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Human Papilloma Virus Vaccine Acceptability and Its Associated Factors among Mothers of Female Children 9 - 14 Years in Ndola District of Zambia

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Abstract

Zambia has the second-highest incidence of HPV-related cervical cancer in sub-Saharan Africa, with a rate of 53.7 per 100,000 women, despite the availability of prophylactic HPV vaccines targeting HPV types 16 and 18. As parental consent is often required for adolescent vaccinations, understanding the factors influencing parental acceptance is essential. This study aimed to assess the acceptability of the human papillomavirus (HPV) vaccine and its associated factors among mothers of female children aged 9 - 14 years in Ndola, Zambia. This cross-sectional survey involved 350 mothers from selected townships in Ndola District and utilized multivariable logistic regression to analyze data. The findings revealed an HPV vaccine acceptability rate of 61.8%. Key factors influencing vaccine acceptance included knowledge of HPV, occupational status, and alcohol consumption. Mothers who had knowledge of HPV were 2.41 times more likely to accept vaccination for their daughters [AOR 2.41 (95% CI: 1.63 - 3.62)]. Employment status also played a significant role, with employed mothers being 1.47 times more likely to accept the vaccine [AOR 1.47 (95% CI: 1.02 - 2.13)]. Additionally, mothers who did not consume alcohol were 1.81 times more likely to accept the vaccine for their daughters [AOR 1.81 (95% CI: 1.22 - 2.66)]. We conclude that the HPV vaccine acceptability rate in Ndola, Zambia, remains suboptimal. This underscores the need for targeted interventions, such as public health campaigns and educational

programs, to improve HPV vaccine knowledge and acceptance, particularly among specific demographic groups. Enhancing understanding of the HPV vaccine's benefits could contribute to reducing the high burden of cervical cancer in Zambia.

Keywords

Human Papillomavirus, Cervical Cancer, Vaccine Acceptability, Zambia

1. Introduction

Human papillomavirus (HPV) is one of the most prevalent sexually transmitted infections globally, and it represents a significant risk factor for cervical cancer, which remains a severe and potentially fatal disease [1]. Over 15 - 20 HPV types are linked to cervical cancer, with HPV types 16, 18, 31, and 45 being the most commonly detected, while HPV type 16 alone accounts for nearly half of all cervical cancer cases worldwide [2]. Despite the high prevalence and associated risk, HPV infections frequently remain asymptomatic, underscoring the importance of early detection through routine screening programs [3].

Two prophylactic vaccines, Cervarix® and Gardasil®, have been developed to protect against the most high-risk HPV types, 16 and 18, which are responsible for the majority of cervical cancer cases [4]. However, the uptake of these vaccines in developing countries, including Zambia, remains limited due to several challenges [5]. The target population for these vaccines young adolescents aged 9 - 14 years requires parental consent, and parental understanding of HPV, its associated risks, and the benefits of vaccination play a critical role in the success of vaccination programs [6]. In Zambia, there is limited data on HPV vaccine acceptability among mothers of adolescent girls, a knowledge gap that may hinder the effectiveness of vaccination efforts [1].

In resource-constrained settings such as Zambia, where the incidence of HPV-related cervical cancer ranks second highest in sub-Saharan Africa and sixth globally, there is a substantial burden due to the lack of comprehensive preventive strategies and treatment options [6]. Cervical cancer in Zambia represents a leading cause of cancer-related deaths among women, further highlighting the critical need for effective prevention through both screening and vaccination [7].

Zambia's high HPV infection rates, second only to Tanzania in sub-Saharan Africa, emphasize the urgency of implementing effective preventive measures, including a comprehensive cervical cancer screening program and widespread vaccination of adolescents [3]. The success of the HPV vaccination program is intimately tied to the knowledge and attitudes of parents, especially mothers, who are key decision-makers in vaccinating their daughters. Yet, there is a paucity of research on these factors in Zambia, which must be addressed to optimize the reach and impact of HPV vaccination efforts [8]. Given that HPV is a leading cause of

cervical cancer, which is the second most common cancer in women worldwide, and that this risk is largely preventable through vaccination, understanding the factors influencing vaccine acceptability is essential [9]. Investigating parental knowledge, attitudes, and acceptance of HPV vaccines will provide crucial insights for shaping future public health interventions and ensuring the success of HPV vaccination programs, particularly in high-risk, resource-limited settings like Zambia.

2. Literature Review

Cervical cancer remains a significant global health challenge, with over half a million women diagnosed annually and more than half of these cases resulting in death. The burden is disproportionately high in developing countries, such as Zambia, where 85% of cervical cancer deaths occur [10]. In Zambia, cervical cancer is the most common cancer among women, largely due to the high prevalence of human papillomavirus (HPV) infection, which is the primary cause of cervical cancer. It is estimated that about 33.7% of women in the general population of Zambia harbor HPV infection at any given time, further compounding the public health burden [6].

HPV is a leading cause of cervical cancer worldwide, particularly in regions such as Latin America, Southeast Asia, and sub-Saharan Africa. Zambia, like many other sub-Saharan African countries, faces numerous challenges in the early detection and treatment of cervical cancer, contributing to late-stage diagnosis when effective treatment is often difficult. Limited access to healthcare facilities, inadequate screening programs, and a lack of public awareness are significant barriers to early detection [11].

2.1. Vaccine Acceptability Levels

Research from various regions shows varying levels of HPV vaccine acceptability among parents. In developed countries such as the U.S. and U.K., initial studies indicated high vaccine acceptance despite low HPV awareness. Similarly, high acceptability was observed in Argentina and Indonesia, where parents expressed a willingness to vaccinate their daughters if the vaccine was affordable. In Africa, acceptability ranges from 59% to 100%, with countries like Nigeria and Kenya reporting a strong willingness to vaccinate [12]. In Zambia, studies on HPV vaccine acceptability are limited. However, early data suggest that social and cultural beliefs, along with the affordability and accessibility of vaccines, play a crucial role in shaping parental attitudes [13].

Since Zambia introduced the HPV vaccine into its routine immunization schedule in 2018 [14], vaccine uptake has faced challenges, primarily due to limited awareness about the vaccine's importance. A recent study conducted in Lusaka showed that the acceptability of the HPV vaccine among mothers was influenced by socio-economic factors and healthcare access, with more affluent and educated families showing higher acceptability [15].

2.2. Socio-Demographic Factors Associated with HPV Vaccine Acceptability

Educational level, employment status, and income have been identified as significant factors influencing vaccine acceptability globally. In Zambia, these same factors are likely at play. Higher education levels tend to correlate with greater knowledge of HPV and increased vaccine acceptance, as has been observed in other African countries [16]. Furthermore, families with higher income levels are more likely to have access to healthcare services and preventive measures, including vaccinations. Conversely, unemployment and lower income levels are associated with decreased vaccine uptake in many developing countries, including Zambia [15].

2.3. Knowledge and Beliefs on HPV Vaccination

Parental knowledge of HPV and its vaccines plays a crucial role in vaccine acceptance. Studies from Zambia indicate that many parents are unaware of the link between HPV and cervical cancer, which significantly impacts vaccine uptake [13]. Efforts to raise awareness about HPV and its prevention through vaccination are crucial to improving vaccine coverage. As seen in other regions, positive beliefs about the vaccine's efficacy and protection against serious diseases strongly predict vaccine uptake.

2.4. Parental Attitudes towards HPV Vaccination

Attitudes toward HPV vaccination in Zambia, as in many other parts of the world, are shaped by cultural, religious, and social beliefs. In some Zambian communities, traditional beliefs and misinformation about vaccines may hinder their acceptance. For instance, misconceptions about the vaccine's potential side effects or concerns that vaccination may promote promiscuity have been noted in certain areas [11]. These cultural barriers need to be addressed through community engagement and education to improve vaccination rates.

2.5. Conclusion

While global HPV statistics illustrate the severity of the disease, Zambia faces one of the highest incidences of cervical cancer in sub-Saharan Africa. The introduction of the HPV vaccine in Zambia, although significant, has been met with varying levels of acceptance. This study focuses on Ndola District, where understanding maternal acceptability of the HPV vaccine is critical to improving vaccination coverage and reducing cervical cancer incidence.

GENERAL OBJECTIVE

The general objective was to determine HPV vaccine acceptability and its associated factors among mothers of female children aged 9 - 14.

SPECIFIC OBJECTIVES

The specific objectives were:

1) To estimate HPV vaccine acceptability among mothers of female children 9-

14 years old.

2) To establish the association between parents; levels of knowledge and acceptance of HPV vaccination.

3) To determine the association between parental attitude and acceptance of HPV vaccination.

4) To determine the association between parental beliefs and acceptance of HPV vaccination.

3. Methodology

Healthcare in Zambia is provided through public, private for-profit and private not-for-profit (mission) facilities. The MOH manages the majority of healthcare facilities, including 100% of third-level hospitals, 67% of second-level hospitals, 49% of first-level hospitals, 87% of health centers, and 95% of health posts. Mission hospitals primarily serve rural areas, while private for-profit facilities are concentrated in urban centers. Health financing comes from the national budget, multi- or bilateral aid, user fees, and employer contributions. The study design was a cross-sectional survey in selected townships in Ndola District on the Copperbelt Province of Zambia

3.1. Study Population

This survey targeted at mothers to adolescent girls aged 9 - 14 years old.

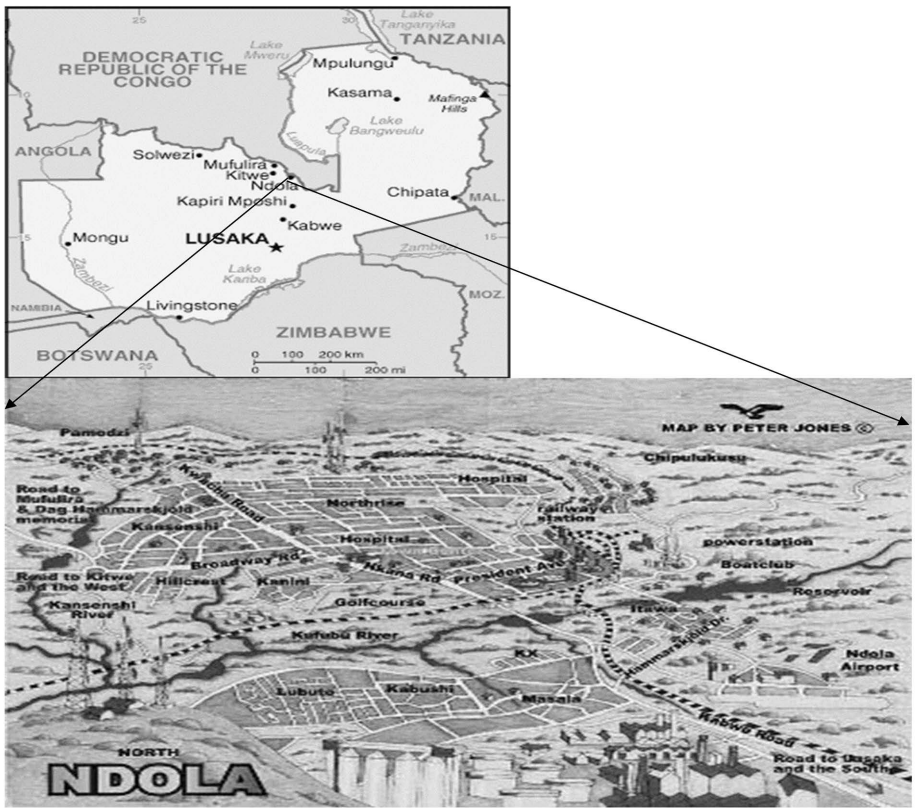

Figure 1. Study sites in Ndola, Zambia. Source: https://images.app.goo.gl/Afx718psdydThftP8.

3.2. Study Sites

The study was conducted in Ndola District on the Copperbelt Province of Zambia. Ndola has an estimated population of about Six hundred and fifty-eight thousand (2011) people and 40,454 are mothers in participating sites. The study areas that participated in this study were Kabushi, Chifubu, Kaloko and Lubuto. Figure 1 shows the map of Zambia and the study site.

Details of the breakdown of estimated adolescent populations are presented in Table 1 below.

Table 1. Adolescent population at the study sites.

Study site	Total population	Adolescent Population	Mothers Population
LUBUTO	55,319	13,830	13,830
KALOKO	17,858	4465	4465
KABUSHI	30,647	7662	7662
CHIFUBU	57,984	14,496	14,497

3.3. Study Design

The study design was a cross-sectional survey in selected townships in Ndola District on the Copperbelt Province of Zambia.

3.4. Sample Size

The sample size calculation used the fisher's exact formula (Jung 2014) as follows:

$$\text{Sample size} = \frac{n}{1+\frac{n}{\text{population size}}}$$

where $n = Z^2 \frac{P(1-P)}{e^2}$

Assuming a response rate of 90%, (161/0.90), the sample size was 350 (Table 2).

Table 2. Values used in the equation.

Approximate Population Size.	40,454
Level of Confidence Measure (Z)	1.96 (at 95% Confidence level)
The Margin of Error (e^2)	5%
Baseline levels of the indicators/Prevalence (P)	21.6% (Kalima *et al.* 2015; IARC 2018)

The calculated sample size is 350 parents.

3.5. Sample Size Allocation

The total sample size (S.Z.) was allocated per study site using a random sampling of mothers proportionate to adolescents' population. Therefore, a sampling fraction was calculated and multiplied by the total population at each site to determine

the sample size for that site as follows:

Sampling fraction (SF) = sample size/total population.

Therefore, SF (350/161,808) = 0.00216 (Table 3).

Table 3. Sample size distributions per township.

Study site	The total population of mothers	SF × SZ	Sample size per site
Lubuto	55,319	55,319 × 0.00216	119
Kaloko	17,858	17,858 × 0.00216	40
Kabushi	30,647	30,647 × 0.00216	66
Chifubu	57,984	57,984 × 0.00216	125
Total	**161,808**		**350**

3.6. Sampling

Simple random sampling was implemented to ensure that each eligible household had an equal chance of being selected. A list of eligible mothers was obtained from local health records, and random numbers were generated using statistical software to select participants. This approach ensured that selection bias was minimized, and the sample accurately represented the target population.

Inclusion criteria and Exclusion criteria: Inclusion criteria were limited to mothers of female children aged 9 - 14 years who provided informed consent and were able to comprehend the language used in the questionnaire. Language comprehension was assessed through a brief interview or screening with open-ended questions to evaluate the participant's ability to understand and respond accurately in the study language. An evaluation of prior education records to confirm language instruction in the study language or related proficiency level was also done.

This ensured that language comprehension was adequately assessed and helped minimize bias, Those who demonstrated difficulty in understanding the language were excluded to prevent misinterpretation of survey questions, which could introduce bias.

3.7. Study Procedure

After getting the number of households from the central statistical office, the calculated sample size was allocated proportionally to the population's size in each town. Parents from each town were selected using simple random sampling .10 data collectors, and two supervisors collected data. Data clerks were trained to recruit and interview participants using a simple random sampling of households at intervals in any direction. A structured questionnaire was used to collect the study data. Only one mother was interviewed per household. Parents' addresses with children aged 9 - 14 for those in school and those out of school were collected from respective schools in the catchment area. All these activities were done in

compliance with health guidelines under COVID-19 like wearing masks by data collectors, washing or sanitizing of hands, a social distance of at least one meter from the respondent was maintained.

3.8. Data Collection and Analysis

Data Collection: A community-based cross-sectional study was conducted among parents of girls aged 9 - 14 years in Kaloko, Kabushi, Lubuto, and Chifubu areas within Ndola district, Zambia. Eligible participants were parents aged 18 or older who were available during data collection. The study utilized a structured questionnaire covering demographics, acceptability, knowledge, attitudes, and beliefs regarding the HPV vaccine. Knowledge was evaluated using "Yes," "No," or "Do not know" responses, while attitudes, beliefs, and acceptability were assessed through a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Data Analysis: Mean scores were computed for knowledge, attitudes, beliefs, and acceptability of the HPV vaccine. Participants scoring above the mean were categorized as knowledgeable, while those scoring below were considered unknowledgeable. Attitudes, beliefs, and acceptability were similarly classified.

Statistical analysis was performed with SPSS version 20. Both adjusted and unadjusted odds ratios with 95% confidence intervals were reported. The assumptions for logistic regression were checked for variables such as age, education, religion, income, occupation, lifestyle factors (alcohol consumption, smoking), medical history (abnormal pap smear, cervical cancer), and knowledge, beliefs, and attitudes toward the HPV vaccine. Binary logistic regression initially identified factors associated with HPV vaccine acceptability, with predictors showing a p-value ≤ 0.25 included in a final multivariable logistic regression model using a backward stepwise selection method. The final model identified income, education level, alcohol consumption, and knowledge of the HPV vaccine as significant predictors of acceptability. Statistical significance was set at $p < 0.05$ [17].

3.9. Ethical Considerations

Ethical approval was obtained from the Ethics Review Committee at the Tropical Disease Research Center (TDRC) and the National Research Health Authority. Written consent was obtained from each participant, with assurance of their right to withdraw from the study at any point without consequence. Although there was no direct benefit to participants, the findings aimed to benefit the wider community. Minimal risk was posed, and confidentiality was maintained by conducting surveys in safe locations chosen by participants and excluding personal identifiers from collected data.

4. Results

In this study, 350 parents or guardians were initially approached, and 340 participants were included in the final analysis, yielding a response rate of 97.1% after excluding ten questionnaires due to uncorrectable errors. Key demographic findings

revealed that 46.6% of respondents were over the age of 35, and 51.9% had completed secondary education. The majority identified as Christian (96.2%), with 57.7% reported as unemployed. Among the employed, 67.0% earned less than ZMW 2000 per month.

Regarding lifestyle factors, 52.0% of mothers had consumed alcohol, while 92.5% had never smoked. Health-related findings showed that 6.9% of mothers had a history of abnormal pap smears, and 15.5% reported a family history of cervical cancer (Figure 2).

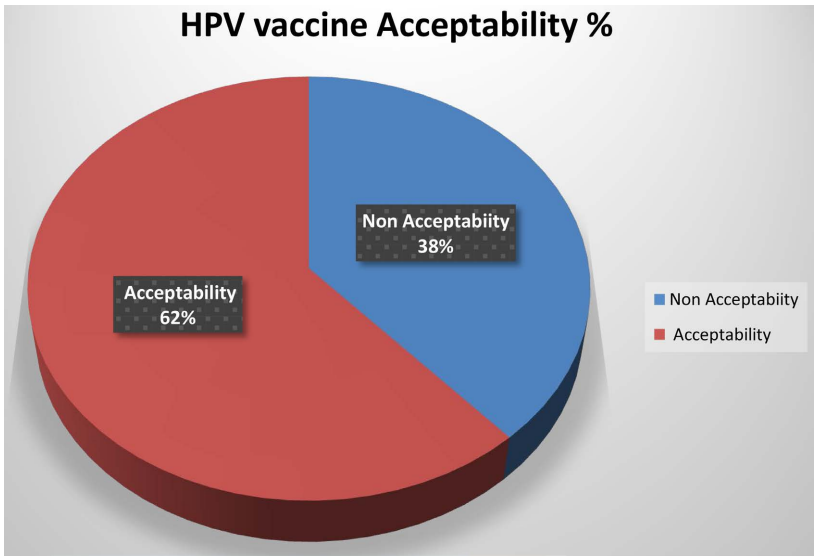

Figure 2. Family history of cervical cancer.

Table 4 shows that 88.0% of participants rated with agreement on whether they "would you agree to have their daughter vaccinated if Ministry of Health offered HPV vaccine free to 9 - 12 years old girls". While 87.3% agreed with giving vaccination to every child, 54.6% disagreed with having their children vaccinated if at all cost was added to the Vaccine.

Table 4. Social demographic characteristics for mothers of female children 9 - 14 years old in Lubuto, Kaloko, Kabushi and Chifubu towns in Ndola district (N = 340).

Characteristics	n	(%)
Address category		
Lubuto	115	33.8
Kabushi	65	19.1
Kaloko	40	11.8
Chifubu	120	35.3
Age (years) (N = 328)		
Less than 30	84	25.6
3034	91	27.7
Over 35	153	46.6

Continued

Education level (N = 314)		
Primary	122	38.9
Secondary	163	51.9
University or college or vocational	29	9.2
Religion (N = 324)		
Christian	311	96.2
Non-Christian	13	3.9
Income (N = 282)		
Less 2000 ZMW	189	67.0
More than or equal to 2000 ZMW	93	33.0
Occupation (N = 306)		
Unemployed	176	57.5
Employed	130	42.5
Alcohol drinking (N = 269)		
Never drink	129	48.1
Drink alcohol	140	52.0
Cigarette Smoking (N = 266)		
Never Smoked	246	92.5
Smoked	20	7.5
Mother ever had an abnormal Pap smear (N = 305)		
Yes	21	6.9
No	284	93.1
Mother or relative history of cervical cancer (N = 304)		
Yes	47	15.5
No	257	84.5

The mean score was 130 (38.2%), which were considered no-acceptability. Those above the mean score were 210 (61.8%) and were considered acceptability (Table 5).

Table 5. Frequency distribution of respondents of HPV vaccine acceptability.

	Question and Statements	[a]Disagree		[a]Agree	
		n	%	n	%
a)	Would you agree to have your daughter vaccinated if Ministry of Health offered HPV vaccine free to 9 - 12 years old girls?	40	12.0	292	88.0
b)	Do you agree with the policy of giving vaccination to every child?	42	12.7	288	87.3
c)	Do you consider vaccinating yourself (for mother)?	120	38.1	195	61.9

Continued

d)	Will you accept active HPV vaccination of your daughter?	40	12.5	280	87.5
e)	If your daughter is not in the target group do you still want to take her for vaccination	153	47.7	168	52.3
f)	If the government offers HPV vaccination free, I will vaccinate my daughter	36	11.1	287	88.9
g)	If HPV had a cost would you still vaccinate your daughter	171	54.6	142	45.4
h)	I do not have enough information about the HPV vaccine to decide whether to give it to my daughter	205	62.5	123	37.5
i)	The HPV vaccine is so new that I want to wait a while before deciding if my daughter should get it	203	61.3	128	38.7

[a]Results are summarized as agree (agree, strongly agree) and disagree (Unsure, disagree and strongly disagree).

Table 6 presents the factors associated with HPV vaccine acceptability through bivariate analyses (Model 1). The analysis revealed statistically significant associations for educational level, monthly income, cigarette smoking, mother's history of cervical cancer, and knowledge about the HPV vaccine.

- **Age**: The age distribution among participants showed 25.6% under 30, 27.7% aged 31 - 35, and 46.6% above 35 years. Age was not statistically significant (p-value 0.148).
- **Education Level**: 38.9% of participants had primary education, 51.9% had secondary education, and 9.2% had higher education. Education level was statistically significant (p-value 0.006).
- **Religion**: The majority of participants were Christians (96.0%), with non-Christians at 4.0%. Religion was not statistically significant (p-value 0.361).
- **Income**: 67.0% of participants earned less than ZMW 2000, while 33.0% earned ZMW 2000 or more. Income was not statistically significant (p-value 0.051).
- **Alcohol Consumption**: 48.0% of participants never drank alcohol, while 52.8% did. Alcohol consumption was not statistically significant (p-value 0.248).
- **Cigarette Smoking**: 92.5% of mothers never smoked, and 7.5% did. Smoking was statistically significant (p-value 0.022).
- **Pap Smear History**: 6.9% of mothers reported having an abnormal pap smear, while 93.1% did not. This was not statistically significant (p-value 0.057).
- **History of Cervical Cancer**: 15.5% of mothers reported a history of cervical cancer, while 84.5% did not. This was statistically significant (p-value 0.032).
- **Knowledge about HPV Vaccine**: 65.3% of participants were knowledgeable about the HPV vaccine, while 34.8% were not. This was statistically significant (p-value 0.000).
- **Attitude towards HPV Vaccine**: 42.9% had a negative attitude, while 57.1% had a positive attitude. Attitude was not statistically significant (p-value 0.822).
- **Belief about HPV Vaccine**: 49.7% of mothers had a belief in the vaccine, while 50.3% did not. Belief was not statistically significant (p-value 0.503).

Table 6. Factors associated with HPV acceptability in bivariate analyses.

Factors	Total n (%)	No n (%)	Yes n (%)	p-value
Age (years) (N = 328)				
Under 30	84 (25.6)	25 (20.3)	59 (70.2)	
31 - 34	91 (27.7)	33 (26.8)	58 (63.7)	0.148
Over 35	153 (46.6)	65 (52.8)	88 (57.5)	
Education level (N = 314)				
Primary	122 (38.9)	36 (29.3)	86 (45.0)	
Secondary	163 (51.9)	70 (56.9)	93 (48.7)	0.006
University or College or Vocational	29 (9.2)	17 (13.8)	12 (6.3)	
Religion (N = 324)				
Christian	311 (96.0)	116 (94.3)	195 (97.0)	0.361
Non-Christian	13 (4.0)	7 (5.7)	6 (3.0)	
Income (N = 282)				
Less 2000 ZMW	189 (67.0)	81 (74.3)	108 (62.4)	0.051
More than or Equal to 2000 ZMW	93 (33.0)	28 (25.7)	65 (37.6)	
Current occupation (N = 306)				
Unemployed	176 (57.5)	63 (52.9))	113 (60.4)	0.236
Employed	130 (42.5)	56 (47.1)	74 (39.6)	
Alcohol drinking (N = 269)				
Never Drink	129 (48.0)	39 (42.9)	90 (50.6)	0.248
Drink Alcohol	140 (52.0)	52 (57.1)	88 (49.4)	
Cigarette Smoking (N = 266)				
Never Smoked	246 (92.5)	79 (86.8)	167 (95.4)	0.022
Smoker	20 (7.5)	12 (60)	8 (4.6)	
Mother ever had a Pap smear (N = 305)				
Yes	21 (6.9)	12 (10.9)	9 (4.6)	0.057
No	284 (93.1)	98 (89.1)	186 (95.4)	
Mother history of cervical cancer (N = 304)				
Yes	47 (15.5)	10 (9.1)	37 (19.1)	0.032
No	257 (84.5)	100 (90.9)	157 (80.9)	
Knowledge (N = 340)				
Knowledgeable	222 (65.3)	68 (52.3)	154 (73.3)	0.000
Unknowledgeable	118 (34.7)	62 (47.7)	56 (26.7)	
Attitude (N = 340)				
Positive attitude	194 (57.1)	73 (56.2)	121 (57.6)	0.822
Negative attitude	146 (42.9)	57 (43.8)	89 (42.4)	
Belief (N = 340)				
Belief	169 (49.7)	68 (52.3)	101 (48.1)	0.503
Unbelief	171 (50.3)	62 (47.7)	109 (51.9)	

In Table 7, The results indicate the following associations with vaccine acceptance for daughters:

1) Occupational Status: Employed mothers were 1.47 times more likely to accept the vaccine for their daughters than unemployed mothers, controlling for other factors (Adjusted Odds Ratio: 1.47, 95% CI: 1.02 - 2.13).

2) Alcohol Consumption: Mothers who never consumed alcohol had an 81% higher likelihood of vaccinating their daughters compared to mothers who drank (Adjusted Odds Ratio: 1.81, 95% CI: 1.22 - 2.66).

3) Knowledge of HPV Vaccine: Mothers who were aware of the HPV vaccine were 2.41 times more likely to accept it for their daughters compared to those unaware of it (Adjusted Odds Ratio: 2.41, 95% CI: 1.63 - 3.62).

Table 7. Independent factors associated with HPV acceptability.

Factors	Adjusted OR (95% CI)
Current occupation (N = 306)	
Employed	1.47 (1.02, 2.13)
Unemployed	1
Alcohol drinking (N = 269)	
Never drink	1.81 (1.22, 2.66)
Drink alcohol	1
Knowledge (N = 340)	
Knowledgeable	2.41 (1.66, 3.49)
Unknowledgeable	1

5. Discussion

Parents' decisions regarding HPV vaccination for their children are complex and influenced by a blend of knowledge, attitudes, beliefs, and cultural or religious factors. National policies, alongside accessible health services such as vaccination programs, sensitization efforts, and screening initiatives, play a pivotal role in shaping HPV vaccine acceptability. The HPV vaccine was introduced in Zambia in 2018; however, research on its acceptance and related factors has been limited, highlighting a need to examine determinants influencing vaccine uptake, which may impact future HPV vaccination deployment strategies [18]-[20].

5.1. Level of HPV Vaccine Acceptability

This study identified that 61.8% of participants were willing to vaccinate their children against HPV, a rate below the WHO-recommended coverage of 80% [21] [22]. Similar findings have emerged globally: in Malaysia, 63% of parents expressed willingness to vaccinate despite existing awareness of the vaccine. Comparatively, Sub-Saharan African countries like Botswana and Kenya reported higher acceptance rates of 88% and 88.1%, respectively [7]. In Nigeria, maternal acceptability was also high at 89.1% [2], whereas, in Northeastern China, vaccine acceptability was significantly lower at 39.6% among mothers of female children

[23].

5.2. Socioeconomic Status

Socioeconomic status (SES) impacts health standards and vaccination acceptance. In this study, unemployed parents were less likely to accept HPV vaccination for their children compared to employed parents who could afford quality healthcare services. Research in Malaysia corroborates these findings, showing employed parents are twice as likely to vaccinate their children compared to unemployed parents [24]. Similar trends were found in Norway and Denmark, where employment positively influenced vaccination rates [25]. These findings highlight the importance of community outreach programs, such as health presentations and vaccinations, particularly in low-income areas to improve HPV vaccine access [26].

5.3. Lifestyle Factors

Lifestyle factors, including alcohol consumption, were significantly associated with HPV vaccine acceptability. Parents who abstained from alcohol were more likely to accept the vaccine for their children. In Kenya, similar findings suggest that alcohol consumption may negatively impact parental adherence to vaccine schedules [27]. A study in Thailand linked parental alcohol consumption to diminished healthcare adherence. To address this, government policies could focus on mitigating the negative consequences of harmful alcohol use on vaccination compliance.

5.4. Knowledge Levels on HPV Vaccine

This study demonstrated that higher knowledge levels about the HPV vaccine correlate with greater acceptability among parents. Vaidakis *et al.* (2017) observed that supportive beliefs and good knowledge positively influenced vaccine acceptance. Consistent with the Health Belief Model [8], knowledge mediates individual beliefs and behaviors. Studies across Romania and South Africa reported varying knowledge levels, with 88.5% of Romanian participants aware of HPV, while only 48% of South Africans were knowledgeable despite vaccine licensing [28] [29] In Nigeria, good knowledge of HPV and cervical cancer correlated with a 39.6% acceptance rate [1].

5.5. Global and National Vaccination Frameworks

The Global Vaccine Action Plan emphasizes universal access to vaccinations, which aligns with Zambia's commitment to a free-of-charge, effective vaccination program with over 95% coverage. The successful integration of HPV vaccination is essential to achieving Zambia's strategic health objectives, including reducing cervical cancer incidence (Zambia Comprehensive Plan, 2015) [30].

6. Conclusion

HPV vaccine acceptability among mothers of female children 9 - 14 years old, was

reasonably high. The study found an association between knowledge about HPV and acceptance of HPV vaccine. Therefore, it is critical to conduct effective education programs to raise awareness and knowledge of HPV vaccine, boosting public confidence regarding vaccine safety and effectiveness. Information, education and communication (IEC) materials intended to draw attention to the HPV vaccine could be given to the community. Parents who reported a higher income were more likely to vaccinate their children than those with a lower income. Based on this finding, it is essential to develop community-based programs such as outreach strategies that may be presentations to groups such as women gathered in farming cooperatives and markets, especially in low settings. The study also found that mothers who never drank alcohol were more likely to vaccinate their children than mothers who drank alcohol to address alcohol consumption. Through the Ministry of Health, the government should develop a national drug policy that should guide production, distribution, and alcohol consumption. The policy should aim to provide measures to mitigate various negative consequences of the harmful use of alcohol, such as parents not adhering to vaccine schedules and programs for their children. Findings show that parents who were employed were more likely to vaccinate their children than those who were unemployed. Parents who were employed were able to afford and access quality health services the results of this study are promising for future implementation of HPV vaccination in the national childhood vaccination program in Zambia.

7. Limitations

The study did not capture any male parent; this may have given a holistic view of HPV vaccine acceptability.

In addition to limited generalizability due to the peri-urban setting, selection bias may have occurred, as mothers who agreed to participate may differ from those who declined. Moreover, the use of interviewer-administered questionnaires could have introduced response bias. Future studies should implement double-blind data collection methods to minimize such biases.

8. Recommendations

To increase HPV vaccine acceptance and coverage in Zambia, especially within the Copperbelt Province, a combination of province-specific and national interventions is essential. Key recommendations include:

Provincial Interventions

1) Community Outreach: Conduct presentations and door-to-door campaigns on HPV vaccine benefits at community hubs, targeting low-income areas and engaging community health workers to improve knowledge and access.

2) Targeted Education: Run focused education sessions on HPV and cervical cancer, utilizing radio, television, and social media to disseminate clear, accessible vaccine information.

3) Youth and School Programs: Integrate HPV awareness in school curricula

and organize school-based vaccination days to normalize and facilitate vaccination.

4) Alcohol Awareness and Support: Offer workshops on the impacts of alcohol on family health, partnering with NGOs to support parents in making informed health decisions.

National Interventions

1) Policy Development: Enact policies to integrate HPV education into antenatal and child health services, making vaccine information a core part of national health campaigns.

2) Community Leader Partnerships: Train religious and cultural leaders to share accurate vaccine information within their communities, fostering trust and addressing hesitancy.

3) Media and Technology Initiatives: Implement a national HPV awareness campaign using media, and develop digital tools like an HPV vaccine portal or app to deliver credible information and reminders.

4) Data-Driven Strategies: Conduct periodic studies to identify barriers and adjust interventions based on findings, collaborating with research institutions to continuously monitor vaccine acceptability and coverage.

These combined efforts aim to enhance HPV vaccine accessibility and acceptance, supporting Zambia's goals of reducing HPV-related cancers and promoting long-term public health.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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