

## Original Paper

# Analysis of Parents' Awareness of HPV Vaccine and Influencing Factors on Vaccination Willingness for Their Daughters in Primary and Secondary Schools in Heze City

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### Abstract

**Objective:** To assess the awareness and vaccination willingness regarding HPV vaccine among parents of primary and secondary school girls in Heze City, and to identify key influencing factors, thereby providing evidence for improving local HPV vaccination coverage.

**Methods:** A cross-sectional questionnaire survey was conducted among 550 parents selected by stratified cluster random sampling from October 2025 to January 2026. Chi-square test and binary logistic regression were used for univariate and multivariate analysis.

**Results:** A total of 506 valid questionnaires were returned (effective response rate 92%). The vaccination willingness rate was 63.2% (320/506). Educational level, monthly household income, and family history of cancer were significantly associated with vaccination willingness ( $P < 0.05$ ). Higher educational level (university or above: OR = 3.07, 95% CI: 1.09-8.66), monthly household income of 5000-10000 yuan (OR = 3.56, 95% CI: 1.32-9.63), and a positive family history of cancer (OR = 2.30, 95% CI: 1.11-4.76) were independent positive influencing factors.

**Conclusion:** The willingness rate for HPV vaccination among parents of girls in Heze City was 63.2%. Higher education, higher income, and family history of cancer were positive influencing factors. Although the present study did not directly measure actual vaccination behavior, a behavior gap likely

*exists in similar populations based on prior reports. Targeted health education and expanded free vaccination programs are needed to promote actual uptake.*

### **Keywords**

*HPV vaccine, Parents, Vaccination willingness, Awareness*

## **1. Introduction**

Persistent HPV infection is the main cause of cervical cancer (CC), vulvar cancer, oropharyngeal cancer, and other malignancies. CC poses a substantial global burden, and the number of new cases and deaths in China remains high each year. HPV is a group of 200 known viruses, which can be divided into high-risk and low-risk types according to their carcinogenicity. Persistent infection with high-risk HPV can cause CC and is related to cancers of the vulva, vagina, oral cavity, penis, and anus [1]. HPV infection accounts for about 5% of all cancers worldwide [2], it is estimated that 625,600 women and 69,400 men develop HPV-related cancers annually. HPV vaccination is the most effective way to prevent HPV infection, CC, and other HPV-related cancers [2,3]. The World Health Organization (WHO) has set a 2030 target: 90% of girls should complete HPV vaccination by age 15, and the optimal vaccination window is 9–14 years old [4,5].

China approved the HPV vaccine in 2016, and in 2021 launched free/subsidized vaccination pilot projects for girls aged 9 to 14 years in many regions. Nevertheless, the vaccination rate among adolescents remains far below the level in developed countries. A national survey in 2019 showed that the vaccination rate among females aged 9 to 14 years was only 1.37%; even in pilot areas it was only 21.2%, far from the WHO 2030 target [6,7].

Parents are the primary decision-makers regarding vaccination for their daughters. Their awareness of HPV vaccine, attitudes, subjective norms, and practical capability directly shape both their intention and actual vaccination behavior [8]. Heze City is a prefecture-level city in Shandong Province predominantly focused on agriculture, providing a unique research context for investigating HPV vaccination willingness. This study surveyed parents of female students in primary and secondary schools in Heze City to comprehensively analyze their awareness levels regarding HPV vaccines and the influencing factors. The aim is to provide a basis for HPV vaccination, HPV infection prevention and control, and cervical cancer (CC) prevention efforts in the Heze region.

## **2. Materials and Methods**

### *2.1 Study Population*

This study employed a stratified cluster random sampling method to select parents of primary and junior high school students in Heze City from October 2025 to January 2026 as the study subjects for a questionnaire survey. A total of 550 questionnaires were distributed, with 506 valid responses collected.

Inclusion criteria: (1) Voluntary participation in this study; (2) Parents of female students enrolled in

primary and junior high schools in Heze City; (3) Ability to read and accurately complete the questionnaire.

Exclusion criteria: (1) Parents currently participating in or who have participated in similar studies within the past six months; (2) Parents unable to complete the questionnaire.

### 2.2 Survey Tools

This study was based on multiple literature sources and employed a self-designed questionnaire to investigate participants' awareness of HPV and HPV vaccines. The questionnaire underwent reliability and validity testing (Cronbach's  $\alpha$  coefficient: 0.833; KMO value: 0.876). It consisted of three sections: demographic characteristics of the participants, their awareness of HPV vaccines, and their willingness to receive HPV vaccination.

(1) Demographic characteristics of the participants: age, ethnicity, marital status, occupation, education level, monthly income, and residence (urban/rural), etc.

(2) Awareness of HPV vaccines: knowledge about HPV infection, transmission, associated diseases, and vaccine benefits.

(3) Willingness to receive HPV vaccination. Actual vaccination status was not collected in this study.

### 2.3 Quality Control

First, the research team conducted a pre-survey to ensure the quality of the questionnaire. After revising the questionnaire and prior to the formal survey, researchers repeatedly explained the purpose and significance of the study to participants, emphasizing that the questionnaire results would be strictly confidential and used solely for research purposes. Participants completed the anonymous online questionnaire (Questionnaire Star) voluntarily and meticulously. The research team monitored the completeness and standardization of questionnaire responses in real time and excluded any non-compliant responses.

### 2.4 Statistical Analysis

The data from Wenjuanxing (Questionnaire Star) were exported and subjected to descriptive and statistical analysis using SPSS 26.0. Statistical methods included:

(1) Descriptive statistics: means, standard deviations, and percentages for baseline characteristics.

(2) Analysis of HPV vaccination intention and influencing factors: the  $\chi^2$  test was used for between-group comparisons of categorical variables, and binary logistic regression was performed to identify influencing factors. A  $P$ -value  $< 0.05$  was considered statistically significant. The significance level was set at  $\alpha = 0.05$ .

### 2.5 Ethics Approval

This study was approved by the Ethics Committee of Shandong First Medical University Affiliated Heze Hospital (2024-KK003-06). Written informed consent was obtained from all participants prior to the survey.

### 3. Results

#### 3.1 Participant Characteristics

A total of 550 questionnaires were distributed, and 506 were returned, yielding an effective response rate of 92%. The age of the respondents ranged from 25 to 49 years, with the largest group aged 35 to 45 years (68.58%). Rural residents accounted for the majority (94.66%), and urban residents accounted for 5.34%. 67.79% of respondents had a monthly household income below 5,000 yuan, 23.91% had an income of 5,000–10,000 yuan, and 8.30% had an income above 10,000 yuan. Regarding educational level of parents, 72.93% had primary or junior high school education, 19.96% had technical secondary or senior high school education, and 7.11% had university education or above. Detailed characteristics are shown in Table 1.

**Table 1. Demographic Characteristics of Parents of Girls in Primary and Junior High Schools (N=506)**

Characteristic	Number of Cases (N)	Composition Ratio (%)
<b>School level of daughters</b>		
Primary school	95	18.77
Junior high school	411	81.23
<b>Residence</b>		
Urban	27	5.34
Rural	475	94.66
<b>Age of parents</b>		
<35 years	62	12.25
35–45 years	347	68.58
>45 years	97	19.17
<b>Educational Level of parents</b>		
University or above	36	7.11
Technical secondary school / senior high school	101	19.96
Primary school / junior high school	369	72.93
<b>Occupation</b>		
Housework / farming	392	77.47
Worker / self-employed	105	20.75
Public servant / technician	9	1.78
<b>Insurance Type *</b>		
No insurance	86	17.00
Social/commercial insurance	420	83.00
<b>Family History of Cancer</b>		

Yes	60	11.86
No	446	88.14
<b>Work Intensity</b>		
Extremely busy	79	15.61
Moderate	406	79.89
Not busy	21	4.15
<b>Monthly Household Income</b>		
<5000 yuan	343	67.79
5000-10000 yuan	121	23.91
>10000 yuan	42	8.30

*Note.* \*Social/commercial insurance includes urban employee basic medical insurance, urban resident basic medical insurance, and commercial health insurance.

### 3.2 Univariate Analysis of HPV Vaccination Willingness

Univariate  $\chi^2$  analysis revealed that parental education, monthly household income, and family history of cancer were significantly associated with vaccination willingness ( $P < 0.05$ ). Results are presented in Table 2.

**Table 2. Univariate Analysis of Factors Associated with HPV Vaccination Willingness**

Factor	Willing to Vaccinate (N=320)	Unwilling to Vaccinate (N=186)	Chi-square	P-value
<b>School level of daughters</b>				
Primary school	57(17.8%)	38(20.4%)	0.53	0.47
Junior high school	263(82.2%)	148(79.6%)		
<b>Residence</b>				
Urban	16(5%)	11(5.9%)	0.20	0.66
Rural	304(95%)	175(94.1%)		
<b>Age</b>				
<35 years	39(12.2%)	23(12.4%)		
35–45 years	222(69.4%)	125(67.2%)	0.33	0.85
>45 years	59(18.4%)	38(20.4%)		
<b>Educational Level of parents*</b>				
University or above	30(9.4%)	6(3.2%)		
Technical secondary school / senior high school	69(21.6%)	32(17.2%)	9.15	0.01
Primary school / junior high school	221(69.1%)	148(79.6%)		

<b>Occupation</b>				
Housework / farming	239(74.7%)	153(82.3%)		
Worker / self-employed	74(23.1%)	31(16.7%)	4.05	0.13
Public servant / technician	7(2.2%)	2(1.1%)		
<b>Work Intensity</b>				
Extremely busy	48(15%)	31(16.7%)		
Moderate	260(81.3%)	146(78.5%)	0.66	0.72
Not busy	12(3.8%)	9(4.8%)		
<b>Monthly Household Income*</b>				
<5000 yuan	199(62.2%)	144(77.4%)		
5000–10000 yuan	85(26.6%)	36(19.4%)	15.71	0.00
>10000 yuan	36(11.3%)	6(3.2%)		
<b>Insurance Type</b>				
No insurance	51(15.9%)	35(18.8%)	0.69	0.41
Social/commercial insurance	269(84.1%)	151(81.2%)		
<b>Family History of Cancer*</b>				
Yes	47(14.7%)	13(7.0%)	6.67	0.01
No	273(85.3%)	173(93.0%)		

\*Note. Variables with  $P < 0.05$  in univariate analysis are bolded in the table.

### 3.3 Multivariate Logistic Regression Analysis

Taking parents' vaccination willingness (0 = willing, 1 = unwilling) as the dependent variable, factors were entered into a multivariate logistic regression model ( $P < 0.05$ ). Higher parental education (university or above: OR = 3.07, 95% CI: 1.09–8.66), monthly household income of 5000–10000 yuan (OR = 3.56, 95% CI: 1.32–9.63), and a family history of cancer (OR = 2.30, 95% CI: 1.11–4.76) were independent positive influencing factors for vaccination willingness (Table 3).

**Table 3. Multivariate Logistic Regression Analysis of Factors Influencing HPV Vaccination Willingness**

Variable	Category (reference)	Number of Cases (N)	$\beta$	S.E.	Wald $\chi^2$	P-value	OR	95% CI	
								Lower	Upper
<b>Parental Education</b>									
	Primary school / junior high school (ref)	369	—	—	—	—	—	—	—
	Technical secondary school / senior high school	101	0.93	0.57	2.68	0.10	2.54	0.83	7.78

University or above	36	1.12	0.53	4.50	<b>0.03</b>	<b>3.07</b>	1.09	8.66
<b>Monthly Household Income</b>								
<5000 (ref)	343	—	—	—	—	—	—	—
5000–10000	121	1.27	0.51	6.26	<b>0.01</b>	<b>3.56</b>	1.32	9.63
>10000	42	0.59	0.54	1.20	0.27	1.81	0.63	5.22
<b>Family History of Cancer</b>								
No (ref)	446	—	—	—	—	—	—	—
Yes	60	0.83	0.37	5.03	<b>0.03</b>	<b>2.30</b>	1.11	4.76

*Note.* Dependent variable: willingness to vaccinate (0=willing, 1=unwilling). Reference categories are indicated in parentheses. Bold P-values indicate statistical significance ( $P<0.05$ ).

#### 4. Discussion

HPV vaccination is an effective means of preventing CC and related malignancies [9]. With the rollout of free HPV vaccination programs, media campaigns, and enhanced public health education in medical institutions, overall awareness among parents of primary and secondary school girls in China has significantly increased. Previous studies have shown that 93.1% of parents of girls aged 9 to 14 years have heard of the HPV vaccine, and the awareness rate among guardians of middle school girls exceeds 85%, which is much higher than the level when the vaccine was first introduced in 2016 [10]. Awareness rates among urban parents, highly educated parents, and those working in medical fields approach 100%. Even among rural parents and those with lower education, the rate has increased to over 70% [11].

In this study, the vaccination willingness rate was 63.2%. A survey reported that 83.27% of parents (fourth-grade students in Qingpu District, Shanghai) were willing to vaccinate their children [12]. A survey conducted among 1227 mothers of primary and secondary school girls found that 71.23% were willing to vaccinate their daughters, but the actual vaccination rate was only 1.87% [13].

Parents' level of awareness affects their willingness to vaccinate their children. This study did not quantitatively measure knowledge scores; however, based on extensive literature and research, it is evident that many parents lack professional knowledge about HPV-related diseases and the optimal timing for vaccination, which may influence their vaccination willingness [14,15]. Relevant authorities should enhance public health education, clarify the factors affecting vaccination willingness, incorporate these factors into educational content, and avoid disseminating one-sided or unscientific information, thereby improving residents' health literacy.

Despite strong vaccination willingness, the overall vaccination rate among children and adolescents remains low. The main reasons cited by parents are that children are too young [16] and concerns about vaccine safety [17]. It is necessary to highlight the optimal vaccination age and the safety and effectiveness of the vaccine in education campaigns targeting key populations and their parents, thereby enhancing parental trust in the HPV vaccine, fostering the understanding that earlier

vaccination yields greater benefits, and reducing vaccine hesitancy [18]. Parents commonly perceive that vaccines with higher valency offer greater protection, which may lead to deferral of vaccination [19]. The bivalent and quadrivalent HPV vaccines may prevent CC to a much greater extent than previously recognized and offer cross-protection. Parents can be advised to consider the overall benefits of vaccination [19].

Parental education and income are influencing factors for HPV vaccination willingness in Heze City. Similar findings have been reported in studies from Beijing [13] and Shanghai [12]. Parents with higher education have better access to health information and greater awareness of preventive measures. Parents with higher monthly income have stronger health awareness. They pay more attention to their own and their children's health, and are willing to invest more time and financial resources in acquiring HPV-related knowledge. This study found a positive correlation between the presence of a family history of cancer and the willingness to receive HPV vaccination. Since these parents perceive a higher risk of tumor occurrence in their families, they are more inclined to consider HPV vaccination as a primary preventive measure.

This study also has several limitations: First, there is a significant imbalance in the sample's geographic distribution, with urban residents accounting for only 5.34% (27/506) and rural residents dominating (94.66%); the low urban proportion may limit the generalizability of the findings. Second, actual HPV vaccination behavior was not measured in this study and should be addressed in future investigations. Third, the "intention-behavior gap" discussed in the paper is derived from literature comparisons rather than direct observations in this study. Finally, self-reported data may be influenced by social expectation bias and recall bias. Future studies should recruit a larger and more balanced sample, including more urban participants, directly measure vaccination status, and employ longitudinal designs to examine the translation of willingness into actual behavior.

Healthcare providers should integrate the local context and research findings to develop targeted intervention strategies to narrow the intention-behavior gap, and increase HPV vaccination rates through public education, policy support, service optimization, and social mobilization. Future intervention efforts should shift from "promoting vaccination willingness" to "promoting the translation of willingness into behavior". This includes correcting cognitive biases, expanding free vaccination policy coverage, optimizing vaccination services, and evaluating the actual effects of free and campus-based vaccination programs through policy assessments. Such efforts will provide scientific support for achieving the WHO 2030 goal and comprehensively increasing HPV vaccination rates among primary and secondary school girls in China.

## 5. Conclusion

Although the willingness rate for HPV vaccination among parents in Heze City is 63.2% and is positively associated with higher education, higher income, and family history of cancer, a substantial willingness-behavior gap likely exists based on prior reports. Future research should oversample urban

parents to enable subgroup comparisons. Targeted health education and expanded free vaccination policies are essential to improve actual uptake.

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