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RESEARCH

Assessment of behavioral and social drivers influencing community awareness, knowledge, perception, and attitudes toward human papillomavirus vaccination in Sierra Leone

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Understanding community awareness, knowledge, perceptions, and attitudes toward the Human Papillomavirus (HPV) vaccine is important for improving vaccination coverage. Limited research exists on the behavioral and social factors influencing HPV vaccine uptake in Sierra Leone. As a result, the study seeks to assess the behavioral and social factors influencing HPV vaccination in Sierra Leone. A convenience sampling approach was used for the selection of the participants at the district and chiefdom level. Data were collected via the KOBO collect tool. A total of 1345 respondents took part in filling out the survey. However, due to missing information, 1231 responses were employed for analysis using Excel software. Virtually all participants in the Eastern, Northern, and Western regions had heard of HPV, with healthcare workers being the primary source of information (49.8%). However, a significant knowledge gap was observed, as most respondents in the four regions could not link HPV to cervical cancer. Concerns about vaccine safety, particularly side effects (39.7%) and fertility issues (28.0%), were prevalent. Despite these concerns, over 75% of respondents expressed a willingness to vaccinate their children, though actual vaccine uptake was low (less than 25% across all regions). Cultural and religious beliefs were found to influence attitudes toward vaccination, with regional variations in the perceived impact of these factors. Although awareness of HPV is high in Sierra Leone, knowledge gaps and misconceptions about the vaccine's safety and its link to cervical cancer persist. Communication strategies should focus on (a) educating the public about the connection between HPV and cervical cancer and (b) addressing misconceptions about vaccine safety, particularly regarding side effects and fertility. Healthcare workers remain a trusted source of information, but peer influence should also be leveraged to improve vaccine uptake. These findings highlight the need for targeted public health interventions to increase HPV vaccination coverage in Sierra Leone.

Keywords: attitude, awareness, cervical cancer, human papilloma virus vaccine, knowledge.

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Introduction

Cervical cancer is one of the most common gynecological malignancies and the fourth leading cause of cancer deaths in women worldwide. Human Papillomavirus (HPV) is a family of more than 170 viruses, 15 of which are classified as high-risk HPV types and have been linked to the development of HPV-related cancers, including cervical cancer (1). Cervical cancer is low among schoolgirls; nonetheless, 604,127 new cases and 341,831 deaths of middle-aged women from cervical cancer have been recorded globally in 2020 (1). Developing countries, such as those in Sub-Saharan Africa, account for around 85% of cancer deaths and over 90% of cervical cancer cases. These high rates are mostly attributable to the proliferation of the HPV, a major cause of cervical cancer, and the absence of HPV vaccination, which is an effective preventive intervention (2). It is believed that approximately 75% of sexually active men and women will get an HPV infection in their lifetime (3). Young individuals are the most likely to contract HPV infections because they engage in the highest sexual risk activities. Sexually active young women, in particular, are at the highest risk of infection, with studies indicating rates as high as 68%–71% (4). The Papanicolaou (Pap) test, which detects the HPV, and sociocultural factors like access to healthcare, family planning, and education helped reduce the prevalence of cervical cancer between 1990 and 2019, despite the notable disparity in the disease's distribution between low- and high-income nations (5).

In Sierra Leone, an estimated 486 new cases of cervical cancer were reported in 2023, yielding an age-standardized incidence rate of 16.5 per 100,000 women. In the same year, an estimated 292 women died from the condition, resulting in an age-standard death rate of 10.9 per 100,000 women (6). Without intervention, the disease is expected to kill 8409 women in Sierra Leone between 2020 and 2070, increasing to 12,074 by 2120. If Sierra Leone meets the WHO's projected "90-70-90" targets by 2030, cervical cancer could be eliminated as a public health hazard by 2073, and 87,073 lives might be saved by 2120. HPV vaccination is a preventive measure designed to reduce the risk of cervical cancer and other HPV-related illnesses (7).

The public's understanding of the importance of the HPV vaccine, as well as attitudes and risk perceptions about its use, has a substantial impact on vaccination coverage. In Sierra Leone, there is minimal research on how community awareness and sociocultural factors influence attitudes and decision-making around HPV vaccination. This study aims to bridge this knowledge gap by assessing the behavioral and social drivers of HPV vaccination in Sierra Leone, focusing on awareness, knowledge, perception, and attitudes among parents, guardians, and caregivers of children aged 10–12 years. By identifying the key barriers and facilitators to HPV vaccine uptake, this study will provide evidence-based insights to inform targeted public health interventions. Understanding the drivers of awareness and perception is critical, building on lessons learned from previous public health challenges such as the response to Ebola, COVID-19, and other vaccine-preventable diseases. As a result, the study seeks to assess the behavioral and social factors influencing HPV vaccination in Sierra Leone.

Materials and methods

Research design and sampling technique

This cross-sectional study was conducted in Sierra Leone. Sierra Leone is divided into five regions; the Western region is a highly populated and dense area with a population density of 7397 per square kilometer (8). A stratified random sampling technique was used to select chiefdoms for the study. The Western region consists of two districts, the Northwest consists of two districts, the Southern region consists of four districts, the Eastern region consists of three districts, and the Northern region consists of five districts. From each district, four chiefdoms were randomly selected. A convenience sampling approach was used for the selection of the participants at the district and chiefdom levels.

Research population and sample size

The study targeted parents, guardians, and carers who have children aged 10–12 years across the five regions in Sierra Leone, which made up the inclusion criteria, while those with children below 10 years or above 12 years were excluded from the study. The sample size was determined using the appropriate statistical formula. The statistical formula was derived from a study done by Pourhoseingholi (9). The sample size after calculation resulted in 384 respondents, accounting for a 10% non-response rate, which amounts to 38 individuals.

$$n = Z^2pq/e^2$$

where: sample size (n), probability (p) = 0.5, frequency of the event (q) = 0.5, standard error (Z) = 1.96, and acceptable sample error (e) = 0.05.

The district sample size for each region was also determined using the HPV target population proportion of 2.4% of the total population in each district. The sample size for each chiefdom was calculated by using the formula.

$$n_c = (P_c * P_d/P_{total}).$$

where: Chiefdom sample size (n_c), Chiefdom population (P_c), District Population (P_d), and Total Population (P_{total}).

However, since the study was a community-based intervention, we therefore increased the number of days for data collection to increase the targeted population (a total of 1231 participants were recruited). Increasing the sample size beyond the calculated requirement (e.g., from 384 to 1345) enhances the precision of the estimates and increases the statistical power of the study.

Data collection tool

The questionnaire items were organized into five sections. The first portion focused on fundamental socio-demographic information. Awareness was measured with two items, attitude with four, perception with three, and knowledge with three. The survey items were adapted from "Behavioral and Social Drivers of Vaccination: Tools and Practical Guidance for Achieving High Uptake." 1st ed. Geneva: World Health Organization (10). The items were scored on a Likert scale.

Data collection process

The data collection covers a five-day period across the country from November 8th to 12th, 2024. A team of four data collectors and one supervisor was deployed in each of the districts where the vaccine was rolled out. This was done to ensure effective coverage and data quality, with the supervisors overseeing the data collection process and ensuring adherence to the survey protocol. All data collectors underwent a one-day training to familiarize themselves with the survey instruments and ethical considerations. After the training, the research instrument was tested in a pilot study with a small subset of thirty participants to establish the validity. Additionally, internal consistency was assessed using Cronbach's alpha, with values above 0.70 indicating satisfactory reliability of the items within the survey. The survey was used to gather information on vaccine knowledge, attitude, and perception. Data were collected on Android tablets using the KOBO Collect App. A total of 1345 respondents took part in filling the survey, and 114 were not appropriately filled, leading to an aggregate of 1231 valid questionnaires, which were used and considered substantial for the study.

Ethical considerations

Prior to conducting the study, the Ministry of Health and the National Public Health Agency approved the research. Before data collection, all participants were informed about the purpose of the study, and their involvement was entirely voluntary. Verbal consent was obtained from all participants. To maintain confidentiality, all data were kept secure and utilized solely for the purpose of the research.

Data analysis

An Excel sheet was automatically generated from the KOBO Collect app. Data analysis was carried out using Excel. Before data analysis, the data were examined for errors. Bar chart, histogram was generated using Excel. The Excel was also used to calculate frequencies and percentages for descriptive analysis.

Results

Socio-demographic information

In total, we enrolled 1341 community members in all five regions, but only 1231 responses were valid for analysis, leaving us with a response rate of 91.8%. A total of 74.5% of respondents were married, while 32.4% of participants had not completed their education level. Parents made up a significant proportion of participants, accounting for 76.2%.

Awareness on HPV vaccine

Figure 1 revealed that among the five regions, 94.4% of participants in the Eastern region, 93.3% of participants in the Northern region, and 90.5% of participants in Western regions have heard of HPV, compared to 81.1% and 72.0% in the South and Northwest. Among those who have heard about the HPV vaccine, 49.8% knew about it from healthcare workers, followed by radio (25.9%) and (0.4% and 0.5%), knew about it from Television (TV) and short message service (SMS) as shown in **Figure 2**.

Knowledge on HPV vaccine

Participants were tested to know their knowledge regarding cervical cancer by showing them the statement "Do you think HPV is linked to a certain type of cervical cancer?" **Figure 3** revealed that among the five regions, 56.8% of participants in the Northwest region answered "Yes," while 25.9% and 2.3% chose "No" and "Not sure" that HPV is linked to a certain type of cancer. There is an equal proportion between those who said "Yes and No/Not sure" in the Eastern region. For the North, South, and Western regions, over half of the respondents could not link HPV to any type of cervical cancer (54.9%, 53.4%, and 57.3%, respectively). Although the rate of awareness was over 80% in these regions, knowledge on linking HPV to any type of cervical cancer was lower compared to the East and Northwest regions. In response to the question "How important do you think the HPV vaccine is to your child's health?" **Figure 4** shows that all of the regions scored above 90%, indicating that respondents in the five regions understood the importance of the HPV vaccine for their children's health.

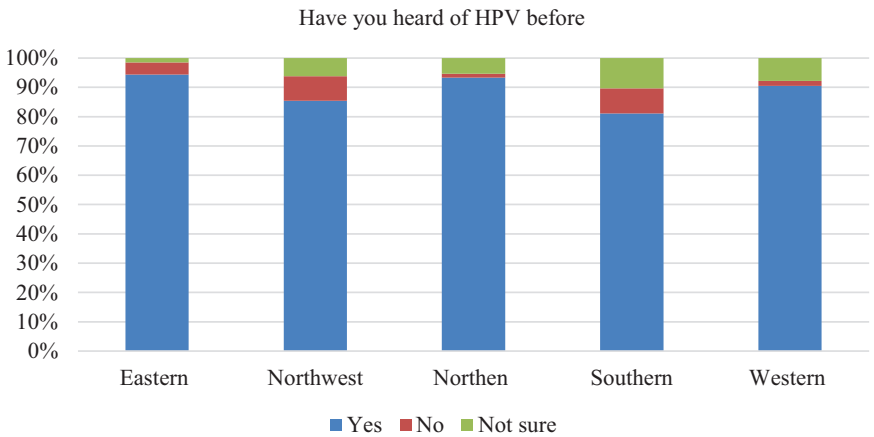

FIGURE 1 | Awareness of HPV vaccine.

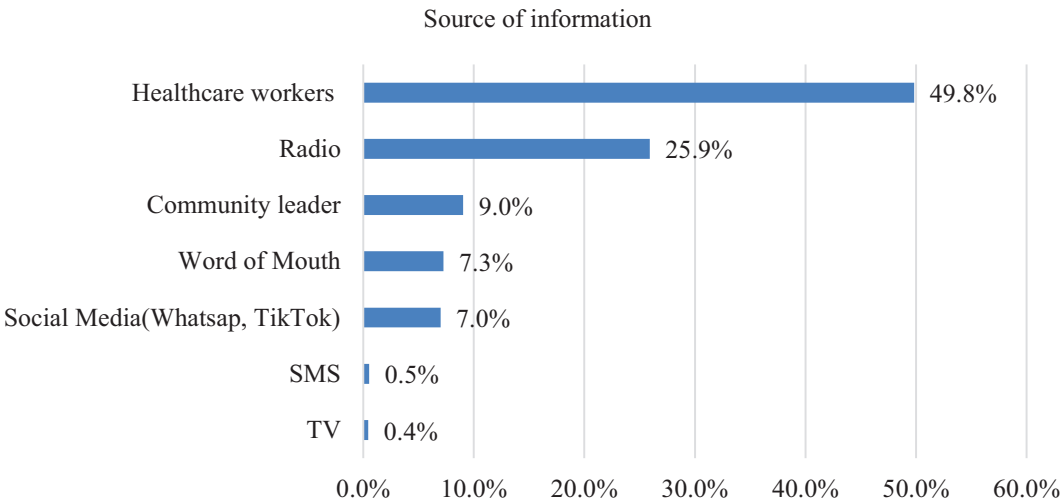

FIGURE 2 | Source of information on the HPV vaccine.

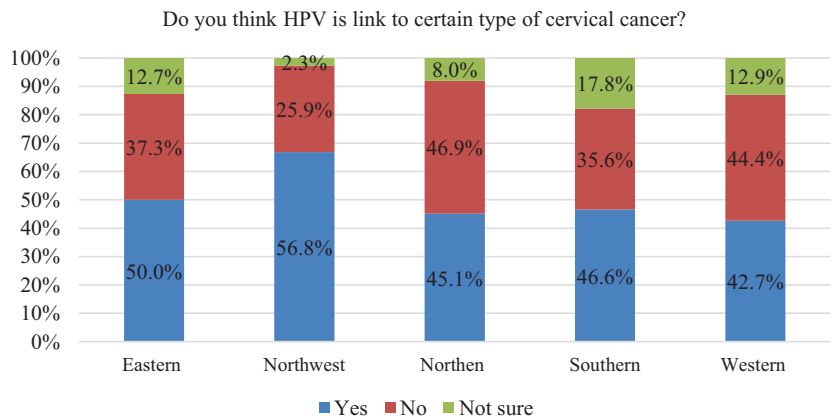

FIGURE 3 | Knowledge on cervical cancer.

Perception on HPV vaccine

Figure 5 revealed that among the five regions, the East, Northwest, and Northern regions had the highest response rate to the perceived safety of the HPV vaccine, as opposed to the South and West. In terms of the safety of the HPV vaccine, 85.4%, 88.1%, and 89.1% of participants in the East, Northwest, and Northern regions felt the HPV vaccine is safe compared to 71.2% and 76.7% in the South and North, respectively. A proportion of participants across the

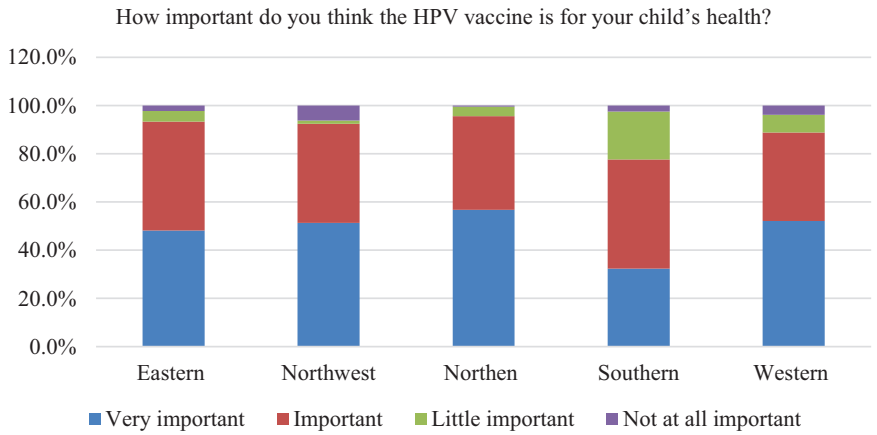

FIGURE 4 | Importance of HPV vaccine.

five regions expressed concern regarding its side effects (39.7%, 37.4%, 40.2%, 35.0%, and 25.4%). Respondents in the West, North, and Northwest regions expressed more concern (28.0%, 29.5%, and 25.7%) about the vaccine causing fertility, compared to 16.0% and 19.6% of participants in the East and Southern regions. Also, 30.1%, 25.0%, 26.3%, and 24.3% of respondents in the Northwest, North, South, and Eastern regions expressed concern about the pain they will receive in taking the injection, with 11.6%, 2.8%, 1.8%, 7.1%, and 7.5% of respondents across the five regions expressing concern about the vaccine composition (**Figure 6**). **Figure 7** shows the percentage of respondents across all regions who expressed serious concern about their children getting any form of cervical cancer (82.1%, 92.5%, 90.2%, 79.0%, and 91.4%).

Attitude regarding HPV vaccine

Figure 8 shows that 75% of respondents in the five regions wanted their children to be vaccinated, although only a small percentage said their children had already been vaccinated (13.4%, 21.2%, 19.6%, 22.8%, and 4.7%, respectively). From **Figure 9**, **85**% of respondents in the East, Northwest, and Northern regions have received vaccination, while 77.6% of respondents have received it in the Southern region, with only 65.1% having received it from the Western region. Also, (67.9% and 58.7%, respectively) of respondents in the East and Southern regions believed that cultural beliefs/traditional practices have no effect on people's views on HPV vaccination, in contrast to the North and Northwest, where (46.0% and 67.3%, respectively) believed that cultural beliefs/traditional practices do. However, there is some variation in people's perceptions of whether cultural beliefs/traditional practices influence their attitudes regarding HPV vaccination in the Western region (39.2% vs. 34.1%) (**Figure 10**). **Figure 11** shows that (76.1%, 66.9%, and 53.4%, respectively) of respondents in the East, South, and Western regions believed that religious beliefs have no effect on people's attitudes/awareness towards HPV vaccination, in contrast to the Northwest, where (65.0%) believed that religious beliefs do. However, there is some variation in people's perceptions of whether religious beliefs influence their attitudes or awareness regarding HPV vaccination in the Northern region (45.1% vs. 40.2%).

Discussion

The World Health Organization considers vaccination to be an essential preventive strategy against HPV infection. Understanding the role of the primary drivers involved in the decision to get the HPV vaccine is an unavoidable step toward achieving adequate vaccination coverage levels. Children aged 10–12 years are a unique population because, at this stage, they are not involved in sexual-related activities. Possible barriers to vaccination in this group are likely to differ from those discovered among parents, such as the concern of an increase in adverse reactions/side effects and the pain they may experience after receiving the vaccine (11). Previous awareness of HPV and vaccines is associated with a positive intention to get vaccinated, and it might be regarded as the initial step toward vaccinations. In our sample, 70% of people who intended to receive the vaccination are aware of the vaccine (**Figure 8**). The results are in line with the findings of Naoum (12); in their findings, it was revealed that 99.4% of respondents were aware of the vaccine. The findings showed that the HPV vaccine uptake is less than 25.0% among children in all five regions in Sierra Leone. This is in line with the Tanzanian National Health Survey report (13) and previous systematic reviews and meta-analyses in high- and low-income countries, which was 41.5% (14). However, this was lower than studies undertaken in Scotland, the USA, and Australia, where the uptake was 94.4%, 62.8%, and 83%, respectively (15, 16).

The respondents had awareness of HPV and HPV vaccines. However, in four of the five regions, over half of the respondents were unable to relate HPV to cervical

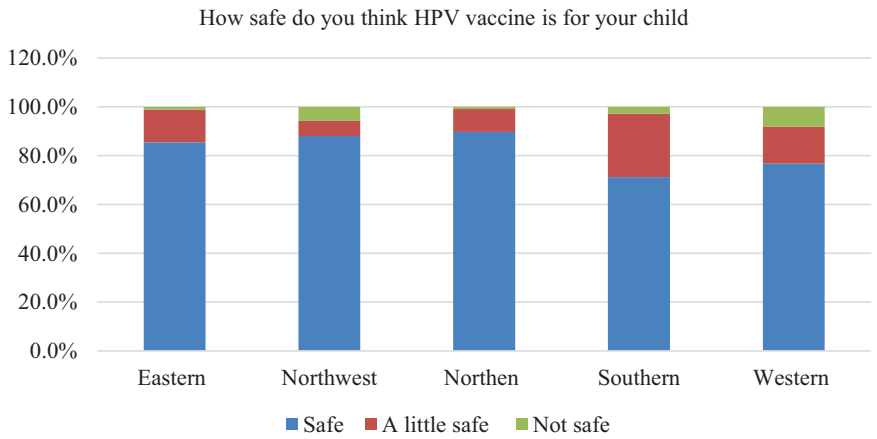

FIGURE 5 | Vaccine safety.

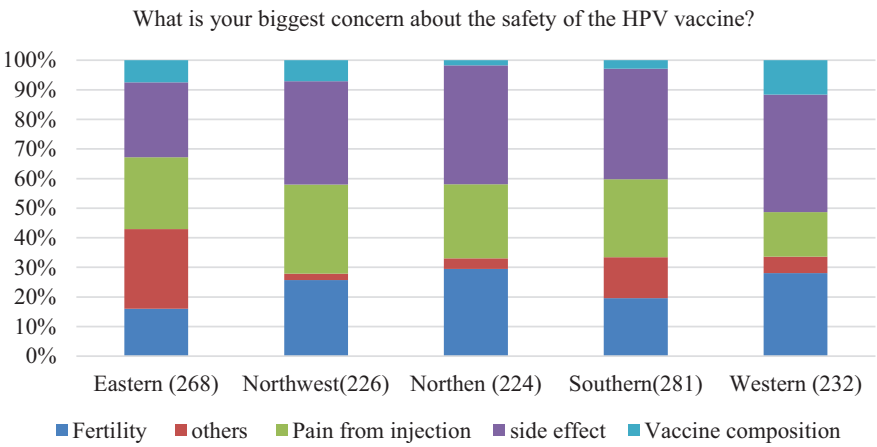

FIGURE 6 | Concern about vaccine safety.

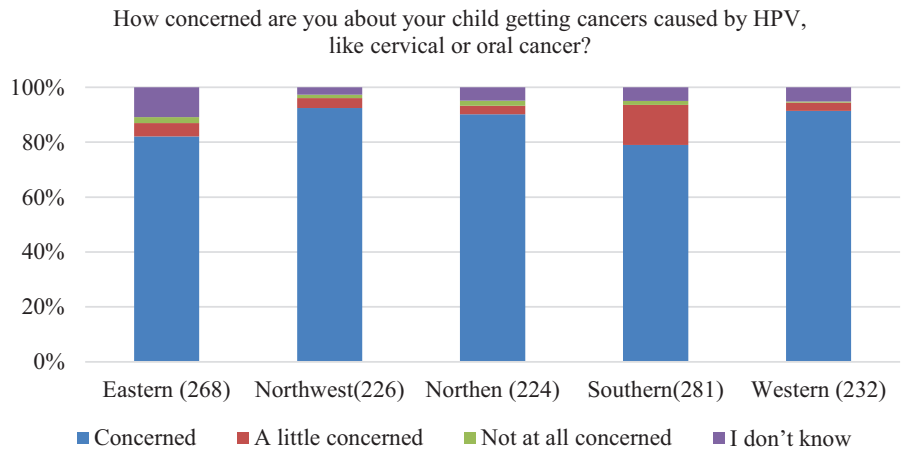

FIGURE 7 | Concern about getting cancer.

cancer. However, the majority of respondents recognized the importance of the HPV vaccine for their child's health. Some studies have demonstrated that parents recognize the importance of the HPV vaccine in cancer prevention (17). The findings revealed that culture, tradition, and religion impact HPV vaccination. According to research, religious beliefs significantly impact an individual's decision-making and health-related behaviors, including sexual health (18, 19) and it is observed that leaving health outcomes to God's will is a common belief (20). However, another study emphasizes the preference for faith healing and traditional medicine over conventional methods (21).

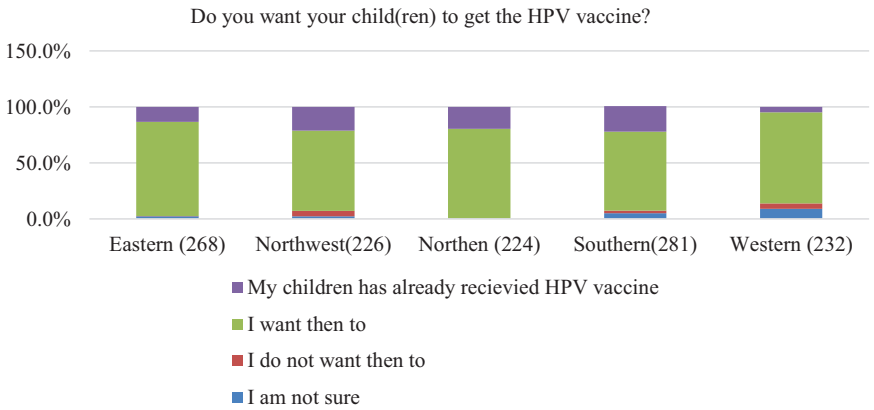

FIGURE 8 | Attitude towards taking HPV vaccine.

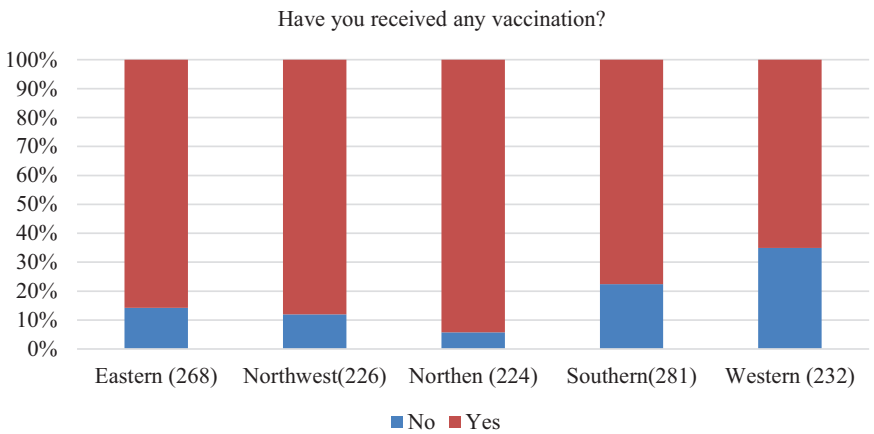

FIGURE 9 | Vaccine uptake.

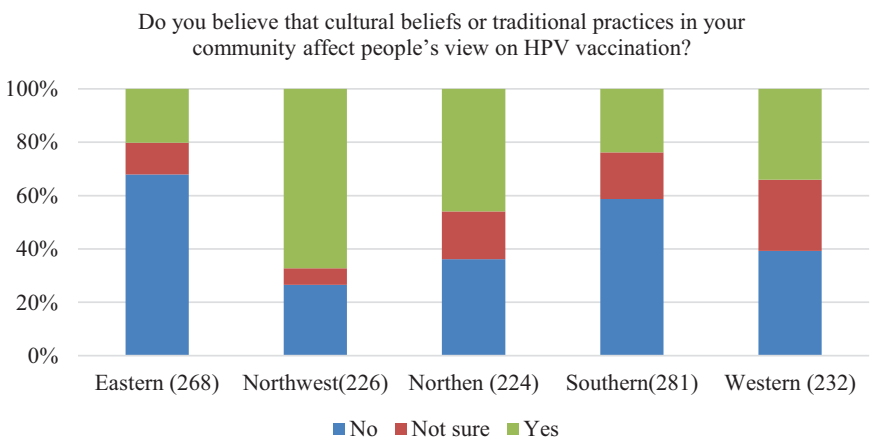

FIGURE 10 | Cultural beliefs on HPV vaccination.

Unanswered questions and research gap

Although this study provides useful recommendations into the behavioral and social drivers of HPV vaccination in Sierra Leone, several unanswered questions and research gaps remain. First, the study did not explore the specific cultural or religious beliefs that contribute to vaccine hesitancy in depth. Future research could conduct qualitative interviews with religious and traditional leaders to better understand these influences. Second, the study did not assess the long-term impact of HPV vaccination campaigns on vaccine uptake and cervical cancer rates. Longitudinal studies are needed to evaluate the effectiveness of public health interventions over

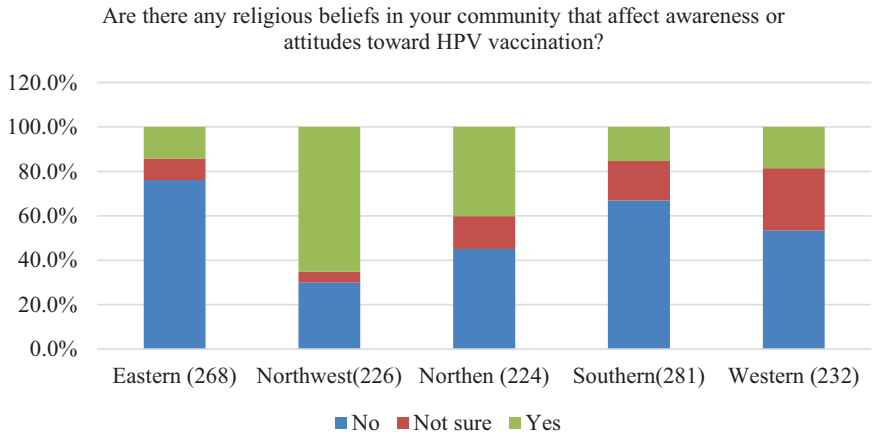

FIGURE 11 | Religious beliefs on HPV vaccination.

time. Third, the study did not investigate the role of peer influence and social networks in shaping attitudes toward HPV vaccination, which could be a significant factor in increasing vaccine acceptance among adolescents.

Limitations

The study has some limitations that should be acknowledged. First, the use of convenience sampling at the participant level may limit the generalizability of the findings, as the sample may not fully represent the broader population. Second, the reliance on self-reported data introduces the possibility of response bias, as participants may provide socially desirable answers. Third, the study did not employ inferential statistical tests, which limits the ability to draw causal inferences or assess relationships between variables. Future studies should consider using more robust sampling methods and statistical analyses to address these limitations.

Implications and future research

Key informative interviews should be done with religious and traditional leaders in the Northwest to identify religious and traditional beliefs that affect awareness and attitude toward the HPV vaccine. Also, in-depth interviews should be done in the Northern region with traditional leaders to identify factors that impact people's views on HPV vaccination. Assessment of the vaccine coverage should be done nationwide to determine the total coverage of the HPV vaccine. Public education should be done on HPV vaccine safety in the North, Northwest, South, and Western regions.

Conclusion

Years after administering the HPV vaccine in Sierra Leone, the vaccine coverage is still unsatisfactory. Children aged 10–12 years are a peculiar population: the roadblocks to HPV vaccination they face are different from those identified among university students. The study revealed that awareness of HPV has grown in Sierra Leone. The study also identifies areas of weakness in the general population regarding' knowledge and misconceptions that might be addressed first. Communication strategies must: (a) raise awareness on linking HPV with cervical cancer; (b) clarify the misconception regarding vaccine safety, such as fertility and side effects. The acceptability of the HPV vaccine varies depending on the information source. Our findings imply that communication strategies should not overlook the importance of peer influence, even though healthcare professionals are the most reliable sources of information.

Author contributions

Each of the mentioned authors has given their approval for the work to be published and contributed significantly, directly, and intellectually.

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Data availability

The manuscript has no associated data or the data will not be deposited.

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