Beliefs and knowledge related to human papillomavirus (HPV) vaccine among African Americans and African immigrants young adults

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Abstract

Background Despite the disparate human papillomavirus (HPV) infection rates among sexually active Black young adults, HPV vaccine uptake remains low among this population. This study aimed to explore HPV beliefs, attitudes, and knowledge among Black young adults and provide recommendations on ways to improve vaccine uptake.

Methods We used a mixed-method, convergent design to conduct five focus groups and administered a 40-item electronic survey that was developed with health belief model (HBM) constructs. We assessed HPV and vaccine knowledge, barriers, and attitudes toward vaccination. We analyzed quantitative data using descriptive statistics and bivariate methods. Focus group transcripts were analyzed using content analysis. Results were integrated to obtain a better understanding of the topic.

Results Forty individuals participated in the study. The mean age was 22.2 ± 4.5 years and 55% identified as African immigrants. Integrated data revealed themes mapped to relevant HBM constructs. Almost one third (32.5%) of participants were unaware of their susceptibility to HPV infection and its severity. From focus group discussions, the majority (75%) believed that vaccines are beneficial. Major cues to action include promoting HPV vaccine uptake via community wide informational sessions, provider recommendation, and social and mass media campaigns.

Conclusion Barriers to vaccine uptake, limited HPV knowledge, and lack of vaccine recommendation are important factors contributing to low vaccine uptake among Black young adults. Interventions to decrease barriers to HPV vaccination, increase HPV knowledge, address misconceptions, and unfavorable beliefs are needed to promote HPV vaccine uptake.

Keywords HPV vaccine · Black young adults · Mixed-methods · Prevention

Introduction

Human papillomavirus (HPV) infection is a critical public health matter in the United States (U.S.) and globally [1]. HPV infection is the most common sexually transmitted infection in the U.S. and affects both males and females [2]. HPV infection rates are highest among sexually active young adults and Black women under the age of 25 [1, 2]. The Centers for disease control and prevention (CDC) reports that about 79 million Americans are currently infected with HPV and projects that an additional 14 million will become infected annually [2]. High-risk HPV types have been etiologically linked to a number of disease conditions, including certain cancers and benign conditions, such as warts and condylomas [3]. About 26,000 new cancers are attributable to HPV yearly in the U.S.; on the average, 17,000 of these new cases are in women [4]. High-risk HPV infections are implicated in almost all cases of cervical cancers, 95% anal cancers, 70% oropharyngeal cancers, 65% of vaginal cancers, 50% of vulvar cancers, and 35% of penile cancers [5]. Despite the high prevalence of HPV infection, there is a general limited public awareness which is more pronounced among the racial/ethnic minority population regarding HPV knowledge, attitudes, and beliefs [6, 7].

Fortunately, there are vaccines available to prevent HPV infection and associated diseases. In the U.S., the advisory committee on immunization practices (ACIP) recommends HPV vaccine for adolescents age 9–12 years, and catch-up HPV vaccine for all persons through age 26 years who had
HPV vaccination is an effective cancer prevention strategy; moreover substantial research supports the vaccine’s safety and its low side effect [11, 12]. Additional benefit of the vaccine is that it helped to increase the awareness of HPV infection among adolescents [6]. However, despite the HPV vaccine efficacy and other benefits, vaccine uptake remains low with 49% up to date among young adolescents (13–17 years) [4, 13]. Black race is one of the factors associated with a lower likelihood of vaccine uptake; the vaccination rate uptake among Black adults (18–26 years) is 36.7% compared to 42.1% for white young adults [14, 15]. Moreover, given the dearth of research regarding HPV vaccine uptake among Black population subgroups, particularly African immigrants, it is difficult to estimate uptake. However, extant literature suggests that Black U.S. subgroups are likely at risk for low HPV vaccination uptake [16–18].

Studies have demonstrated that knowledge and awareness of HPV promotes vaccine uptake [19, 20]. Chido-Amajuoyi and colleagues asserted that programs directed towards fostering HPV awareness are one of the most effective strategies for increasing vaccine uptake [21]. Therefore, the aim of this study was to explore HPV beliefs, attitudes, and knowledge among Black young adults with a view of providing recommendations on strategies to improve HPV vaccine uptake among Black young adults.

**Theoretical framework**

We used the constructs of the well validated health belief model (HBM) [22] to guide the data collection for the qualitative phases of this study. The HBM has the following constructs: perceived susceptibility, severity, benefits and barriers, self-efficacy, and cues to action. The model posits that individuals are likely to take action to reduce risk if they believe: (1) the action will reduce their risks, (2) that the condition would have potentially serious consequences, (3) that a course of action available to them would be beneficial in reducing either their susceptibility to or severity of the condition, (4) the anticipated benefits of taking action outweigh the barriers to or costs of action or (5) regard themselves as susceptible to a condition [22]. Furthermore, knowledge, attitudes, and beliefs related to a condition are believed to have indirect effects on behavior by influencing the HBM constructs [23].

**Methods**

**Study design**

To provide a more complete description of the phenomenon affecting HPV vaccine uptake, we used a mixed-method, convergent design [24].

**Sample, recruitment, and setting**

Between October 2020 and April 2021, research personnel identified Black young adults from Central Kentucky for study participation via purposive and snowball sampling using flyers and word of mouth. Eligibility criteria included the following: (a) self-identified Black (b) 18–45 years of age; (c) able to speak and understand English; (d) Sub-Saharan African-born or U.S born-Black; and (e) ability to provide informed consent. We sought to recruit participants from diverse places of birth (U.S. born and Sub-Saharan African-born Black adults). Interested eligible participants were consented and scheduled to participate in one of five online focus groups and to complete an online survey which was completed after the focus group. The University Office of Research Integrity approved all research procedures.

**Data collection**

**Qualitative phase**

We conducted and recorded five focus groups over Zoom video conferencing. Each group included 5–8 participants with a total of 38 participants and lasted 60–80 min. Focus groups were facilitated by the first author (AA) and were guided with a semi-structured interview guide. Appropriate probes were developed based on the aims of the study and previous literature. The interview guide included topics on HPV vaccine beliefs, barriers, facilitators, and attitudes to vaccination. All sessions were audio recorded. Interviews were conducted until saturation was reached [25], which occurred after 38 interviews. Saturation occurred when no new information or insights were elicited from participants interviews. All participants were offered a $20 incentive for their participation.

**Quantitative phase**

A 40-item electronic survey that required approximately 12 min to complete was used to collect HPV and HPV vaccine knowledge, barriers to HPV vaccination checklist, and
sociodemographic characteristics and was administered online via Research Electronic Data Capture (REDCap).

**Measures**

Participants completed sociodemographic items (gender, age, race, education, income, insurance status), HPV vaccination history, HPV knowledge items, and an 8-item checklist that assessed barriers to HPV vaccination.

**HPV and HPV test knowledge items**

HPV knowledge items included 15-items assessing knowledge of HPV (including transmission, consequences, risk factors). Response options were true/false/don’t know, with ‘don’t know’ scored as incorrect [26, 27]. HPV vaccine knowledge [26] was assessed with 7 items regarding the protection offered by HPV vaccines.

**Data analysis**

**Qualitative data analysis**

The data was analyzed using content analysis. The recorded Zoom sessions were transcribed verbatim using a transcription software (otter ai.) and reviewed for accuracy by a research staff. The first two authors (AA and OO) read the transcripts several times to familiarize themselves with the data. To flesh out initial codes, authors AA and OO discussed initial thoughts, assumptions, and understandings of key concepts. Author (OO) began the line-by-line coding of the transcripts, affixing codes to each text segment. The first author (AA) then worked with (OO) to refine and define the codes, eventually developing a preliminary codebook, which allowed standardization of the content analysis. The codebook underwent an iterative procedure to refine the codes and identify emergent themes. The research team met to reconcile the minor differences in interpretation, finalized and summarized the themes. In addition to the standardization of the codebook, independent transcript coding by two researchers enhanced verification of themes and an audit trail ensured reproducibility of the findings [28]. Also, we employed member checking by contacting 4 participants and verifying interpretation of findings based on discussions during the focus group [28]. After iterative readings of the qualitative data, all authors discussed the relationships between the themes and how they informed the quantitative results and determined how to best integrate, and report results for enhanced understanding. We paid attention to similarities and differences among and between African American and Sub-Saharan immigrant participants.

**Quantitative data analysis and data integration**

Basic descriptive statistics were reported using frequency distributions, means and standard deviations or medians and interquartile ranges to describe participant sociodemographic characteristics, HPV and HPV vaccination knowledge, and barriers to HPV vaccination uptake. The two-sample *t*-test, Chi-square test of association or Mann–Whitney *U* test examined unadjusted associations between sociodemographic characteristics and HPV vaccination status. All data analysis was conducted using SAS, version 9.4 with an alpha of 0.05.

**Results**

**Quantitative results**

**Participant’s characteristics**

Forty individuals participated in the study; with 38 completing the focus group sessions. The mean age was 22.2 ± 4.5 years and 55% identified as African immigrants with average length of stay of 3.5 years in the U.S. About 40% reported some college education and 70% reported having more than enough to make ends meet. (See Table 1).

**Vaccination status**

Fifteen were vaccinated (37.5%). Those who identified as African American had higher vaccination history compared to African immigrant participants (66.7% vs. 33.3%, respectively, *p* = 0.033), and African immigrants who had a longer length of stay in the U.S, were more likely to be vaccinated (median = 6 years, IQR = 6–10), than those who had not (median = 3 years, IQR = 2–5, *p* = 0.029). In the bivariate analysis, age, race/ethnicity, length of stay in the U.S. (among immigrant participants), and HPV vaccine knowledge were significantly associated with vaccination status. Those vaccinated were significantly younger (*M* = 20.3, *SD* = 2.5), than those who were not (*M* = 23.3, *SD* = 5.0, *p* = 0.015; see Table 1).

**Knowledge of HPV and HPV vaccine**

Table 2 describes the participant’s responses to HPV knowledge and HPV vaccine knowledge scales. Out of 15 knowledge questions regarding HPV, participants were correct on an average of 10 items (*M* = 10.1, *SD* = 4.5) and for HPV vaccination, knowledge was low; participants answered an average of three out of seven items correctly (*M* = 3.3, *SD* = 2.0). While 80% of the participants had heard of HPV, over 70% of them were unaware that
most sexually active people will get HPV at some point in their lives, and 90% were ignorant of the fact that HPV infection usually does not require treatment. Almost one third (32.5%) of participants thought that HPV is rare and were unaware of their susceptibility to HPV infection and its severity (Table 2). Furthermore, 75% of the participants provided an incorrect response on the item HPV vaccines are most effective when administered prior to the first sexual encounter, moreover, 60% responded incorrectly to the item that assessed HPV vaccines protection against cervical cancers. Lastly, only 37.5% of the participants had received the HPV vaccine (Table 1).

### Barriers to HPV vaccination

The most common barriers to HPV vaccination identified were being unaware of the importance (47.5%), lack of provider recommendation (37.5%), cost (30%), and privacy concerns (22.5%) (See Fig. 1).

### Qualitative results

#### Emergent themes

In line with the interview guide which was designed based on the main aim of the study, seven themes emerged from data analysis and were mapped to the HBM construct. The emerging themes included (1) attitudes and beliefs related to HPV vaccine, (2) barriers to HPV vaccination (3) misconceptions about risks, (4) willingness to discuss and learn more about HPV. The remaining three themes were related to cues to action, (5) platform for providing information about HPV, (6) medium of dissemination of HPV information, and (7) information needed to promote HPV vaccination. Table 3 summarizes the themes and concepts identified from focus group analyses and Table 4 shows focus groups exemplary quotes.
### Table 2 Participants' responses to HPV and HPV vaccine knowledge items \((n=40)\)

| Variables                                                                 | Correct \(n\) (%) | Incorrect \(n\) (%) | Don’t know \(n\) (%) |
|--------------------------------------------------------------------------|------------------|---------------------|---------------------|
| HPV can cause cervical cancer (T)                                        | 34 (85)          | 0 (0)               | 6 (15)              |
| A person could have HPV for many years without knowing it (T)            | 22 (55)          | 3 (7.5)             | 15 (37.5)           |
| Having many sexual partners increases the risk of getting HPV (T)        | 34 (85)          | 0 (0)               | 6 (15)              |
| HPV is very rare (F)                                                    | 27 (67.5)        | 3 (7.5)             | 10 (25)             |
| HPV can be passed on during sexual intercourse (T)                       | 37 (92.5)        | 0 (0)               | 3 (7.5)             |
| HPV always has visible signs or symptoms (F)                            | 17 (42.5)        | 8 (20)              | 15 (37.5)           |
| Using condoms reduces the risk of getting HPV (T)                       | 29 (72.5)        | 3 (7.5)             | 8 (20)              |
| HPV can cause HIV/AIDS (F)                                               | 17 (42.5)        | 7 (17.5)            | 16 (40)             |
| HPV can be passed on by genital skin-to-skin contact (T)                 | 21 (52.5)        | 6 (15)              | 13 (32.5)           |
| Men cannot get HPV (F)                                                  | 31 (77.5)        | 7 (17.5)            | 2 (5)               |
| Having sex at an early age increases the risk of getting HPV (T)         | 20 (50)          | 5 (12.5)            | 15 (37.5)           |
| There are many types of HPV (T)                                          | 17 (42.5)        | 4 (10)              | 19 (47.5)           |
| HPV can cause genital warts (T)                                          | 31 (77.5)        | 0 (0)               | 9 (22.5)            |
| HPV can be cured with antibiotics (F)                                    | 17 (42.5)        | 6 (15)              | 17 (42.5)           |
| Most sexually active people will get HPV at some point in their lives (T)| 9 (22.5)         | 17 (42.5)           | 14 (35)             |
| HPV usually doesn’t need any treatment (T)                               | 4 (10)           | 24 (60)             | 12 (30)             |
| HPV can cause oral cancer (T)                                            | 18 (45)          | 4 (10)              | 18 (45)             |
| HPV is a bacterial infection (F)                                         | 16 (40)          | 8 (20)              | 16 (40)             |
| You can cure HPV by getting the HPV vaccine (F)                         | 22 (55)          | 3 (7.5)             | 15 (37.5)           |
| One of the HPV vaccines offers protection against genital warts (T)      | 16 (40)          | 2 (5)               | 22 (55)             |
| HPV vaccines offer protection against all sexually transmitted infections (F) | 32 (80)        | 1 (2.5)             | 7 (17.5)            |
| Someone who has an HPV vaccine cannot develop cervical cancer (F)       | 21 (52.5)        | 2 (5)               | 17 (42.5)           |
| HPV vaccines offer protection against most cervical cancers (T)          | 16 (40)          | 9 (22.5)            | 15 (37.5)           |
| The HPV vaccine requires at least two doses (T)                          | 15 (37.5)        | 2 (5)               | 23 (57.5)           |
| HPV vaccines are most effective if given to people who have never had sex (T) | 10 (25)         | 12 (30)             | 18 (45)             |

### Fig. 1 Participants’ barriers to HPV vaccination acceptance \((n=40)\)

Percent agree

- **Cost**: 30.00%
- **My family/friends don’t think I should**: 7.50%
- **It will be painful**: 10%
- **I don’t trust the health provider**: 5%
- **I am concerned about my privacy**: 22.50%
- **I didn’t realize it was important to get vaccinated**: 47.50%
- **I am too embarrassed for the provider to think**: 12.50%
- **My provider has not told me that I needed one**: 37.50%
Table 3  Emergent themes from focus group discussions ($n=38$)

| HBM constructs               | Emergent themes                                      | Findings                                                                 |
|------------------------------|------------------------------------------------------|--------------------------------------------------------------------------|
| Perceived benefits           | Attitudes and beliefs related to HPV vaccine         | Belief that vaccines are safe and effective                               |
| Perceived barriers           | Barriers to HPV vaccination                          | Lack of trust in the medical community in general and the historical racial discrimination |
|                              |                                                      | Cost                                                                      |
|                              |                                                      | Lack of knowledge and awareness                                          |
|                              |                                                      | Fear of potential side effects                                           |
|                              |                                                      | Lack of health care provider recommendation                              |
| Perceived susceptibility and severity | Misconceptions about risks                           | Belief not susceptible due to lack of family history of cancer           |
| Self-efficacy                | Willing to discuss and learn more about HPV          | Pain from HPV vaccine is short-lived and will not stop vaccination       |
| Cues to action               | Platform for providing information about HPV         | Open and willing to discuss sexual health with health care providers     |
|                             |                                                      | Inclusion in school curriculum                                           |
|                             |                                                      | Community wide informational sessions and health fairs                   |
|                             |                                                      | School organizations and orientation programs, campus campaigns          |
|                             |                                                      | Social & mass media (Instagram, twitter, YouTube, Tik-tok, websites, video advertisement on HPV) |
|                             |                                                      | Healthcare centers and Planned Parenthood Services                       |
|                             |                                                      | Integration into other sexually transmitted infection prevention programs/activities |
| Medium of dissemination of HPV information | Healthcare professionals                           | Incorporation of HPV vaccine as part of college or job entry            |
| Information needed to promote HPV vaccination | Trusted and famous celebrity/influencers from Black community    |                                                                          |
|                              | HPV related-cancer survivor and individuals with a history of HPV disease |                                                                          |
|                              | Peers who are knowledgeable about HPV                |                                                                          |
|                              | HPV infection prevention and treatment, risk factors, symptoms and consequences of HPV infection | Explain the science behind HPV vaccine, benefits of HPV vaccination & side effects |
|                              | Evidence of success rate and effectiveness of HPV vaccine | Community HPV vaccine sites and other available resources on HPV         |

Perceived benefits

**Attitudes and beliefs related to HPV vaccine**

Majority of the participants were pro-vaccine because they believe vaccines are safe and beneficial, however, 62.5% had not been vaccinated. Several participants had mixed feelings about the need for HPV vaccination and were skeptical about vaccines.

Perceived barriers

**Barriers to HPV vaccination**

Lack of knowledge and awareness of HPV, fear of potential side effects, and the cost of the vaccine, were the major barriers discussed across the focus group discussions. Most participants across all the focus groups had heard of HPV but lacked detailed knowledge of HPV infection and HPV vaccination. The conversations revealed the depth of ignorance about HPV and its consequences among the participants.

Most participants indicated that HPV is rarely talked and recommended that the public be educated on HPV and its consequences. Another factor identified as a barrier to HPV vaccination among the participants was lack of trust of the medical community in general, especially White medical practitioners. Another barrier to HPV vaccination was safety related to the potential and long-term side effect that may occur from HPV vaccination. Another major barrier identified was the lack of health care provider recommendation of HPV vaccination. Participants discussed that their health care providers had not advised them on the need for HPV vaccination or offered the option to be vaccinated.

Perceived susceptibility and severity

**Misconceptions about risks**

Several participants discussed that they were not susceptible to or at risk of HPV infection. Many of the interviewees did not know the long-term consequences of high-risk HPV infection. Participants shared that they were
not promiscuous, have no family history of cancer, and several male participants wrongly believed that HPV was peculiar to females.

**Self-efficacy**

**Willingness to discuss and learn more about HPV**

The discussions in the focus groups showed that generally young Black adults would be open to discussing sensitive health issues like sexually transmitted diseases with their healthcare providers even if they were not comfortable doing so. In addition, the interviewees discussed that injection pain will not stop them from getting the HPV vaccination because the pain is transient, and benefits of vaccination outweighs the pain.

**Cues to action**

**Platform for providing information about HPV**

The use of social media (e.g., Instagram, Twitter, YouTube, Tik-Tok), advertisements on college campuses, and video adverts on HPV stood out as one of the major recommended platforms that should be used to promote information about HPV. The participants observed that “everyone is on social media” and so the information would reach many people. Other platforms suggested across the focus groups included advertisements on college campuses, community health fairs, and healthcare centers. Participants advocated for the inclusion of education on sexually transmitted infections including HPV prevention efforts in the school curriculum for health promotion. Participants

| Table 4 Summary of focus groups exemplary quotes (n-38) |
|--------------------------------------------------------|
| **Perceived benefits**                                |
| “…I believe they are fine. They are good for the general public.” (Male AA) |
| “I think vaccines are amazing. I mean, we've been able to mitigate so many diseases just by having them available.” (Male, SAI) |
| “I have a mixed relationship with them.” (Female, SAI) |
| **Perceived barriers**                                |
| “…I say it's something I've been hearing a lot, but I've never really took time to, like really understand what it is.” (Male, SAI) |
| “I would say that I don't have a basic knowledge of what it is.” (Male, SAI) |
| “I don't know a lot about HPV either not enough to, you know, explain it to somebody”. (Female, AA) |
| “...and it goes like between not knowing what's in there, and then the history of Black Americans and physicians, how surgeries were done on slaves.” (Male, AA) |
| “The only thing that I could think about would be the cost depending on how much it will cost.” (Female, SAI) |
| “...side effects may prevent people from wanting to get vaccinated just because there's fear that there's potential side effects that come along with that.”(Male, AA) |
| “and it goes like between not knowing what's in there, and then the history of Black Americans and physicians, how surgeries were done on slaves.” (Male, SAI) |
| “I cannot remember my doctor telling me about the HPV vaccination, of course we discuss about use of condom” (Male, AA) |
| **Perceived susceptibility and severity**              |
| “…(most young) they feel that just vaccines in general are unnecessary, because it's not likely that they'll get sick.”. (Female, AA) |
| “I feel like it's more of like female things, like females get infected by more than like, guys”. (Male AA) |
| **Self-efficacy**                                     |
| “I mean, it's just a shot. It's might cause some pain, but I don't think that would have the long-lasting effects, just to discourage people”. (Female, SAI) |
| “I feel like I'm pretty comfortable with discussing with my health provider because I can trust them enough to actually be able to help me if an issue does occur”. (Female AA) |
| **Cues to action**                                    |
| “Social media and mass media would greatly increase knowledge and interest in HPV”. (Female AA) |
| “I think sex education should be more broadly taught in both school curriculum and the community.”. (Male AA) |
| “I feel like our younger generation really likes information that's kind of compact, like so just infographics and statistics.” (Female SAI) |
| “since you've had this HIV campaign, that is really out there now, if they can find a way to tie it okay, so I will say for the younger people if, for me, when I'm in church, I don't pay attention.” (Female SAI) |
| “I agree that church might not be the ideal place to talk about something like that. But I feel like if it was, we would have to be separated, like adults separated from like, the young adults, because like she said, we don't want the parents thinking that their kids are like, involved with sex and stuff like that, like privacy reasons.” (Male SAI) |
| “..anything going on in the social media world, if it's not through influencers, it doesn't reach as many people as possible. "I think radio is also a good method because like people listen to the radio while driving back home from work or to work.” (Female AA) |
encouraged the use of infographics, statistics, and easy to read and understand information.

**Medium for dissemination of HPV information**

There was a consensus that health care provider recommendation will be the most effective medium of dissemination of HPV vaccination and information. Participants discussed that people are prone to listen to their healthcare providers because information from them is reliable.

Similarly, participants also suggested role models and influencers of color in the community (e.g., a celebrity or someone famous), as great media of information dissemination. They indicated that people are more likely to pay attention to influencers within the Black community. Additional suggestions included information dissemination through peer mentors who are knowledgeable about HPV, have had the HPV vaccination. The participants also suggested that individuals with a history of HPV infection and survivors of HPV-related cancer will make good ambassadors for HPV vaccination promotion.

**Information needed to promote HPV vaccination**

Participants suggested information needed to help promote the awareness of HPV and its vaccine. They suggested that detailed information should be provided on the burden of HPV infections among young Black adults, risk factors for HPV infection, HPV prevention, and consequences of HPV infection. In addition, participants requested that information should be provided on the effectiveness, benefits, and side effects of HPV vaccine, community-based HPV vaccination facilities, and information on how to be tested for HPV. There were also recommendations for the provision of free or subsidized HPV vaccination and testing for eligible individuals. Several participants suggested that government should make HPV vaccine mandatory for eligible individuals.

**Discussion**

Our study revealed low vaccine knowledge and uptake among young Black adults. We found that HPV vaccine knowledge was significantly associated with vaccination status. The vaccine knowledge deficit was more apparent among SAI immigrants. These findings are consistent with U.S. data regarding the underutilization of the HPV vaccine and the associated disparities of HPV-related diseases among Black Americans [29]. Transition to young adulthood has been identified as a time of changes in lifestyle behaviors that may exacerbate cancer risk and a critical period to institute health-promoting behaviors [30] such as HPV vaccination for unvaccinated young adults. Catch-up HPV vaccination is recommended for all persons through age 26 years who did not start or complete routine vaccination [31]. Additionally, shared clinical decision-making regarding HPV vaccination is recommended for adults aged 27–45 years who have not started or completed the vaccine series [31].

One of our major findings was that Black young adults had low knowledge of HPV and low HPV vaccination completion. Even though, 80% of participants reported awareness of HPV, the knowledge scores indicated significant gaps in their knowledge about HPV. Most of the participants admitted having limited evidence-based knowledge regarding HPV and its consequences. This is in accord with findings from college age adults that reported significant knowledge gaps regarding prevention, symptoms, and consequences of HPV infection [32]. HPV vaccine knowledge was significantly associated with being vaccinated. Limited knowledge is a major barrier to vaccination uptake among participants in this study. This finding is consistent with reports from national data that have shown lower HPV awareness and knowledge among Black Americans [6, 7], and is worrisome as knowledge of HPV is necessary for making informed decisions about safe sexual behaviors and HPV risk reduction. According to Cooper and colleagues, high-risk sexual behaviors, such as short-term partnerships, casual, and multiple sex partners are suggestive of a lack of awareness of susceptibility to HPV and a general lack of HPV education [33]. Increasing knowledge of HPV is a critical step in reducing both HPV infection and HPV-related diseases among Black young adults. In addition, this finding highlights the need to increase vaccine promotion efforts, with the hope of reaching the Healthy People 2030 goal of 80% HPV vaccination completion rate among adolescents age 13–15 years old [7, 34].

We found that U.S. born participants had higher vaccination rates (66.6%) compared to African born (33.3%, $p = 0.033$) participants. This is in accord with literature that suggest immigrants lag in preventive behaviors uptake. Ashing and colleagues [16] reported that immigrants were less informed regarding vaccine availability and accessibility. These disparities highlight the need for community-based interventions targeting immigrants and other minority groups to promote HPV vaccine. Research shows that using community channels and engaging community health workers in health promotion can lead to behavior adoption [35]. In addition, efforts should be focused on addressing barriers specific to subgroups of Black populations in the U.S. to achieve high penetrance of HPV vaccination [36]. Future research should examine potential cultural differences (e.g., religious/spiritual beliefs, stigma) to develop tailored interventions for the different sub-groups [16].
Other barriers identified from this study included lack of trust, high cost, and concerns regarding the safety of the HPV vaccine. These barriers are similar to those among minority youths [17]. According to the HBM, barriers may act as impediments to undertaking health behaviors, and a lack of perceived benefits may be the primary reason that some individuals forgo HPV vaccination. Our findings that some participants acknowledged the benefits of HPV vaccination was encouraging; however, it was disappointing that 56% of the unvaccinated participants were either neutral or unwilling to be vaccinated. Additionally, some participants discussed a sense of lack of susceptibility to HPV infection. Interventions tailored to specifically address these barriers, heighten susceptibility, and elucidate benefits from vaccination may help alleviate the challenges to HPV vaccine uptake. Moreover, the implementation of programs that incorporate the cues to action identified by participants, such as inclusion in school curriculum, community-wide informational sessions, social and mass media campaigns, and peer promotion efforts integrated with other sexually transmitted infection (e.g., HIV) prevention programs, incorporating HPV vaccine as part of college or job entry may also increase vaccine uptake among this population. Based on our findings, those of others [6, 7, 32], interventionists should prioritize Black young adults for programs to promote HPV vaccination and decrease the HPV-related burden. In accordance with the literature, findings from our study suggest that a multi-component approach is needed to promote HPV vaccination among young Black adults.

HPV prevention programs should include strategies to: (1) provide accurate and credible information on HPV modes of transmission, risk factors, and prevention and HPV-related cancers; (2) provide access to free or reduced-cost HPV vaccinations and financial assistance programs for uninsured and underinsured; (3) leverage community-based interventions and social media platforms for HPV vaccination promotion; and (4) counsel and educate health care providers on how to normalize discussion around sexual health; and (5) Health care providers should utilize every opportunity to provide recommendation for HPV vaccine. Our findings that more than one third (37.5%) of the participants had not received a healthcare providers’ recommendation for HPV vaccination is worrisome. Health care provider recommendation is a strong predictor of vaccination for a wide range of vaccines in young adults [37, 38].

Primary prevention of cancer requires that behaviors contributing to the initiation or progression of tumors be precluded, postponed, or minimized, and behaviors protecting against cancer development be initiated as early as possible and maintained throughout life [30]. Promoting vaccination among young adults is a way to initiate primary prevention. However, individuals who do not receive a vaccine recommendation from a health care provider are significantly less likely to obtain an HPV vaccine. Almost half (47.5%), stated that they didn’t realize that it was important to get vaccinated. From the participants’ discussions, it showed that healthcare providers were not providing recommendations and not doing a thorough job in providing detailed information about HPV and its consequences to their patients. To increase catch-up HPV vaccination among young adults and reduce vaccine disparities an effective intervention may be to target health care providers to increase recommendations and risk reduction counseling for Black adults.

In addition, it is critical that providers cultivate cultural humility to build honest and trustworthy relationships [39]. Harrington and colleagues, 2021, found that the decision to get HPV vaccine is dependent on the reliability and accuracy of information about the vaccine, including the source of the information. A trusted source of information would lead to a positive attitude towards the vaccine [40]. This observation is consistent with our findings from the focus groups about the preferred medium of dissemination of information about HPV. Mistrust of pharmaceutical companies, the government or even healthcare providers was consistently associated with lower HPV vaccine uptake and negative attitudes towards the vaccine among racial and ethnic minorities [40]. Healthcare providers must identify opportunities to take meaningful steps to create a private and conducive environment to encourage discussion and build participant’s self-efficacy.

**Strengths and limitations**

Our study fills an important literature gap regarding the barriers to HPV vaccine uptake among two subgroups of Black (African American and African immigrants). The study provided important strategies to improve vaccination uptake among Black young adults. The mixed methods approach provided an in-depth understanding of HPV beliefs, attitudes, and knowledge among Black young adults. However, it is not without limitations. First, the small sample size for survey completion, convenience sampling, and the cross-sectional data limits generalizability to all African American and African immigrants. Despite the small sample size, we reached saturation with the interviews conducted. Second, given that we explored a sensitive topic of HPV and sexual health, the participants may have withheld their experiences due to concerns about social desirability. Third, HPV vaccination history was a self-reported measure and may therefore be unreliable due to recall bias. Study strengths include inclusion of two subgroups of Black (African American and African immigrants) and using a mixed method approach provided an in-depth understanding of HPV beliefs, attitudes, and knowledge among Black young adults.
Clinical implications and future directions

Increasing knowledge and awareness of HPV and promoting heightened susceptibility to HPV infection among young Black adults is crucial in promoting the HPV vaccine among this group. Findings from this study reiterates that it is important to provide information in ways that are appealing and easily accessible for young Black adults.

This study demonstrated the need for further research examining vaccine uptake among young Black adults. More research with larger sample sizes exploring differences in barriers and knowledge by demographic characteristics would be of interest in future studies to understand disparities in HPV vaccination among young Black adults.

Future research directions should better address the informational needs of young Black adults to assure informed, educated decision-making and encourage acceptance of HPV vaccination. The findings from this study can inform the development of and testing of interventions to promote the benefits and self-efficacy related to HPV vaccination as well as reinforce susceptibility to HPV infections while reducing barriers to HPV vaccination.

In conclusion, a strong body of research supports the effectiveness, safety and tolerability of the HPV vaccine [11, 12]. While the ideal time for HPV vaccination is during adolescence, given their increased risk of HPV transmission and low vaccine uptake the young adult period is a great opportunity for targeted HPV catch-up vaccination.

Our findings underscore the need to prioritize Black young adults for HPV vaccine recommendation and detailed HPV vaccination program to increase HPV knowledge, decrease barriers to vaccination, and promote vaccination among this group of young adults.

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Data availability Due to privacy or ethical restrictions, the data that support the findings of this analysis are not publicly available; however, they are available upon request from the corresponding author.

Code availability Not applicable.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Ethical approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University of Kentucky.

Informed consent Informed consent was obtained from all individual participants included in the study.

Consent for publication The authors affirm that human research participants provided informed consent for publication.

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