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Understanding HPV Prevention: A Survey-Based Analysis of Cognitive and Emotional Predictors

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Abstract. Human papillomavirus (HPV) is not only a significant global sexually transmitted infection but also a primary contributor for preventable cancers. However, the inconsistent rates of vaccination and public awareness push me for writing this essay. This study utilized a cross-sectional online survey, involving 205 participants and evaluating their knowledge of HPV, emotional reactions, perceived control, confidence in the vaccine, and intentions to engage in preventive measures, accompanied by the relationships among these factors. The findings demonstrated a moderate level of HPV knowledge. Along with enduring misconceptions about transmission, diagnosis, vaccine safety and fertility, the participants displayed moderate vaccine confidence, anxiety related to HPV, perceived control, and intentions to take preventive actions. Correlation analyses claimed that greater knowledge has relationships with reduced anxiety. While the intentions to prevent HPV were strongly influenced by vaccine confidence and perceived control than by knowledge alone, no notable differences in knowledge or psychological factors were found in different vaccination status groups. Medical professionals and institutions were the main sources of information. But there were significant misunderstandings regarding non-sexual transmission routes presented. These results imply merely enhancing HPV knowledge may not be sufficient to encourage preventive behaviors. In order to foster greater engagement in vaccination and screening, public health initiatives should focus on providing accurate education, reducing stigma, alleviating anxiety, improving perceived control and vaccine confidence. This research, wanting to enhance HPV prevention efforts, underscores the necessity of incorporating cognitive and emotional elements in health communication.

Keywords: Human papillomavirus (HPV), Vaccination, Cancer prevention

1. Introduction

Human papillomavirus (HPV) infection is one of the most prevalent sexually transmitted infections globally, which is also a significant contributor to preventable cancers such as cervical, anal, and oropharyngeal cancers. The World Health Organization recognizes its vaccination as fundamental element worldwide. As one of the most essential cancer prevention strategies, however, vaccination rates vary significantly across different countries and demographic groups [1]. Although there are a lot of comprehensive public health initiatives, many people lack a complete understanding of HPV. They are often confused with it, describing lack of knowledge to human immunodeficiency virus

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(HIV), together with underestimating its association with cancers beyond the cervix [2]. Biologically, HPV is a double-stranded DNA virus that targets basal epithelial cells. Its persistent infection from high-risk strains leads to significant changes via the viral oncoproteins E6 and E7 [3], particularly HPV 16 and 18. Prophylactic vaccines have shown high effectiveness in preventing both infection and precancerous lesions. Earlier bivalent and quadrivalent vaccines focusing on HPV 16/18 and 6/11/16/18. On the other hand, the newer monovalent vaccine offers protection against five additional oncogenic types [4]. Long-term studies suggest immunity conferred by the vaccine lasts for at least a decade [5]. Research indicates that two-dose regimens in adolescents provide comparable immunogenicity to three-dose schedules. At the same time, the emerging data propose that a single-dose vaccination also confer significant protection [6]. Extensive cohort studies appear no link between HPV vaccination and infertility or autoimmune diseases [7].

Public hesitancy, regarding HPV vaccination, remains—despite substantial biological evidence supporting its efficacy. Research indicates gaps in knowledge, stigma associated with sexually transmitted infections and inconsistent messaging, which can significantly hinder vaccine acceptance [8]. Also, emotional factors, such as anxiety—especially when individuals feel a lack of control—can deter proactive health behaviors. This study aims to assess public understanding of HPV through a survey-based approach. Achieving these by focusing on factual knowledge, emotional reactions, perceived coping abilities, and prevalent misconceptions. Research explores how these elements influence intentions toward preventive measures like vaccination and screening. It also seeks to identify key psychological and informational factors, which can enhance health communication strategies. Ultimately it improves both knowledge and perceived control over HPV-related health decisions.

2. Methods

2.1. Study design and participants & knowledge assessment

A cross-sectional and anonymous online survey was carried out. In order to evaluate the public's understanding of human papillomavirus (HPV), people's preventive attitudes and intentions are researched along. A total of 205 valid responses were analyzed. The survey included demographic questions, a structured array of knowledge-based, and Likert-scale items. They all aimed at assessing the cognitive, emotional, and behavioral aspects of HPV perception. HPV knowledge was assessed through 11 true/false statements (Questions 10 – 20). These statements addressed essential biomedical information and prevalent misconceptions. They encompassed various topics, including opinions from modes of transmission to myths related to fertility, promiscuity, and the severity of the disease. Responses indicating "Not sure" were considered incorrect. The total number of correct answers was compiled to generate a Knowledge Score, which ranged from 0 to 11. A higher score reflects a more accurate understanding of HPV.

2.2. Attitudes, emotions, perceived control, & prevention intention

Three composite psychological measures were developed by using an agreement scale ranging from 1 (strongly disagree) to 5 (strongly agree). Vaccine confidence was assessed through three items (Questions 21 – 23). They evaluated perceived benefits and safety concerns, with one item reflecting safety worries being reverse coded prior to calculating the mean score. HPV-related anxiety was gauged using three items (Questions 25 – 27). They focused on emotional responses to HPV and cervical cancer. Additionally, perceived coping and control were measured through three items

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(Questions 28 – 30). They, in the meantime, examined beliefs regarding the manageability of HPV via screening, vaccination, and medical follow-up. For each psychological domain, the composite score was determined by averaging the relevant items. The score is also determined by the fact that higher scores indicating a stronger endorsement of the respective construct. Preventive intention was evaluated through four specific items (Questions 31 – 34). They gauged individuals' willingness to receive the HPV vaccination, recommendation, adhere to medical advice following a positive diagnosis and engage in future cancer screenings. The responses were later transformed into a 1 – 5 numeric scale. After that, the data is averaged to create an overall Intention Score, in which higher scores reflect a greater commitment for preventive health measures.

2.3. Statistical analysis

All analyses were performed using Python. Its descriptive statistics were calculated for each composite measure. To explore the relationships between knowledge, vaccine confidence and preventive intention, Pearson correlation analyses were also employed. By adding this analysis, the relationship of anxiety and perceived control was also cleared. The findings were visually represented through distribution plots, summaries of composite scores and correlation heatmaps. By all means, the effectively highlighting significant patterns within the data.

3. Results

3.1. Sample characteristics and HPV awareness

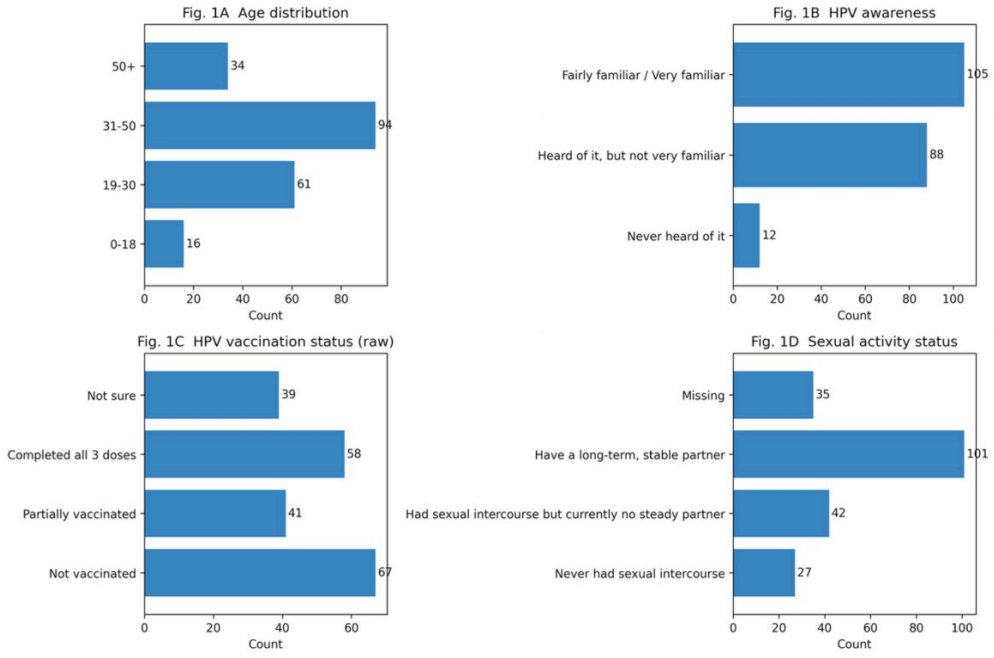

Figure 1. Distribution of HPV knowledge scores and key misconceptions. (A) Histogram showing the distribution of total knowledge scores (0–11) across respondents. (B) Accuracy rates for individual knowledge items, highlighting lower correctness for stigma-related and fertility-related misconceptions compared with basic biomedical knowledge items

A total of 205 individuals participated in the survey, showcasing a diverse age range among adults (Fig. 1A). The predominant age group was 31 to 50 years, comprising 45.9% of respondents,

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followed by those aged 19 to 30 at 29.8%, individuals over 50 at 16.6%, and those under 18 at 7.8%. Awareness of HPV was moderate, with 51.2% of participants indicating they were fairly or very familiar with the virus, while 42.9% had heard of it but lacked familiarity, and 5.9% reported never having heard of HPV (Fig. 1B). Vaccination rates varied, as 28.3% of respondents had completed all three doses, 20.0% were partially vaccinated, 32.7% had not received any vaccinations, and 19.0% were uncertain about their vaccination status (Fig. 1C). In terms of sexual activity, 49.3% reported having a long-term stable partner, 20.5% had previous sexual experiences without a current partner, and 13.2% indicated they had never engaged in sexual intercourse (Fig. 1D). This sample reflects a wide array of demographic and experiential factors pertinent to HPV risk and prevention.

3.2. Moderate overall knowledge with persistent misconceptions

Participants exhibited a moderate understanding of HPV-related information, with an average knowledge score of 5.76 ± 2.47 out of a possible 11, reflecting significant variability among individuals. Analysis of item-level accuracy highlighted considerable differences in understanding, particularly regarding misconceptions about HPV positivity (37.6%), the implications of abnormal test results (38.5%), the protective nature of long-term monogamous relationships (42.4%), and concerns about fertility post-vaccination (44.4%). Conversely, higher accuracy rates were noted in distinguishing HPV from HIV (66.3%) and acknowledging the necessity of cervical cancer screening even after vaccination (68.3%). These results suggest that while many participants grasp fundamental HPV facts, prevalent misconceptions about transmission, diagnosis, and vaccine safety persist.

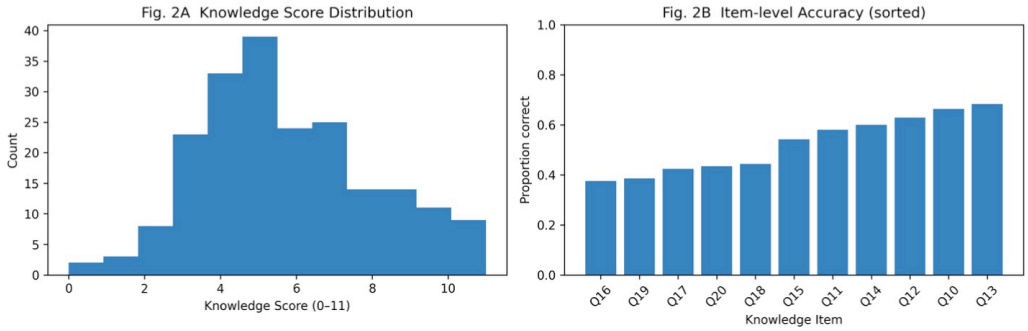

Figure 2. Composite psychological and behavioral scores

Boxplots showing the distributions of vaccine confidence, HPV-related anxiety, perceived coping/control, and overall preventive intention (all scaled 1–5). Scores cluster around the midpoint, with moderate variability across respondents.

3.3. Mid-range psychological attitudes and preventive intentions

Participants displayed moderate levels of confidence, anxiety, perceived control, and preventive intention regarding HPV, as indicated by the psychological composite measures (Fig. 3A). The average vaccine confidence was recorded at 3.31 ± 0.68, while HPV-related anxiety and perceived coping control averaged 3.34 ± 1.01 and 3.40 ± 0.98, respectively, all measured on a five-point scale. Similarly, preventive intention reflected a mid-range pattern (Fig. 3B), with an overall mean of 3.49 ± 1.08. Specific intention items, such as willingness to vaccinate, recommend vaccination, follow up after a positive result, and undergo screening, showed means ranging from 3.43 to 3.52.

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These findings indicate that respondents, at the population level, exhibited neither strong resistance nor proactive engagement in HPV prevention, instead demonstrating moderate and varied attitudes.

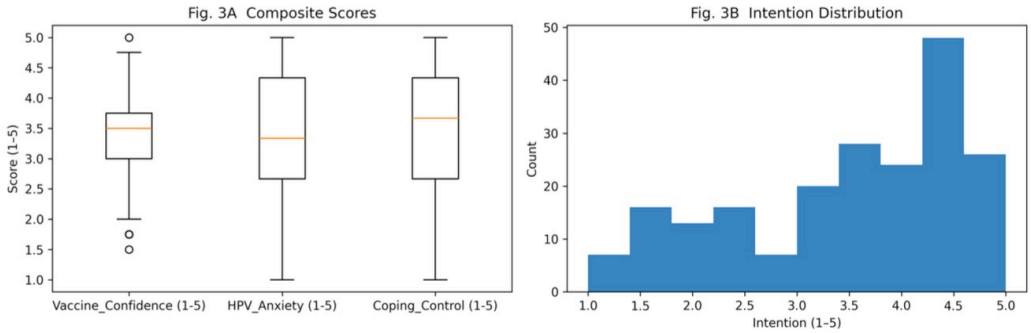

Figure 3. Correlation matrix of knowledge, attitudes, emotions, control, and intentions

Heatmap of Pearson correlations among the five composite variables. Knowledge is negatively associated with HPV-related anxiety, while vaccine confidence and perceived control show strong positive associations with preventive intentions.

3.4. Preventive intentions are more strongly linked to confidence and perceived control than to knowledge

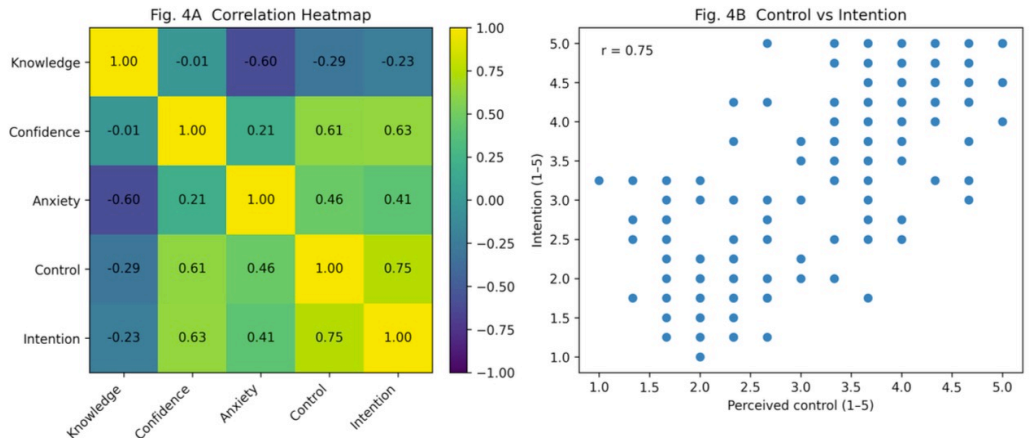

Figure 4. Sources of HPV information and perceived transmission routes

Correlation analyses identified clear relationships among knowledge, emotional responses, and preventive intentions (Fig. 4A). A strong negative correlation was found between knowledge and HPV-related anxiety ($r = -0.60$), suggesting that increased knowledge correlates with reduced anxiety levels. Conversely, knowledge exhibited only weak negative correlations with perceived coping control ($r = -0.29$) and preventive intention ($r = -0.23$), and it was nearly unrelated to vaccine confidence ($r = -0.01$). In contrast, psychological factors displayed more robust interconnections. Vaccine confidence was positively correlated with both perceived control ($r = 0.61$) and preventive intention ($r = 0.63$). Notably, perceived control had the strongest correlation with intention ($r = 0.75$; Fig. 4B), indicating a significant relationship between individuals' sense of efficacy and their readiness to adopt preventive measures. Additionally, HPV-related anxiety showed moderate correlations with perceived control ($r = 0.46$) and intention ($r = 0.41$). Overall, these

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results suggest that preventive intentions are more closely linked to confidence and perceived control than to knowledge alone.

Bar plots summarizing the most frequently reported information channels, reasons for first learning about HPV, and perceived transmission routes. Medical institutions and traditional media were the most common sources, and sexual transmission was the most widely recognized route.

3.5. Psychological and knowledge variables did not differ significantly by vaccination status

Analysis of group comparisons based on vaccination status revealed no statistically significant differences in knowledge or psychological measures. The Kruskal–Wallis tests indicated non-significant results for various factors, including knowledge ($H = 1.466$, $p = 0.480$), vaccine confidence ($H = 1.210$, $p = 0.546$), HPV anxiety ($H = 2.063$, $p = 0.356$), perceived coping control ($H = 0.461$, $p = 0.794$), and preventive intention ($H = 1.354$, $p = 0.508$). These findings imply that, within this sample, vaccination status does not appear to have a strong correlation with levels of knowledge, emotional responses, or intentions related to preventive behavior.

3.6. Medical professionals are the primary information source, but misconceptions about transmission remain widespread

Medical institutions and healthcare professionals emerged as the primary sources of HPV-related information, garnering 175 responses, followed by traditional media with 111, friends or family at 99, and educational campaigns with 97. The leading reasons for HPV awareness included health check-ups involving oneself or acquaintances (117 responses), consistent exposure to health information (116), and self-directed learning (115). Despite this relatively high level of awareness through medical and educational avenues, misconceptions regarding transmission routes were prevalent. While sexual transmission was correctly identified by 158 participants, many also mistakenly believed in other routes, such as indirect contact with contaminated objects (127), mother-to-child transmission during childbirth (123), and contamination via medical instruments (107). These results indicate that, although exposure to information is widespread, the accuracy and clarity of that information may vary significantly.

4. Discussion

This research offers a comprehensive perspective on the interplay between knowledge of HPV, emotional responses and perceived control in relation to preventive intentions. Notably, participants exhibiting higher confidence in the HPV vaccine demonstrated a greater inclination towards preventive actions. Those actions included getting vaccinated, recommending vaccination to others, and adhering to screening guidelines. Additionally, the perception of coping and control was strongly linked to these intentions: individuals who felt that HPV could be effectively managed through vaccination were more likely to adopt preventive measures. Plus, they often has regular follow-ups. These results align with established health behavior theories, which means that highlight perceived efficacy and control for action—as key motivators.

Furthermore, an interesting observation was the inverse relationship between knowledge and anxiety related to HPV. Those with higher levels of knowledge turned out to be more likely to report lower anxiety and fewer catastrophic thoughts about HPV infection. This of course indicated accurate information alleviate uncertainty and stigma. Also suggesting knowledge serves as a protective factor against heightened anxiety, which allows individuals to view HPV as a manageable

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condition, rather than a severe threat. One finding reveals a less straightforward relationship between knowledge and vaccine confidence (or preventive intentions). This indicates merely possessing information about HPV doesn't necessarily enhance the motivation to vaccinate or undergo screening. On the contrary, emotional responses and the perception of control probably have a more significant influence on behavioral intentions. Consequently, cognitive understanding alone may is not sufficient to drive behavior change. These insights carry essential implications for HPV education strategies. Even though traditional health education prioritizes factual knowledge, current findings suggest that addressing emotional concerns and perceptions of control is equally vital. Effective communication should not only aim to alleviate fear and dispel stigma-related misconceptions, and also reinforce HPV is both prevalent and manageable. Campaigns focusing on the effectiveness and safety of vaccines, as well as the routine nature of screening, need to prove more compelling than those centered solely on knowledge dissemination.

In summary, the findings indicate that the combination of accurate information with emotional support and a strong sense of personal agency is the most successful HPV education initiatives. Public health efforts will be more effective if they employ communication strategies. It included simultaneously tackle beliefs, emotions and actionable preventive measures.

5. Conclusion

This research examined the several connections between knowledge of HPV: confidence in the vaccine, emotional reactions, perceived control, and intentions to engage in preventive measures. The overall level of knowledge was moderate, with persistent misconceptions, which related to stigma and fertility. While greater knowledge correlated with reduced anxiety, it had only a weak relationship: between vaccine confidence and preventive intentions. Conversely, strong associations were identified. The relationship between vaccine confidence and perceived control over coping significantly recommended intentions to vaccinate and adhere to screening guidelines. These results indicate only enhancing factual knowledge is not enough for driving behavioral change. Surprisingly, emotional support and a sense of control seem to play crucial roles in encouraging preventive actions. Therefore, effective communication strategies regarding HPV should integrate accurate information with efforts to highlighting what is true about HPV and its prevention. Approaches addressing both cognitive and emotional dimensions proved a more successful result in fostering vaccination and screening behaviors.

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