

Knowledge and Attitudes Towards Cervical Cancer and the Human Papillomavirus Vaccine Among Women in Mukalla City, Yemen: A Cross-Sectional Study

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Abstract

Background: Cervical cancer is a major public health concern, especially in regions with limited screening and vaccination access. Human papillomavirus (HPV) vaccination is a vital preventive measure, yet its success depends on public knowledge and acceptance. This study assessed knowledge and attitudes regarding cervical cancer and the HPV vaccine among women in Mukalla City, Yemen. **Methods:** A cross-sectional survey was conducted from June to August 2023 among 425 women aged 18 years and older. A structured questionnaire captured sociodemographic data, knowledge of cervical cancer and HPV vaccination, and attitudes towards vaccination and screening. Descriptive statistics, chi-square tests, and multivariate logistic regression were used for analysis. **Results:** The largest participant group was aged 18–24 years (174/425; 41.0%), and 196/425 (46.0%) had secondary education. Overall, 216/425 (50.9%) demonstrated sufficient knowledge about cervical cancer and the HPV vaccine. Knowledge was significantly higher among women with college education or above ($p = 0.050$). Positive attitudes towards HPV vaccination were noted, with 294/425 (69.2%) supporting its inclusion in the national immunization program. Educational level was an independent predictor of sufficient knowledge (adjusted odds ratio, 1.60; 95% confidence interval, 1.00–2.50; $p = 0.050$). **Conclusions:** Substantial knowledge gaps exist regarding cervical cancer and HPV vaccination among women in Mukalla City. Despite generally positive attitudes, targeted education campaigns are essential, especially for women with lower education levels. Future research should explore sociocultural factors influencing awareness to guide public health interventions

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Introduction

Cervical cancer is the fourth most common cancer among women worldwide, with approximately 604,000 new cases and 342,000 deaths reported annually [1]. Nearly 90% of deaths in 2020 occurred in low- and middle-income countries, where access to immunization, screening, and treatment remains limited [2]. The disease is a major public health issue, with one woman dying every two minutes, despite cervical cancer being largely

preventable and curable if detected early. Women living with HIV are particularly vulnerable, being six times more likely to develop cervical cancer, and younger women are disproportionately affected across all regions [3].

In Yemen, the age-standardized incidence rate for HPV-related cervical cancer was 2.5 per 100,000 females in 2020, with a mortality rate of 1.8 per 100,000 [4]. A study among women at a gynecological clinic in Sana'a

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found that 30.5% were unaware of any cervical cancer risk factors. Among those who were informed, 42.3% identified HPV, 36.2% mentioned having multiple sexual partners, 29.6% referred to genetic factors, and 29.1% cited prolonged contraceptive use as potential causes [5]. In the same study, 59% recognized regular screening and 18% noted HPV vaccination as preventive measures [5].

Notably, the incidence of cervical cancer has declined in developed nations due to increased awareness, preventive action, and organized screening programs. These interventions have achieved significant reductions in both incidence and mortality, as early detection is linked to more favorable outcomes stage [6]. Conversely, the absence of national screening programs can contribute to lower awareness of HPV-related complications, particularly in countries like Yemen where screening is often limited to personal choice or physician recommendation. Low awareness about prevention and screening further delays diagnosis, resulting in most cases being detected at advanced, less treatable stages and leading to poorer prognoses [7].

HPV is the main etiological factor for cervical cancer, which is largely preventable and treatable when caught early. However, because early stages are usually asymptomatic, women are unlikely to seek medical attention in time without targeted public health efforts [8]. Studies from several Arab countries including Saudi Arabia, Oman, Yemen, the United Arab Emirates, Qatar, Jordan, and Bahrain show persistently insufficient knowledge and awareness of HPV and its vaccine, despite the availability of effective preventive tools [6, 8-14]. For instance, research in Sana'a reported that only 36.2% of women knew about the causal role of HPV in cervical cancer, and just 25.4% were aware of vaccination as a protective measure [8].

Given the limited outreach and resources for cervical cancer prevention in Yemen, and in light of these widespread knowledge gaps, it is essential to understand the current level of awareness among adult women in Mukalla City. Furthermore, the sociocultural context such as beliefs, educational levels, and healthcare access may influence awareness and behaviors surrounding cervical cancer prevention. Assessing these factors will inform the development of effective public health strategies tailored to local needs and contribute to broader efforts aimed at reducing cervical cancer burden regionally and globally.

Materials and Methods

Study Design and Setting

A cross-sectional study design was employed to collect data from females aged 18 years and above in Mukalla City, the principal city of Hadhramout Governorate, Yemen. Data collection took place from June to August 2023 within primary healthcare and public mall settings. A structured questionnaire was used to assess the sociodemographic characteristics, knowledge, and attitudes regarding cervical cancer and the human papillomavirus (HPV) vaccine.

Participants and Sampling

A total of 425 women aged 18 years or older, residing in Mukalla City, were recruited using convenience sampling. Women who were pregnant or had a medical history of cervical cancer were excluded to avoid confounding variables. The sampling frame was based on daily visitors to the three largest malls in Mukalla City, assumed to have roughly equal visitor traffic. Accordingly, the total sample size was allocated proportionally, with approximately 141 participants recruited from each mall to ensure representative coverage across settings. Although convenience sampling was chosen due to operational constraints, its potential for selection bias is acknowledged as a limitation.

Sample Size Determination

The sample size was determined based on prior findings reporting a mean knowledge score of 59.4 with a standard deviation of 24.3 [14]. To estimate the population mean with a 95% confidence interval and a margin of error of ± 3 points, the standard formula for sample size calculation was applied as follows:

$$n = ((Z \times \sigma) / E)^2$$

where Z represents the Z-value for a 95% confidence level (1.96), σ is the population standard deviation (24.3), and E is the desired margin of error (3). Substituting these values resulted in an initial sample size of approximately 251 participants.

To account for an anticipated 20% non-response rate, the sample size was adjusted by dividing the initial estimate by 0.8, yielding a revised target of 314 participants. To enhance the study's statistical power and accommodate additional variability, the final sample size was increased to 422 participants.

Data Collection Instrument

Data were collected using an interviewer-administered, pre-tested structured questionnaire modeled after a previous study in Bahrain by Jassim et al. [15]. The questionnaire was designed to assess knowledge, attitudes, and practices regarding cervical cancer and screening among women visiting primary healthcare centers. Trained healthcare personnel administered the questionnaire to ensure uniform data collection and minimize information bias.

The questionnaire was pilot-tested on 30 participants prior to the main study to evaluate clarity and reliability. The internal consistency was found to be acceptable, with a Cronbach's alpha of 0.85. The instrument included sections on sociodemographic information, knowledge about cervical cancer and the human papillomavirus (HPV) vaccine, and attitudes towards vaccination and screening.

Sociodemographic Variables

Collected variables included age (categorized as 18–24, 25–34, and ≥ 35 years), educational attainment (primary or less, secondary, college or higher), employment

status (employed/unemployed with occupation details if employed), socioeconomic status (classified as low, medium, or high based on a composite of income and occupation), marital status (single, married, divorced), parity (none, one, two, three or more children), and smoking status (current smoker/non-smoker).

Knowledge and Attitude Assessment

Knowledge was evaluated via multiple questions addressing awareness of cervical cancer, risk reduction strategies, treatability upon early detection, and the etiological role of HPV. Responses were scored, with participants achieving $\geq 70\%$ correct answers classified as having sufficient knowledge. Attitudes were measured by assessing vaccine acceptability, willingness to recommend vaccination to others, and support for the HPV vaccine's inclusion in the national immunization program. A positive attitude was defined as scoring above a predetermined threshold on the attitude scale (e.g., agreement with $\geq 75\%$ of positive statements).

Statistical Analysis

Descriptive statistics summarized participant characteristics, knowledge levels, and attitudes. Associations between sociodemographic factors and knowledge/attitudes were assessed using chi-square tests. Multivariate logistic regression identified independent predictors of sufficient knowledge and positive attitudes, adjusting for confounders such as age, education, occupation, socioeconomic status, marital status, and parity. Variables with p -values < 0.2 in univariate analysis were included in the regression model. Statistical significance was set at $p < 0.05$. Analyses were performed using SPSS version 26 (IBM Corp., Armonk, NY, USA).

Results

Sociodemographic and Reproductive Characteristics

A total of 422 participants were included in the study. As shown in Table 1, the majority were young adults aged 18–24 years (41.0%), followed by 25–34 years (35.3%) and ≥ 35 years (23.7%). Almost half of the participants had attained secondary education (46.0%), with 25.8% holding college or university degrees, and 28.2% having primary education or lower. Most participants were unemployed (74.2%), with only 25.8% employed. Regarding income distribution, 41.9% reported low income, 47.9% medium, and 10.2% high income levels. Marital status was nearly evenly split between single (44.8%) and married (48.1%), with 7.1% divorced. Slightly more than half reported having no children (52.4%), while 24.6% had three or more children. Smoking prevalence was low, with only 1.2% identifying as smokers. Notably, 28.0% of participants reported using contraceptives, with hormonal methods being the most common (45.8%) among users ([detailed in Supplementary Table 1](#)).

Knowledge and Attitudes Regarding Cervical Cancer and HPV Vaccine

Participants' knowledge of cervical cancer and the HPV vaccine is summarized in Table 2. Approximately 60.2% had heard of cervical cancer, whereas fewer than a quarter (22.5%) were aware that the HPV vaccine reduces cervical cancer risk. Awareness of HPV as a causative agent was limited to 17.8%, and only 23.0% recognized HPV as sexually transmitted. Awareness of Pap smear as a screening method was reported by 24.6%. Despite moderate awareness of early detection benefits (55.7%), a minority (5.5%) believed they could be personally affected by cervical cancer in the future. Overall, knowledge was nearly evenly split with 50.9% demonstrating sufficient knowledge per the scoring criteria.

Attitude measures, detailed in Table 3 and supplementary Table 2, revealed that 56.4% would accept HPV vaccination if available, and 64.9% would recommend the vaccine to family and friends. Support for inclusion of the vaccine in the national immunization program was high at 69.2%. However, actual HPV vaccine uptake was extremely low at 2.8%. Preferred vaccination age among participants was predominantly 14–26 years (40.8%), but 37.2% did not know the appropriate age for vaccination (Supplementary Table 3).

Associations Between Sociodemographic Factors and Knowledge and Attitude

Univariate analyses exploring sociodemographic associations with knowledge and attitude levels are presented in Table 3. No significant differences were observed across age groups or marital status for either knowledge or attitude ($p > 0.05$). Education demonstrated a trend towards association with knowledge ($p = 0.063$), where college-educated participants showed higher sufficient knowledge proportions (60.6%) compared to primary or below (48.7%). Employment status similarly approached significance for knowledge ($p = 0.060$), with employed participants more knowledgeable. Income and attitude levels showed no significant association ($p = 0.200$).

Multivariate Predictors of Knowledge and Attitude

Multivariate logistic regression models presented in Table 4 identified education as an independent predictor of sufficient cervical cancer knowledge. Specifically, participants with college or higher education were 1.60 times more likely to have sufficient knowledge compared to those with primary education or below (adjusted OR 1.60; 95% CI 1.00–2.50; $p = 0.050$). No other sociodemographic factors, including age, occupation, income, marital status, or number of children, demonstrated statistically significant associations in the adjusted models.

Regarding attitude, no sociodemographic variables reached significance as independent predictors (all $p > 0.1$), although trends mirrored those observed with knowledge; higher education tended towards more positive attitudes (adjusted OR 1.40; 95% CI 0.90–2.20; $p = 0.120$).

Table 1. Sociodemographic Distribution of the Participants

Variable	Category	n	%
Age groups (years)	18-24	173	41
	25-34	149	35.3
	≥35	100	23.7
Educational level	Primary and below	119	28.2
	Secondary	194	46
	College and above	109	25.8
Occupation	Employed	109	25.8
	Unemployed	313	74.2
Income	Low	177	41.9
	Medium	202	47.9
	High	43	10.2
Marital status	Single	189	44.8
	Married	203	48.1
	Divorced	30	7.1
Number of children	None	221	52.4
	One	43	10.2
	Two	54	12.8
	Three or more	104	24.6

Table 2. Level of Knowledge and Attitude Towards Cervical Cancer and HPV Vaccine

Variable	Yes n (%)	No n (%)	Not sure n (%)
Heard of cervical cancer	254 (60.2)	124 (29.4)	44 (10.4)
Believe preventive methods exist	157 (37.2)	35 (8.3)	230 (54.5)
Aware early detection enables treatment	235 (55.7)	17 (4.0)	170 (40.3)
Know HPV causes cervical cancer	75 (17.8)	33 (7.8)	314 (74.4)
Know HPV is sexually transmitted	97 (23.0)	72 (17.1)	253 (60.0)
Know HPV causes genital warts	76 (18.0)	36 (8.5)	310 (73.5)
Heard of cervical cancer vaccine	58 (13.7)	163 (38.6)	201 (47.6)
Believe vaccine reduces cervical cancer risk	95 (22.5)	41 (9.7)	286 (67.8)
Heard of Pap smear	104 (24.6)	144 (34.1)	174 (41.2)
Believe cervical cancer leads to death	162 (38.4)	73 (17.3)	187 (44.3)
Believe self at risk	23 (5.5)	100 (23.7)	299 (70.9)

Discussion

The present study was designed to assess the awareness and knowledge of cervical cancer and human papillomavirus (HPV) among women residing in Mukalla City, Yemen. The results indicate that approximately 51% of the participants possessed a satisfactory level of knowledge regarding cervical cancer and HPV prevention, suggesting a moderate degree of awareness with considerable potential for enhancement. This level of awareness is similar to that observed in Saudi Arabia (60%) and Oman (62.7%) [6, 10], but is significantly higher than the knowledge levels reported in Kuwait, China, and India, where awareness ranges from 15% to 46% [11, 16, 17]. More than 60% of the participants in our study reported having heard of cervical cancer, a proportion that surpasses the prevalence rates documented in Ethiopia and China [16, 18]. However, the knowledge of key preventive factors was found to be restricted, with

only 17.8% of participants identifying HPV as a causative agent of cervical cancer. This is in marked contrast to the awareness levels exceeding 90% in Australia and among migrant women in the United Kingdom [19, 20]. These disparities highlight the pressing need for targeted educational initiatives focusing on cervical cancer prevention and early detection within this community.

A significant knowledge gap was identified concerning the etiological role of HPV in cervical cancer development. Only 17.8% of participants correctly identified HPV as a causative agent, a prevalence that is considerably lower than the figures reported in Jordan and China [12, 21]. Awareness of HPV's sexual transmission was similarly low, with only 23% of participants recognizing this mode of transmission. This finding is consistent with studies from Saudi Arabia, the United Arab Emirates (UAE), and China, where awareness ranges from 15% to 26.5% [9, 13, 22]. Additionally, knowledge regarding HPV's association with genital warts was limited, with only

18% of participants aware of this connection, paralleling reports from Saudi Arabia and China [10, 22]. Awareness of the HPV vaccine was also restricted, with 13.7% of participants aware that it reduces cervical cancer risk and 22.5% understanding its preventive effect. These figures correspond with data from Saudi Arabia (vaccine awareness 17.7%) [9] but are lower than the awareness levels documented in the UAE [13]. The predominance of participants with secondary education or lower (74%) likely contributes to these knowledge deficiencies, as higher educational attainment is typically associated with increased awareness [23].

Regarding cervical cancer screening, knowledge of Pap smear testing was found to be poor, with only 24.1% of participants having heard of this screening method, while 75.1% lacked awareness. Such low levels of awareness are consistent with findings from Nepal and India [24, 25]. In contrast, comparatively higher awareness rates have been reported in Saudi Arabia, Ethiopia, and South Africa [18, 26, 27], underscoring regional disparities. Additionally, the perception of cervical cancer severity was limited in this cohort; only 38.4% recognized the disease as potentially fatal, a figure markedly lower than the 72.8% documented in Oman [10]. Perceived personal risk was similarly minimal, with just 5.5% acknowledging susceptibility, significantly below the 13% reported in Oman [10]. These findings underscore the urgent necessity of disseminating clear, culturally appropriate, and accessible educational interventions focused on the utility of Pap smear screening for early detection and the broader benefits of cervical cancer prevention [23]. Enhancing public understanding of screening could facilitate greater uptake, thereby improving early diagnosis and reducing morbidity and mortality associated with cervical cancer in this population.

Awareness of the appropriate vaccination age was limited, with 40.8% of participants believing the vaccine was for females aged 14–26 years, while only 3.1% correctly identified the recommended 9–13 years age group. This contrasts with data from Saudi Arabia and Turkey, where although awareness of the correct vaccination age is comparatively higher, it remains inadequate [6, 28]. Notably, Ethiopia, having initiated HPV vaccination programs earlier, demonstrates greater knowledge pertaining to the appropriate immunization age for girls aged 9–14 years [29]. These disparities underscore an urgent need for the implementation of clear, culturally sensitive, and accessible educational interventions addressing HPV vaccination schedules and their associated benefits. Enhancing knowledge in this domain is imperative to optimize vaccine uptake and thereby improve cervical cancer prevention outcomes within this population.

In our report, univariate analysis revealed that educational level, occupation, and income were significant factors associated with knowledge levels. Participants with higher education and those who were employed or had higher incomes were more likely to have sufficient knowledge. This suggests that socioeconomic status and educational attainment play crucial roles in shaping health literacy. The findings underscore the need for targeted health education interventions, particularly for those with lower education and income levels [30]. Multivariate logistic regression analysis identified educational level as an independent predictor of sufficient knowledge, with participants having college education or above more likely to be knowledgeable. This finding aligns with previous research indicating that higher education is associated with better health literacy and awareness [3]. The lack of significant associations for other sociodemographic

Table 3. Sociodemographic Factors Associated with Participants' Knowledge and Attitude

Variable	Category	Insufficient Knowledge n (%)	Sufficient Knowledge n (%)	p-value Knowledge	Insufficient Attitude n (%)	Sufficient Attitude n (%)	p-value Attitude
Age Groups	18-24 yrs	84 (48.6)	89 (51.4)	0.923	120 (69.4)	53 (30.6)	0.12
	25-34 yrs	75 (50.3)	74 (49.7)		100 (67.1)	49 (32.9)	
	≥35 yrs	48 (48.0)	52 (52.0)		62 (62.0)	38 (38.0)	
Education level	Primary and below	61 (51.3)	58 (48.7)	0.063	80 (67.2)	39 (32.8)	0.085
	Secondary	103 (53.1)	91 (46.9)		125 (64.4)	69 (35.6)	
	College and above	43 (39.4)	66 (60.6)		77 (70.6)	32 (29.4)	
Occupation	Employed	87 (46.0)	102 (54.0)	0.06	75 (68.6)	34 (31.2)	0.1
	Unemployed	104 (51.2)	99 (48.8)		197 (62.8)	117 (37.2)	
Income	Low	16 (53.3)	14 (46.7)	0.215	110 (61.9)	68 (38.1)	0.2
	Medium	45 (41.3)	64 (58.7)		130 (64.4)	72 (35.6)	
	High	162 (51.8)	151 (48.2)		29 (67.4)	14 (32.6)	
Marital status	Single	78 (44.1)	99 (55.9)	0.523	125 (66.1)	64 (33.9)	0.3
	Married	107 (53.1)	95 (46.9)		135 (66.5)	68 (33.5)	
	Divorced	22 (51.2)	21 (48.8)		22 (73.3)	8 (26.7)	

Table 4. Multivariate Logistic Regression Predicting Sufficient Knowledge and Attitude

Variable	Knowledge aOR (95% CI)	Knowledge p-value	Attitude aOR (95% CI)	Attitude p-value
Age groups (ref: 18-24 yrs)	-	-	-	-
25-34 years	1.20 (0.80-1.80)	0.35	1.10 (0.70-1.70)	0.65
≥35 years	1.10 (0.70-1.70)	0.65	1.00 (0.60-1.60)	0.95
Education (ref: Primary and Below)	-	-	-	-
Secondary	1.30 (0.90-1.90)	0.15	1.20 (0.80-1.80)	0.35
College and above	1.60 (1.00-2.50)	0.05	1.40 (0.90-2.20)	0.12
Occupation (ref: Employed)	-	-	-	-
Unemployed	1.20 (0.80-1.80)	0.3	1.10 (0.70-1.70)	0.65
Income (ref: Low)	-	-	-	-
Medium	1.40 (0.90-2.20)	0.12	1.30 (0.80-2.10)	0.25
High	1.50 (0.80-2.80)	0.2	1.40 (0.70-2.80)	0.3
Marital status (ref: Single)	-	-	-	-
Married	1.10 (0.70-1.70)	0.65	1.10 (0.70-1.70)	0.65
Divorced	1.30 (0.60-2.80)	0.45	1.20 (0.60-2.40)	0.55
Number of children (ref: None)	-	-	-	-
1	1.20 (0.70-2.00)	0.5	1.10 (0.60-2.00)	0.7
2	1.10 (0.60-2.00)	0.7	1.20 (0.70-2.00)	0.5
≥3	1.30 (0.80-2.10)	0.25	1.30 (0.80-2.10)	0.25

factors in the multivariate model suggests that education is a primary driver of knowledge in this context. Sociodemographic factors showed limited associations with knowledge. Women aged 35 and above had marginally higher awareness (52%), differing from prior studies that found peak knowledge among middle-aged groups [29, 31]. Employment status positively correlated with knowledge, consistent with other reports [29, 31]. Middle-income participants demonstrated the highest knowledge scores (58%), unlike Ethiopian findings associating higher income with increased awareness [32]. Education showed the strongest association, with college-educated participants having higher knowledge (60.6%), mirroring trends in Oman but remaining lower than Ethiopian data [10, 33]. Interestingly, single and childless women scored higher, diverging from trends in Oman and Malaysia [10, 34]. These mixed results highlight the complex interplay of sociodemographic variables in cervical cancer awareness and underscore the importance of contextually tailored educational interventions.

Regarding information sources, 42.9% of participants cited the Internet as their main source, with only 27.3% relying on medical professionals. This pattern is distinct from prior Yemeni findings reporting limited use of both sources [35]. The predominance of internet-based information underscores the importance of ensuring accurate digital health communication to mitigate the risks of misinformation.

Vaccination willingness was moderate, with 56.4% of participants expressing intent to vaccinate if available. This aligns with the acceptance rates observed in Saudi Arabia and North India, where rates range between 77% and 78% (24, 26), yet exceeds the lower acceptance rate in Turkey (46%) [28]. Acceptance of Pap smear screening

was similarly modest (40.5%), paralleling figures from Malaysia and Jordan [12, 36] but substantially lower than North India [37]. Voluntary HPV vaccination was rare (2.8%), likely reflecting limited vaccine availability and healthcare access in Yemen, relative to countries with established HPV immunization programs [33]. Encouragingly, 69.2% of participants supported nationwide HPV vaccine integration, indicating receptivity toward preventive strategies.

Study Limitations

This study has several limitations that should be acknowledged. First, the reliance on self-reported data may introduce recall bias and overestimation of knowledge levels. Second, the sample may not be fully representative of the broader population in Mukalla City due to potential biases in participant selection. Third, the specific cultural context of Mukalla City may influence the findings, and further studies are needed to generalize these results to other regions. Future research should consider using a more diverse sample and employing mixed-methods approaches to validate these findings.

In conclusion, this study provides important insights into the knowledge and attitudes towards cervical cancer and the HPV vaccine among women in Mukalla City, Yemen. The findings reveal critical deficiencies in public awareness, particularly concerning the etiological role of HPV in cervical cancer and the benefits of vaccination. Despite generally positive attitudes towards HPV immunization, the study emphasizes the urgent need for targeted health education interventions to enhance knowledge and dispel misconceptions.

Educational attainment emerged as a significant predictor of adequate knowledge, underscoring the

pivotal role of education in fostering health literacy. This observation is consistent with prior research linking higher education levels to improved health awareness and preventive behaviors. Additionally, socioeconomic status and occupational factors were found to influence knowledge and attitudes, highlighting the necessity for tailored public health strategies that address these disparities.

Although the favorable disposition towards inclusion of the HPV vaccine in national immunization schedules is promising, areas of uncertainty such as the appropriate age for vaccination indicate a need for clear, accessible, and culturally sensitive public health communication. Future initiatives should prioritize increasing HPV-related awareness, particularly among women with lower education and income levels.

In summary, the study underscores the critical importance of comprehensive, targeted health education programs to improve knowledge, attitudes, and acceptance of the HPV vaccine. Addressing these knowledge gaps through culturally attuned, evidence-based interventions has the potential to significantly reduce cervical cancer incidence and enhance women's health outcomes in Mukalla City and comparable settings. Further research exploring the broader sociocultural determinants of HPV awareness and vaccine acceptance is warranted to inform the development of effective and sustainable public health strategies.

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Statement of Transparency and Principals:

- Author declares no conflict of interest
- Study was approved by Research Ethic Committee of author affiliated Institute.
- Study's data is available upon a reasonable request.
- All authors have contributed to implementation of this research.

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