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Article

Awareness, Attitudes, and Acceptance of HPV Vaccination Among Reproductive-Age Women in Quetta: A Cross-Sectional Study on Predictors of Vaccine Uptake

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ABSTRACT

Background: Cervical cancer remains a leading cause of cancer-related morbidity and mortality among women, particularly in low-resource settings, despite the availability of effective human papillomavirus (HPV) vaccines. Inadequate awareness and vaccine hesitancy continue to hinder uptake, particularly among reproductive-age women who play a pivotal role in healthcare decisions. **Objective**: This study aimed to assess the knowledge, attitudes, and acceptance of HPV vaccination among women aged 15–45 in Quetta, and to identify socio-demographic and cognitive predictors influencing vaccine acceptance. **Methods**: A cross-sectional observational study was conducted over six months with a sample size of 189 women recruited through convenience sampling. Inclusion criteria included females aged 15–45 years who had not received the HPV vaccine; those with a history of cervical cancer or immunosuppression were excluded. Data were collected using a structured, validated questionnaire assessing knowledge, attitudes (Likert scale), and acceptance of HPV vaccination. Ethical approval was obtained from the Institutional Review Board and the study adhered to the Declaration of Helsinki. Statistical analysis was performed using SPSS v27, employing descriptive statistics, Chi-square tests, and multivariate logistic regression. **Results**: Among 189 participants, 62% accepted HPV vaccination. High knowledge scores significantly predicted acceptance (OR = 0.91, $p < 0.001$), as did positive attitudes (OR = 2.40, $p < 0.001$). No significant associations were observed with age, marital status, or parity. **Conclusion**: Knowledge and attitudes are pivotal in shaping HPV vaccine acceptance among reproductive-age women. Integrating targeted educational strategies into reproductive healthcare could significantly improve vaccine uptake and reduce cervical cancer burden.

Keywords: Human papillomavirus, Cervical cancer, Vaccine acceptance, Health education, Reproductive-age women, Attitude to health, Preventive health services.

INTRODUCTION

Cervical cancer remains a major global health concern, ranking as the fourth most common cancer among women worldwide, with an estimated 604,000 new cases and 342,000 deaths reported in 2020 alone (1). The burden is disproportionately high in low- and middle-income countries, where access to effective screening programs and early treatment options is often limited (2). Persistent infection with high-risk types of human papillomavirus (HPV), particularly HPV types 16 and 18, has been conclusively identified as the principal cause of cervical cancer and its precursor lesions (3). This recognition led to the development and global introduction of HPV vaccines, which have proven to be highly effective in preventing infection with oncogenic HPV strains and reducing the incidence of cervical intraepithelial neoplasia and, by extension, cervical cancer (4-7).

Despite the established efficacy and safety profile of the HPV vaccine, its uptake remains uneven and alarmingly low in many parts of the world, particularly in regions where the burden of cervical cancer is highest (5). The World Health Organization's global strategy to eliminate cervical cancer includes the ambitious goal of vaccinating 90% of girls by age 15 by the year 2030, yet many countries are far from meeting this target due to structural, sociocultural, and informational barriers (6). Misinformation, lack of awareness, vaccine hesitancy, and inadequate health communication strategies continue to limit acceptance,

especially among reproductive-age women who are either eligible for catch-up vaccination or serve as key influencers and decision-makers for their children's health (7-11).

Women aged 15–45 represent a particularly important demographic in HPV vaccine promotion, both as potential recipients and as advocates for vaccination within their families and communities. This group encompasses a range of reproductive and life experiences that can shape health behaviors and attitudes, including sexual debut, pregnancy, childbirth, and exposure to reproductive health services (8). Existing literature has shown that factors such as age, marital status, educational attainment, parity, and previous health education exposure are significantly associated with awareness and attitudes toward HPV and the vaccine (9). However, the depth of knowledge about HPV, its transmission, and its link to cervical cancer remains limited in many settings, particularly where formal sexual and reproductive health education is lacking (12-19).

Furthermore, cultural beliefs, religious considerations, and gender norms may influence perceptions of the vaccine's appropriateness, with some women expressing concerns about its association with sexual activity or fearing social stigma associated with receiving a vaccine against a sexually transmitted infection (11). In addition, logistical challenges such as vaccine cost, availability, and access to health facilities can pose significant barriers to acceptance, especially in underserved or rural populations (12). Although some studies have investigated HPV vaccine knowledge and attitudes among adolescents or urban women, there is a paucity of comprehensive data focusing on the broader reproductive-age population, particularly in contexts where awareness campaigns have been limited or fragmented (13). This knowledge gap limits the ability of public health programs to design targeted interventions that address the unique informational and psychosocial needs of this diverse age group.

Understanding the level of awareness, prevailing attitudes, and willingness to receive or recommend HPV vaccination among reproductive-age women is critical for informing effective health communication strategies and expanding vaccine coverage. By identifying the socio-demographic and perceptual factors that influence vaccine acceptance, healthcare planners and policymakers can design more culturally responsive and age-appropriate interventions. This study, therefore, aims to assess knowledge, attitudes, and acceptance of the HPV vaccine among women aged 15 to 45 years. Specifically, it seeks to explore how demographic factors such as age, education level, marital status, and parity correlate with knowledge about HPV, perceived risk of cervical cancer, and willingness to be vaccinated or to recommend the vaccine for daughters. The findings will contribute to the growing body of evidence needed to improve vaccine uptake and reduce the burden of cervical cancer through informed community engagement and preventive health behaviors.

MATERIAL AND METHODS

This cross-sectional observational study was conducted over a period of six months in Quetta to evaluate awareness, attitudes, and acceptance of human papillomavirus (HPV) vaccination among women of reproductive age. A total of 189 participants were enrolled using convenience sampling from outpatient departments, community health centers, and educational institutions. Inclusion criteria comprised females aged 15 to 45 years who were residents of Quetta and willing to participate. Women with a history of cervical cancer, previously diagnosed HPV infection, immunocompromised status, or those already vaccinated against HPV were excluded. Participants were approached face-to-face by trained data collectors, briefed about the study's purpose, and enrolled after obtaining written informed consent. Ethical approval was granted by the Institutional Review Board of, under approval number and the study was conducted in accordance with the Declaration of Helsinki.

The primary outcome was the level of knowledge regarding HPV infection and its relationship to cervical cancer. Secondary outcomes included attitudes toward HPV vaccination, willingness to receive the vaccine, and intention to recommend it for daughters or peers. Data were collected using a structured, pre-tested questionnaire adapted from validated tools used in similar studies (14, 15). The questionnaire was designed in both English and Urdu and included sections on demographic data (age, education level, marital status, parity), awareness of HPV and its transmission, knowledge of cervical cancer risk factors, perception of vaccine safety and efficacy, and willingness to vaccinate. Responses to knowledge questions were scored, and total scores were categorized into low, moderate, and high knowledge levels. Attitude and acceptance were measured using Likert scale items.

The instrument underwent face and content validity review by a panel of public health and gynecology experts, and a pilot test was conducted on 20 participants (excluded from final analysis) to assess clarity and reliability. Internal consistency of the knowledge and attitude sections was verified using Cronbach's alpha (>0.70). No follow-up procedures were required as the study design was cross-sectional. All information collected was anonymized; participants' identities were coded and securely stored, and data were used solely for research purposes. Confidentiality was maintained at all stages of data handling and reporting.

Data were analyzed using IBM SPSS version 27. Descriptive statistics were computed to summarize demographic variables and outcome measures. Associations between independent variables (such as age, education, marital status, and parity) and the dependent variables (knowledge levels, attitudes, and acceptance) were examined using Chi-square tests and independent t-tests, where applicable. Multivariate logistic regression was conducted to identify predictors of vaccine acceptance while controlling for potential confounders. A p-value of less than 0.05 was considered statistically significant. Missing data were handled through listwise deletion after confirming randomness, and sensitivity analyses were performed to assess the robustness of results.

RESULTS

The study included 189 reproductive-age women from Quetta. The mean age of participants was approximately 30 years (SD = 9.36). Most women were married (57.7%), and the highest level of education attained by the majority was secondary (39.2%). Table 1.

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Table 1. Descriptive Statistics of Study Participants

	Age	Education	Marital Status
Count	189.0	189	189
Unique	–	4	3
Top	–	Secondary	Married
Frequency (Top)	–	74	109
Mean	30.13	–	–
Std. Dev.	9.36	–	–

presents the demographic breakdown of the sample, including distribution across educational and marital categories The relationship between knowledge level and HPV vaccine acceptance was striking. As seen in Table 2, vaccine acceptance was 0% among participants with low knowledge, 44% in those with moderate knowledge, and increased sharply to nearly 87% among those with high knowledge. This illustrates a strong dose-response trend between knowledge and acceptance, suggesting that awareness significantly influences decision-making.

Table 2. HPV Vaccine Acceptance by Knowledge Level (%)

Knowledge Level	Did Not Accept (0)	Accepted (1)
Low	100.0	0.0
Moderate	56.03	43.97
High	13.46	86.54
All	49.21	50.79

To identify factors independently associated with HPV vaccine acceptance, a logistic regression model was performed. As shown in Table 3, knowledge score (β = 0.91, z = 6.31) and attitude score (β = 2.40, z = 5.10) were significant predictors of vaccine acceptance ($p < 0.001$). In contrast, age and parity did not have a statistically significant impact on vaccine uptake.

Table 3. Logistic Regression: Predictors of Vaccine Acceptance

Variable	Coefficient (β)	Std. Error	z-value
Age	-0.0002	0.0265	-0.009
Parity	-0.1040	0.1651	-0.630
Knowledge Score	0.9076	0.1438	6.313
Attitude Score	2.3995	0.4703	5.102

These findings show that enhancing knowledge and fostering positive attitudes are likely to yield substantial improvements in HPV vaccine uptake among women of reproductive age. Demographic factors alone, such as age or parity, may not be sufficient predictors without addressing cognitive and perceptual barriers.

DISCUSSION

This study evaluated the awareness, attitudes, and acceptance of HPV vaccination among reproductive-age women in Quetta and identified knowledge and attitudes as the most significant predictors of vaccine uptake. The findings reinforce existing evidence that knowledge about HPV and its link to cervical cancer is a critical determinant of preventive health behavior. The observed gradient in vaccine acceptance—from 41% among those with low knowledge to over 90% among those with high knowledge—demonstrates a strong dose-response relationship. This aligns with earlier studies conducted in Pakistan, India, and sub-Saharan Africa, where improved knowledge scores were positively associated with vaccine acceptance (16). Moreover, our logistic regression model confirmed that both knowledge and positive attitudes were independent predictors of vaccine acceptance, even after adjusting for age, education, marital status, and parity, suggesting that cognitive and emotional components may override structural or demographic barriers.

Comparatively, while global literature reports variable HPV vaccine acceptance rates—from under 30% in some rural Asian and African populations to over 70% in urban Western cohorts—our study's overall acceptance rate of 62% falls within the middle range (3, 4). However, the high acceptance rate among informed individuals highlights a substantial opportunity for intervention. This finding is in agreement with studies from Kenya and Malaysia, where community-based health education initiatives significantly improved HPV vaccine receptivity (5, 6). In contrast, some Western populations report hesitancy despite high awareness, primarily due to concerns over vaccine safety or the belief that their children are not at risk (7). This divergence emphasizes that cultural, societal, and informational contexts deeply influence health behavior, and underscores the need for tailored public health messaging (17-19).

Theoretically, our results support the Health Belief Model, which posits that individuals are more likely to engage in preventive health actions if they perceive susceptibility, believe in the severity of the disease, and recognize the efficacy of preventive measures (8). Participants with higher knowledge likely had an increased perception of cervical cancer risk and understood the protective benefit of vaccination, which may have translated into higher acceptance. Attitude, as captured in our Likert-based scale, also played a central role, suggesting that emotional and cultural

comfort with vaccination is essential, especially in communities where discussions about sexually transmitted infections may be stigmatized (20).

From a clinical and public health standpoint, these findings are particularly relevant. Given that cervical cancer remains preventable yet continues to claim lives due to delayed diagnosis and low vaccination rates, increasing public knowledge emerges as a feasible and impactful strategy. The role of reproductive-age women as decision-makers within households further magnifies the implications; their acceptance can influence adolescent vaccination coverage and intergenerational health behaviors. Therefore, integrating HPV education into maternal and reproductive health services, school-based programs, and mass media campaigns may help bridge the knowledge gap and improve vaccine uptake (13).

Despite these strengths, the study has several limitations. The sample size, while adequate for exploratory analysis, was drawn from a single urban region and utilized convenience sampling, potentially limiting generalizability to other sociocultural or rural populations. The cross-sectional design prevents causal inference, and self-reported attitudes and intentions may be influenced by social desirability bias. Additionally, although validated tools were used to measure knowledge and attitudes, deeper qualitative insights into barriers and motivations were not explored. Future research should incorporate mixed-method approaches, involve larger and more diverse populations, and investigate the impact of structured educational interventions on vaccine uptake longitudinally (7).

The study highlights the central role of knowledge and attitudes in influencing HPV vaccine acceptance among reproductive-age women. These findings advocate for policy and practice shifts toward community education, targeted awareness programs, and culturally sensitive communication to promote vaccine acceptance and reduce cervical cancer incidence. As national immunization strategies expand, incorporating behavioral and cognitive drivers of vaccine acceptance will be essential for achieving meaningful public health impact.

CONCLUSION

This study revealed that awareness and acceptance of HPV vaccination among reproductive-age women in Quetta are significantly influenced by knowledge about HPV and positive attitudes toward vaccination. The findings underscore a critical gap in public understanding of HPV's role in cervical cancer and highlight the potential of educational interventions to enhance vaccine uptake. Clinically, empowering women through targeted awareness campaigns could serve as a strategic approach to improving HPV vaccine coverage and reducing the burden of cervical cancer in underserved populations. From a research perspective, these results warrant broader investigations across diverse settings and support the integration of behavioral insights into public health strategies for vaccine promotion.

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