding the HPV vaccine, the inclusion of the HPV vaccine in free vaccine programs, and differences in education and awareness levels about HPV.

In this study, it was determined that individuals' HPV knowledge level was low (Table 2). In a study by Yarıcı and Memmedov with individuals in Cyprus, the total score on the HPV-KS was 16.42<sup>32</sup>. In a study with university students in Turkey, the average total score on the HPV-KS was found to be 9.08<sup>33</sup>. In a study by Ağadayı *et al.* with women, the average total score on the HPV-KS scale was 8.99 ±6.15<sup>34</sup>. In a study by Yıldız *et al.* with individuals, the average total score on the HPV-KS scale was 8.99<sup>35</sup>. In the study by Yakşi and Topaktaş with healthcare workers, the average total score on the HPV-KS was 25<sup>36</sup>. Although varying by sample, the findings in the literature, excluding healthcare workers, are similar. In this study, it was determined that individuals had a moderate level of vaccine attitude towards the HPV vaccine (Table 2). In a study in Turkey, parents' total score on the HPV Vaccine Attitudes and Beliefs Scale was 32.07<sup>27</sup>. Individuals received a total score of 27.90±11.10 on the Vaccine Hesitancy Scale, indicating hesitancy towards the HPV vaccine. In a study in China, 53.9% of participants experienced vaccine hesitancy<sup>31</sup>.

Our study generally aligns with the literature. Understanding such differences may play a crucial role in developing targeted health policies and educational programs to increase the acceptance and vaccination rates of the HPV vaccine.

In this study, there were very weak negative correlations between individuals' HPV knowledge and the total HPV Vaccine Attitude, as well as the harm, barriers, and uncertainty sub-dimensions. A very weak positive correlation was found between the Effects sub-dimension of HPV Vaccine Attitude, total vaccine hesitancy, and the distrust and risks sub-dimensions. A weak positive correlation was observed between vaccine attitude and vaccine hesitancy and distrust, as well as uncertainty sub-dimensions ( $p < 0.005$ ; Table 3). The study by Atlı and Göl with parents shows similarity with our results<sup>27</sup>. In a study by Van Wormer investigating the relationship between parents' attitudes towards HPV and HPV vaccine uptake, it was determined that decreasing uncertainty positively influenced vaccine uptake<sup>37</sup>. In a study conducted in Kenya, more than 60% of parents had positive attitudes towards the

safety and effectiveness of the HPV vaccine, but very few vaccinated their daughters. Over 90% expressed a desire to learn more about the HPV vaccine, and a positive correlation was found between children's willingness to receive the HPV vaccine and their knowledge levels<sup>38</sup>. Our research results are similar to the literature. For individuals to develop a positive attitude towards the HPV vaccine, they need to first have sufficient and accurate knowledge about HPV. Thus, individuals are expected to develop a positive attitude towards the HPV vaccine.

When individuals' HPV-KS (knowledge about HPV) was examined according to their socio-demographic characteristics, statistically significant higher scores were found for female than male, those with nuclear families compared to those with extended families, those with low income compared to those with moderate income, married individuals compared to singles, those without children compared to those with, those with one or two children compared to those with three children, literate individuals compared to those with other educational levels, those living in rural areas compared to urban areas, non-healthcare workers compared to healthcare workers, those with knowledge about HPV compared to those without, those who received the HPV vaccine compared to those who did not, those with HPV vaccination in their surroundings compared to those without, and those with vaccine hesitancy compared to those without (Table 4). These results are similar to studies in the literature<sup>32,35,39,40,41</sup>. When examining the relationship between socio-economic level, education level, living conditions, healthcare-related professions, and knowledge level about HPV, it can be said that higher socio-economic status, higher education levels, benefiting from the opportunities of the living environment, and having a healthcare-related profession have a positive effect on knowledge level about HPV (Table 4).

When individuals' vaccine attitude scores were examined according to their socio-demographic characteristics, statistically significant higher scores were found for those with extended and fragmented families compared to those with nuclear families, those with low income compared

to those with moderate income, married individuals compared to singles, those with children compared to those without, those with three children compared to those with one or two children, those living in rural areas compared to urban areas, non-healthcare workers compared to healthcare workers, those with knowledge about HPV compared to those without ( $p < 0.005$ ; Table 4). In the study conducted by Mersin and Tuncer with family physicians, physicians who had children were found to have higher knowledge about the way of administering the HPV vaccine and to whom it was administered, compared to physicians who did not have children<sup>43</sup>. In the study conducted by Turan *et al.* with individuals, the majority of the participants do not consider getting HPV vaccination for themselves or their children, even though they have undergraduate and graduate degrees.<sup>44</sup> The results of the study are supported by the literature<sup>38,42,43,44</sup>. When examining the relationship between socio-demographic characteristics and vaccine attitude, it can be said that these individuals have higher awareness and need for the HPV vaccine (Table 4).

## Recommendations and conclusion

The research results indicate that individuals have insufficient knowledge about HPV, show hesitancy regarding HPV vaccination, and lack adequate vaccination attitudes. A very weak negative relationship was found between individuals HPV knowledge and the total HPV Vaccine Attitude, and a weak positive relationship was observed between vaccine hesitancy and total HPV Vaccine Attitude. However, a positive weak relationship was found between vaccine attitude and vaccine hesitancy ( $p < 0.005$ ). According to the established regression model in the study, it was found that HPV vaccine attitude was explained by 22.5% by HPV knowledge level and vaccine hesitancy. In line with these results, educational programs targeting the community, families, young individuals, and especially those at risk should be developed by healthcare professionals, particularly nurses and midwives, to increase awareness about HPV and its vaccine. Informative campaigns should be

organized, and public collaboration should be established. Additionally, in our country, efforts should be made to ensure that the HPV vaccine is not only free and easily accessible, but it should also be included in the national vaccination program for free. Finally, it is recommended to conduct research on

HPV knowledge and attitudes in different groups, as well as on HPV vaccine hesitancy and the factors influencing them.

## Conflict of interest

The authors declare that there are no conflict of interests.

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## Contribution of authors

Design of the study: GG, NA, KOB, AU

Acquisition of data: GG, NA, KOB, AU

Analysis and interpretation of data: GG

Study supervision: GG, NA

Manuscript writing: GG, NA, KOB, AU

Critical revisions for important intellectual

Content: GG,NA

All authors contributed to the article and approved the submission

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