

ORIGINAL RESEARCH ARTICLE

Factors that influence the uptake of human papillomavirus vaccine among preadolescent girls in South Africa: A Scoping Review

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Abstract

Human papillomavirus (HPV) infection is a sexually transmitted infection which causes cancer, especially cervical cancer. HPV infection and cervical cancer are a public health concern in South Africa. Primary prevention interventions, such as vaccination against cervical cancer, have been rolled out in the country. However, the uptake of the vaccine faces challenges due to various factors. The aim of the review was to identify factors which influence the uptake of the vaccine. A six-step framework developed by Levac, Colquhoun and O'Brien was adopted to guide this scoping review. The articles were searched in the following databases: EBSCOhost, PubMed, CINAHL and Google scholar. The search, conducted from May to July 2023 was limited to articles published in English between 2008-2023 and those conducted in Africa. The results showed that most studies were conducted in sub-Saharan Africa, with majority of the studies being from Nigeria. Subthemes were extracted from the articles and categorised under the four themes of the Social Ecological Model. The four themes used from the Social Ecological Model were individual factors; interpersonal factors; community and societal factors, and organisational factors and public policy. The subthemes were socioeconomic and sociodemographic of parents, knowledge, fear and mistrust, family structure and proximity to cancer/STI, misinformation from social media, religion, culture and tradition, free vaccination programme and lack of engagement. The identified gap in literature was a lack of studies of factors which influence HPV vaccination uptake in South Africa and qualitative studies that explore and provide the factors influencing uptake. We conclude that in designing effective interventions for the uptake of HPV vaccines, it is important to consider influential factors that are tailor-made for specific demographics. (*Afr J Reprod Health* 2024; 28 [7]: 127-144).

Keywords: Factors, girls, HPV, influencing, preadolescent, South Africa, uptake, vaccine

Résumé

L'infection par le virus du papillome humain (VPH) est une infection sexuellement transmissible qui provoque le cancer, notamment le cancer du col de l'utérus. L'infection au VPH et le cancer du col de l'utérus constituent un problème de santé publique en Afrique du Sud. Des interventions de prévention primaire, telles que la vaccination contre le cancer du col de l'utérus, ont été déployées dans le pays. Cependant, l'adoption du vaccin se heurte à des difficultés dues à divers facteurs. Le but de l'examen était d'identifier les facteurs qui influencent l'adoption du vaccin. Un cadre en six étapes élaboré par Levac, Colquhoun et O'Brien a été adopté pour guider cet examen de la portée. Les articles ont été recherchés dans les bases de données suivantes : EBSCOhost, PubMed, CINAHL et Google Scholar. La recherche, menée de mai à juillet 2023, s'est limitée aux articles publiés en anglais entre 2008-2023 et à ceux menés en Afrique. Les résultats ont montré que la plupart des études ont été menées en Afrique subsaharienne, la majorité des études provenant du Nigeria. Les sous-thèmes ont été extraits des articles et classés sous les quatre thèmes du modèle socio-écologique. Les quatre thèmes utilisés dans le modèle socio-écologique étaient des facteurs individuels ; facteurs interpersonnels ; les facteurs communautaires et sociétaux, ainsi que les facteurs organisationnels et les politiques publiques. Les sous-thèmes étaient socio-économiques et sociodémographiques des parents, connaissances, peur et méfiance, structure familiale et proximité du cancer/IST, désinformation provenant des médias sociaux, religion, culture et tradition, programme de vaccination gratuit et manque d'engagement. La lacune identifiée dans la littérature était le manque d'études sur les facteurs qui influencent le recours à la vaccination contre le VPH en Afrique du Sud et d'études qualitatives qui explorent et fournissent les facteurs qui influencent le recours à la vaccination. Nous concluons que lors de la conception d'interventions efficaces pour l'adoption des vaccins contre le VPH, il est important de prendre en compte les facteurs influents adaptés à des données démographiques spécifiques. (*Afr J Reprod Health* 2024; 28 [7]: 127-144).

Mots-clés: Facteurs; filles, VPH, influence, préadolescent, Afrique du Sud, adoption, vaccin

Introduction

The Human papillomavirus (HPV) infection is the most common sexually transmitted infection with a prevalence rate of 85.2%¹. The virus mostly affects women and is regarded as a public health concern². It is claimed that Africa has the second highest HPV prevalence³. The virus enters the epithelium through broken skin or mucosa and infects the basal epithelial cells. Once the virus has entered the host cells, it releases proteins, causing inflammation. The abnormal growth of these cells causes chronic pain and leads to cancer which affects reproductive systems.

While screening and treatment options exist to reduce the prevalence of HPV, vaccination is considered the preferred primary prevention method⁴. In South Africa, there is a school-based vaccination programme which was introduced in 2014 and with this programme, girls in grade 4 who are either 9 years old or are above qualify for this vaccine. Girls enrolled in public schools are eligible to receive this vaccination for free twice a year during a one-month period; the first and second dose are administered six months apart^{5,6}. Despite this, there is a scarcity of published literature specifically addressing the factors influencing HPV vaccine uptake in South Africa. Therefore, studies from other African countries with comparable sociodemographic characteristics will be used to contextualise the extent of the matter in southern Africa. This could be attributed to the fact that the vaccine was introduced in South Africa in 2014, whereas in other countries, it was introduced as early as 2008. However, other African countries have extensive available research pertaining to factors which influence uptake of HPV vaccine.

A study reported that the vaccine was effective in lowering the cancer-causing strains of the virus in teenagers and young women by 86% and 71%, respectively⁷. To address the challenges of the spread of HPV, the South African government rolled out the primary preventative measure through the Integrated School Health Programme. The vaccine is intended for preadolescent girls between the ages of 9 and 12 since they are less likely to be exposed to the virus at this age⁶. The important aspect of this initiative is that it is being implemented in no-fee paying schools to bridge the gap between poverty and health inequality that is related to cervical

cancer. Sadly, one study found that the uptake in no-fee paying schools in Tshwane is lower than the set targets⁸. Although this vaccine is like other childhood vaccines, its uptake remains a challenge globally. This is also supported by a study which observed that African American women in the USA are 10% less likely to get the HPV vaccine, whereas the vaccination average of other women is at a staggering uptake of 38%⁷. Consequently, this places most women at a higher risk of getting infected due to missed opportunities to vaccinate against the virus.

Given advancements in technology and medicine, preventable illnesses leading to shortened lifespans among women are unacceptable. To address this, understanding the challenges surrounding HPV vaccine uptake is crucial, especially considering its implications for the reproductive health of preadolescent girls. Despite this urgency, there remains a notable lack of research investigating the scale of uptake in South Africa. South Africa urgently needs to address high HPV infection rates and factors influencing uptake to achieve cervical cancer elimination by 2030. Existing research has recognized the barriers to HPV vaccination in Sub-Saharan African countries, yet there remains a gap in understanding these factors specifically within the context of South Africa. Therefore, this scoping review aims to identify the factors influencing HPV vaccine uptake among preadolescent girls in South Africa. This scoping review will employ the Social Ecological Model to elucidate the impact of various determinants. It is expected that the findings of this review will inform strategies for improving the HPV vaccination uptake.

Methods

Study design

A scoping review was conducted using a six-step framework proposed by Levac⁹. The steps are; identify research question, identification of relevant studies, study selection, charting of data, summarising and reporting of results and lastly, consultation. According to two studies, scoping reviews are ideal for determining the extent of knowledge on a specific issue^{9,10}. The review addressed the following research question: "What are the factors which influence the uptake of the

human papillomavirus vaccine among preadolescent girls in South Africa?"

Search strategy

A search strategy was developed by using key search terms and synonyms identified through PubMed, EBSCOhost and Google search. The strategy and Boolean operators were “uptake” OR “adherence” OR “participation” OR “admission” AND “HPV vaccine” OR “Human Papillomavirus vaccine” AND “young girls” OR “preadolescent girls” AND “South Africa” OR “Sub Saharan Africa” OR “Western Africa” OR “Southern Africa” OR “Eastern Africa” OR “Central Africa”. Other search terms and Boolean operators were (“MH” Papillomavirus vaccine”) OR (“uptake” OR “adherence” OR “participation” OR “admission”) AND (“young girls” OR “preadolescents”) AND (“South Africa” OR “Sub Saharan Africa” OR “Western Africa” OR “Southern Africa” OR “Eastern Africa” OR “Central Africa”). The search was conducted from May to July 2023. The search was limited to articles published in English between 2008-2023; studies conducted in Africa. The rationale for limiting articles to the English language is that the authors are fluent in English. The reason for the selected period is that the first HPV vaccine was introduced in Africa in 2008. We aimed for a large pool of articles to understand the current uptake of HPV vaccine. The databases were selected based on the comprehensive coverage of health-related topics in Africa. The terms “sub-Saharan countries” were used to narrow down the results.

Study selection

The included articles were those that used mixed methods, qualitative or quantitative research designs. On the other hand, the exclusion criteria were 1) scoping reviews, dissertations, non-referable articles or papers; 2) studies that focused on the immunisation of boys/males and older women; 3) non-English article; 4) articles which has a study population outside of Sub-Saharan Africa; 5) articles that did not have a clear methodology or where the findings did not correlate with the research question. The identified articles from the search strategy were exported to the Rayyan software for screening and reviewing articles, and removing duplicates. The screening was done by two reviewers to reduce bias.

Where there were conflicts between the first reviewer and second reviewer, the third author was invited as the third reviewer to resolve the differences.

The screening process involved checking if the title contained the keywords. The abstract was then read to assess the relevance of the article. Following that, the full texts of the included articles were searched in Google Scholar and through Google search. Throughout the process, the Preferred Reporting Item for Systemic Reviews for Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist and flow diagram was used to tally the available literature.

Quality appraisal

Scoping reviews do not typically assess of quality of included studies⁹. However, the Mixed Methods Appraisal Tool (MMAT) was used to appraise the methodology of the included studies. One study was removed as it did not meet the requirements of the MMAT as it was a review article. The review included six qualitative papers, eleven quantitative and one mixed method research papers.

Ethical considerations

Ethical approval was not obtained because this is a scoping review. A priori protocol was not developed and could not be registered with a database such as PROSPERO because the database is only used to register systemic reviews. However, the authors ensured transparency, confidentiality, and integrity in the research process. In addition, the PRISMA-ScR framework was used to report the findings.

Identification of relevant data

After removing duplicates, and screening the title, abstract and full text, eleven (11) eligible studies were incorporated into the review from EBSCOhost; utilizing Academic Search Complete and CHINAL. Additionally, PubMed was employed, resulting in the exportation of 21 articles to Rayyan, with one article being selected for inclusion, while one duplicate from another database was identified and removed. The rest were obtained from Google search and reference check. A preliminary search of

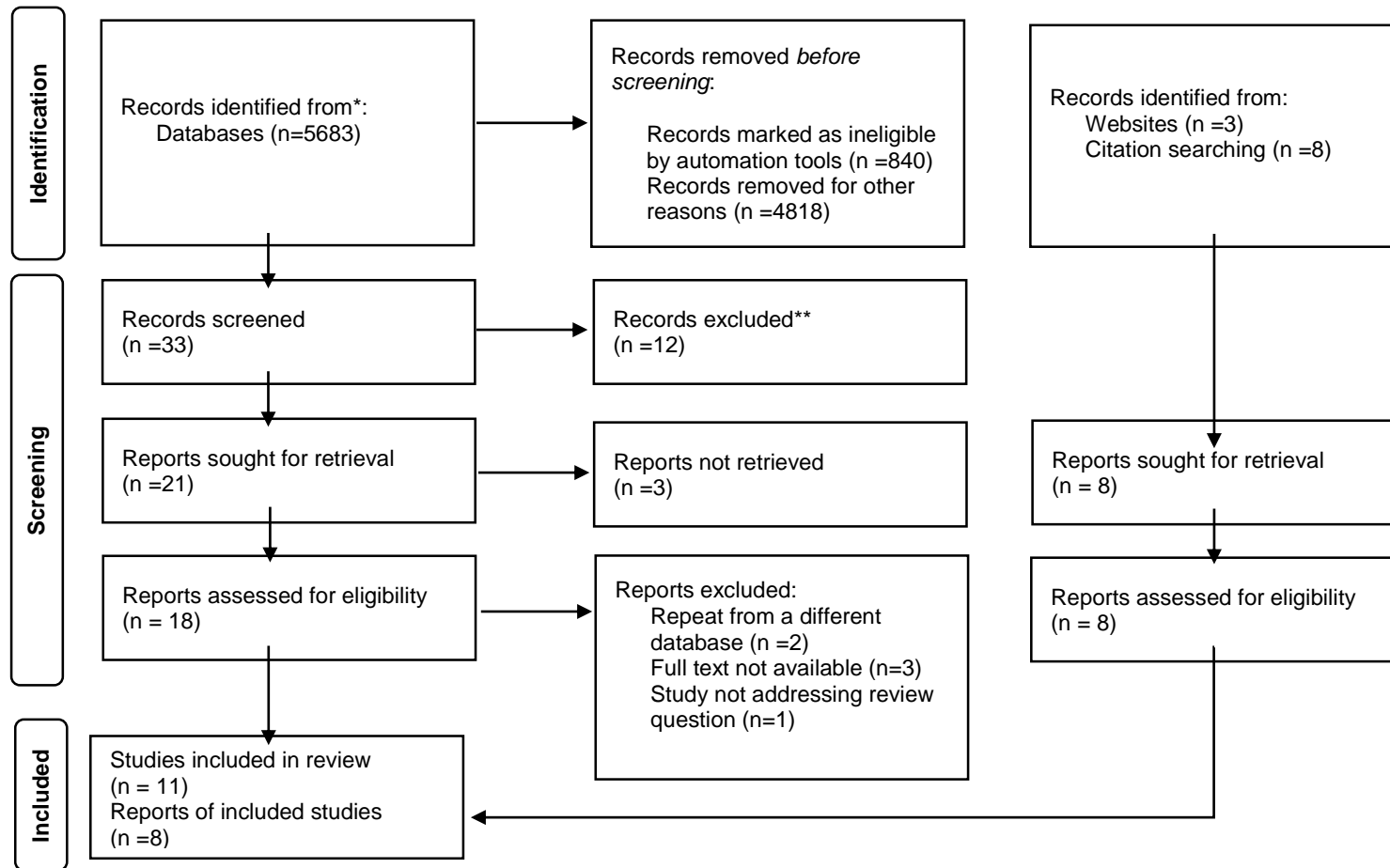


Figure 1: Flowchart of the results of the search

the title in PROSPERO, PubMed, Scopus, Google Scholar and a generic Google search was conducted in May 2023. No similar scoping review has been conducted in the context of South Africa before. Due to the gap of literature in South Africa, literature from other countries on the similar topic will be utilised due to comparable sociodemographic characteristics to South Africa.

The articles found focused on non-African countries, and high-income countries, topics were specific to acceptability, knowledge, policy responses, prevention and educational interventions and implementation strategies. However, a systematic review was conducted by Loke, Kwan, Wong and Wong on the uptake of HPV vaccination and associated factors in 2017, with a global focus. However, this study was heterogenic, causing generic information, lacking in context and not inclusive of African studies (as there were no available studies found by the author). This scoping review will take into consideration the specific context of South Africa, it will not be as generic and global as the above-mentioned study. Unlike systematic reviews, scoping reviews are at a lesser risk of being biased. Lastly, this review will add to the body of knowledge by discussing how the Social Ecological Model can provide a basis for the factors that impact uptake.

Results

A total of eighteen (18) studies were included in this scoping review. The studies were conducted in various African countries: two were conducted in Kenya, four were conducted in Uganda, one from Malawi, six from Nigeria, one from Ethiopia, one from Zimbabwe, one from South Africa, and two from Tanzania. The studies included quantitative, qualitative, and cross-sectional designs. Refer to Table 2 for details of the included studies.

Tabulation of findings

The following information was obtained and tabulated according to a data extraction tool for each included study: First author and publication year, title of the study, aim of the study, study population, study setting, study findings, and conclusion of the study. The data extracted was compared against the

PCC framework to see whether the relevant information was gathered. The PCC model assisted the reviewers to extract the information that was from the relevant population (African parents/caregivers/adolescents/policymakers), concept (factors influencing HPV vaccine uptake) and context (Sub-Saharan African countries that share similar sociodemographic characteristics as South Africa).

The studies identified barriers and factors that influence HPV vaccine uptake in Africa. Although there has been successful implementation of HPV vaccination programmes in Africa, the literature extracted in this study show that there is low uptake and the set targets are not being attained due to associated factors and barriers. Through school-based immunization programs, Western countries, like Taiwan, have witnessed an increase in uptake from 1.1% to 94.4% since the inception of school-based programmes¹¹. On the contrary, Sub-Saharan African nations continue to have poor uptake rates; for instance, Uganda has a 17.61% uptake rate. Moreover, two studies indicated that the COVID pandemic was a contributing factor to the reduced uptake^{1,12}.

Themes

We identified four major themes that contributed to factors that influence the uptake of HPV vaccine in sub-Saharan countries. The themes were derived from the Social Ecological Model. The themes and subthemes are charted below:

- I. Individual factors include the age, maternal tertiary education and knowledge, fear and mistrust, and socioeconomic factors. This accounted for 72.2% (=13) of the studies.
- II. Interpersonal factors included family structure and proximity to cancer/STI; whether a family member or friend had cancer or an STI. This accounted for 11.1% (=2) of the studies.
- III. Community and societal factors included misinformation from social media, religion, culture and tradition. This accounted for 55.5% (=10) of the articles.
- IV. Organisational factors and public policy include the implementation of the free vaccination programme and the lack of engagement. This accounted for 50% (=9) of the articles.

Table 1: Search strategy

Search String	Limiters	Database
("uptake" OR "adherence" OR "participation" OR "admission") AND ("HPV vaccine" OR "Human Papillomavirus vaccine" OR "HPV vaccination" OR "Human Papillomavirus vaccine" OR "HPV vaccine") AND ("young girls" OR "preadolescent girls") AND ("South Africa" OR "saharan Africa" OR "western Africa" OR "southern africa" OR "eastern africa" OR "central Africa")	2008-2023	Academic Search Complete
("uptake" OR "barriers" to "uptake" OR "immunization" OR "vaccination") AND ("human papillomavirus vaccine" OR "human papilloma virus vaccine" OR "hvp vaccine") AND ("female children" OR "adolescents" OR "youth" OR "child" OR "teenager") AND ("sub-Saharan africa" OR "africa south of the sahara")	2008-2023	Africa-worldwide information
(MH "Papillomavirus Vaccine") OR ("uptake" OR "adherence" OR "participation" OR "admission") AND "Human Papillomavirus vaccine" AND ("young girls" OR "preadolescent girls") AND ("South Africa" OR "sub Saharan Africa" OR "western Africa" OR "southern Africa" OR "eastern africa" OR "central africa")	2008-2023 Limited to Africa	CINAHL

Theme I: Individual factors

Age: One study reported a significant association between age and the acceptance of the HPV vaccine. With young mothers (≤ 40 years) showing to be more accepting of the HPV vaccine²⁸. The young mothers were more likely to take preventative measures of having their children vaccinated against cervical cancer.

Maternal tertiary education and knowledge: Interestingly, five studies concluded that maternal tertiary education increased vaccine uptake among their daughters^{16,19,20,24,28}. These studies emphasised that education yielded to better knowledge of the HPV vaccine, an important predictor of vaccine uptake. However, one study argued that knowledge did not necessarily lead to vaccine acceptability¹⁸.

Poor knowledge about the vaccine was identified in six studies^{4,12,16,17,19,20}. Despite lacking information, two studies noted positive attitudes from parents^{14,19}, while two others observed negative attitudes^{21,22}. Three studies found that some parents perceived the vaccine as irrelevant or claimed to have "no reason" for vaccine refusal^{21,28,30}. Participants in one research expressed a complacent attitude toward vaccination due to the perceived low prevalence of cervical cancer³⁰. Additionally, two separate studies raised concerns about the low knowledge levels of medical students and healthcare workers regarding HPV vaccination, highlighting a possible consequence for future patients^{19,30}.

Fear and mistrust: Fear played an important role, with a high perceived severity of HPV increasing concerns about the disease compared to vaccine side effects (Beyen et al., 2022). In one Zimbabwean study, 43% of parents were motivated by the fear of cancer²³. Parental understanding was also important, with two studies emphasizing that vaccine uptake depended on clear understanding of the vaccine's mechanism preventing cervical cancer^{11,12}.

Socioeconomics: Individual characteristics include socioeconomic status, parental comprehension, knowledge, attitudes and fears. Six studies found that socioeconomic status influences vaccine uptake^{4,14-17}. Among them, three studies identified poverty and inequality as barriers to vaccine uptake^{12,15,26}. Notably, one study observed higher vaccination rates in the middle socioeconomic quantile compared to the poor wealth quantile¹⁵.

Theme II: Interpersonal relationships

Family structure: Only one study focused on the role that family structures contributed to the decision to consent for HPV vaccination. This study indicated a unique perspective, noting increased willingness when the father took charge of the decision-making process for vaccination³⁰. For instance, households where the father is the solely decision-maker are less likely to vaccinate if the father has a negative attitude towards the vaccine.

Table 2: Summary of included studies

AUTHOR AND PUBLICATION YEAR	TITLE OF THE STUDY	AIM OF THE STUDY	STUDY POPULATION	STUDY SETTING	STUDY FINDINGS	CONCLUSIONS
<u>Nabirye et al., 2020</u>	Health system factors influencing uptake of Human Papilloma Virus (HPV) vaccine among adolescent girls 9-15 years in Mbale District, Uganda	To assess how the health systems is influencing uptake of HPV vaccine so as to inform policy for vaccine implementation and uptake in Mbale district, Eastern Uganda.	Adolescents	Uganda	Lack of awareness about the HPV vaccine as the major reason for not having received it. The following positively associated with uptake: receiving vaccines from outreach clinics, options from which to receive the vaccine, getting an explanation on possible side-effects and receiving the vaccine alongside other services. The negative associations: inconsistency with supply, inadequate training and lack of clear target.	Uptake of the HPV vaccine was lower than the target Recommendation: training of health workers to clearly provide adequate information on HPV vaccine, increasing awareness about the vaccine to the adolescents and increasing access for girls in and out of school.
Adeyanju et al., 2021	Exploring the Drivers of Vaccine Hesitancy Toward Childhood and Adolescent Vaccination in Malawi: A Qualitative Study	Exploring the factors that influence vaccine hesitancy among caregivers of children and adolescent girls that are eligible for routine childhood immunisation and the human papillomavirus (HPV) vaccine in Malawi.	Caregivers	Malawi	The study shows that most of the vaccine-hesitancy drivers for routine immunisation also influenced the newly introduced HPV vaccine. The drivers: inadequate awareness of the vaccination schedule, rumours and conspiracy theories exacerbated by religious beliefs, inability to translate knowledge and attitudes into actual vaccination behaviour, low literacy levels of caregivers, complacency occasioned by the stress of distance and transportation logistics, and disconnection between the community healthcare system and community leaders, among others.	This study provides deeper insights into the determinants, informs the design of context-specific interventions by decision-makers. Provided behavioural insights regarding vaccination behaviour in Malawi.
Kisaakye et al., 2018	Level and factors associated with uptake of human	This study assessed the level and the factors associated	Female adolescents	Uganda	Low uptake. The factors associated with uptake of HPV vaccine were:	HPV vaccine uptake was low. Efforts to improve uptake: consistent supply of

	papillomavirus infection vaccine among female adolescents in Lira District, Uganda.	with uptake of HPV vaccine by female adolescents in Lira district, Uganda.			attaining ordinary level of education. Positive attitude: receiving vaccine doses from different vaccination sites and encouragement from a health worker. Other factors associated with uptake of HPV vaccine included; the existence of community outreaches, availability of vaccines at vaccination sites and receiving full information about the vaccine at the vaccination site.	vaccines at the vaccination sites, health education aimed at creating a positive attitude towards the vaccine, sensitisation of the adolescents about the vaccine and conducting community outreaches
Moucheraud et al., 2023	Malawian caregivers' experiences with HPV vaccination for preadolescent girls: A qualitative study.	To understand attitudes about, and experiences with, the HPV vaccine among caregivers of eligible girls in Malawi.	Caregivers	Malawi	Uptake was low. Caregivers were aware of the dangers of cervical cancer, and understood that HPV vaccine is an effective prevention tool. Many caregivers had heard rumours about the vaccine such as, alleged harmful effect on girls' future fertility. Many caregivers, especially mothers, felt that school-based vaccination was efficient; but some caregivers expressed they had not been more engaged during the school-based HPV vaccination. Caregivers also reported that the COVID-19 pandemic has been disruptive to vaccination.	Complex and intersecting factors that affect caregivers' motivation to vaccinate their daughters against HPV, and the practical challenges that caregivers may encounter. Improving communication about vaccine safety (particularly to address concerns about loss of fertility), leveraging the unique advantages of school-based vaccination while ensuring parental engagement, and understanding the complex effects of the COVID-19 pandemic (and vaccination program).
Egbon et al., 2023	Challenges and lessons from a school-based human papillomavirus (HPV) vaccination program for adolescent girls in a rural Nigerian community.	To understand the challenges to implementing school-based HPV vaccination programs, particularly in a remote rural setting where vaccine hesitancy is high.	Adolescents	Nigeria	Challenges to vaccine delivery included operational costs exacerbated by lack of adequate health workforce and infrastructure in the study setting.	One needs to understand the complexities of the vaccine from the perspective of the target audience, and the local community. Strategies should include addressing community concern, appropriate delivery, and targeted advocacy to make the vaccination program locally relevant.
Mihretie et al., 2022	Knowledge and willingness of parents	To assess knowledge, willingness, and associated	Parents of girls aged 9–14 in	Debre Tabor Town,	Parents of preadolescent girls between 9-14 showed that	The knowledge and willingness of parents toward the HPV vaccine were

	towards child girl HPV vaccination in Debre Tabor Town, Ethiopia: a community-based cross-sectional study.	factors of the human papillomavirus vaccine among parents of girls aged 9–14 years at Debre Tabor Town.	Debre Tabor Town, Ethiopia	Ethiopia	indirectly being exposed to cervical cancer, STI increased their awareness and knowledge about HPV and heightened their fear which led to the likeness of their children being vaccinated.	low.
LaMontagne et al., 2021	HPV vaccination coverage in three districts in Zimbabwe following national introduction of 0,12-month schedule among 10- to 14-year-old girls.	To determine two-dose HPV vaccination coverage in three districts of Zimbabwe.	All households with girls currently aged 11 to 15 years.	Three districts in Zimbabwe; Mutare City, Matabo, Zvimba.	On-time dose 1 uptake ranged from 88 to 94% and two-dose HPV vaccine coverage ranged from 75% to 86% across the three districts.	Zimbabwe has demonstrated that high uptake and successful completion of 2-dose HPV vaccination can be achieved with an annual dosing schedule.
Isabirye et al., 2020	Factors associated with HPV vaccination uptake in Uganda: a multi-level analysis	The aim of the study was to identify individual (school attendance status, age of girls, ethnicity, and amount of media exposure) and community (socioeconomic disadvantages) factors associated with HPV vaccination.	6093 girls, aged 10–14 years (level 1), nested within 686 communities (level 2)	Uganda	Individual and community factors were associated with HPV vaccination in this study were socioeconomic factors; parents in the middle socioeconomic quantile were more likely to vaccinate their female child as compared to parents in poorer wealth quantile.	Both individual and community factors show a noticeable effect on HPV vaccination. Strategies aimed at reaching younger girls, street children, out of school girls, and girls with lower SES should be embraced in order to achieve high vaccination uptake.
Essoh et al., 2023	Exploring the factors contributing to low vaccination uptake for nationally recommended routine childhood and adolescent vaccines in Kenya	To explore the factors that contribute to low demand or vaccine hesitancy for childhood and adolescent vaccines in Kenya.	In-depth Interviews (IDI) was done to collect opinions of caregivers of children 0–23 months and adolescent girls	The data was collected at the national level and counties such as Kilifi, Turkana, Nairobi and Kitui.	Factors driving low uptake of the newly introduced HPV vaccine were reported to include misinformation about the vaccine, rumours that the vaccine is a form of female contraception, the suspicion that the vaccine is free and available only to girls, poor knowledge of cervical cancer and benefits of HPV vaccine	Rural community sensitization on both routine childhood immunization and HPV vaccine should be key activities post COVID-19 pandemic.
Mabeya et al., 2018	Uptake of three doses of HPV vaccine by primary school girls in Eldoret, Kenya; a prospective cohort study in a malaria endemic setting	The aim of this study was to identify barriers and facilitators associated with uptake of HPV vaccine.	3000 girls aged 9 to 14 years from 40 schools.	Eldoret, Kenya	Distance to a health facility was the identified barrier to uptake. Knowledge about cervical screening was the identified facilitator to uptake.	Distance to vaccination centres requires a more innovative vaccine-delivery strategy and education of parents/guardians on cervical screening to increase attainment of the HPV vaccination.

Adejuyigbe et al., 2015	Cervical Cancer and Human Papilloma Virus Knowledge and Acceptance of Vaccination among Medical Students in Southwest Nigeria	This study was aimed at determining the knowledge of cervical cancer and HPV as well as the acceptance of HPV vaccination among medical students of the University of Lagos.	Medical Students	Nigeria	Good knowledge of cervical cancer, HPV and HPV vaccination was demonstrated by 51.8%, 67.1% and 21.1% respectively; only 39.6% fully accepted HPV vaccination	Inadequate information and high costs were the obstacles identified to receiving vaccine and recommending it to others.
Ezeanochie et al., 2014	Human Papilloma Virus Vaccine: Determinants of Acceptability by Mothers for Adolescents in Nigeria	to evaluate the acceptability of HPV vaccines among a population of Nigerian women for their adolescent daughters and identify factors that may influence vaccine acceptance including the determinants of unwillingness to accept HPV vaccination for daughters	Mothers	Nigeria	70% accepted vaccination of their daughters, 30% were unwilling and the commonest reason for unwillingness was that it may encourage sexual promiscuity (62.3%). Mothers with poor knowledge of STI were significantly more unwilling to accept HPV vaccines compared to those with average or good knowledge	perception of susceptibility to HPV infection by daughters was significantly associated with acceptance of the vaccines
Elebiyo 2023	Knowledge, attitude, and uptake of Human Papilloma Virus (HPV) vaccine among parents of adolescents attending outpatient clinic at the University of Benin Teaching Hospital, Nigeria	Aim of the study was to examine the knowledge, attitude and uptake of the Human Papilloma Virus (HPV) vaccine among 302 parents whose adolescents' children utilized care services at the General Practice Units (GPU) of the University of Benin Teaching Hospital	Parents	Nigeria	The results indicate that 42.4% of the respondents have heard of HPV infection, while only 18.5% have heard of HPV vaccine. By contrast, 18.5% of the respondents reported that their children had been vaccinated. Attitude of the respondents on the vaccine was not impressive given that only 34.4% reported that the vaccine was important, while 56.6% reported that they will advise their friends to be vaccinated. A higher proportion of children who were vaccinated were those whose parents believed that their children will be vulnerable without vaccination and those whose religion did not disapprove of the vaccination.	Knowledge of HPV among parents in this population is low; the knowledge of the vaccine and its uptake is low; while attitude towards the vaccine is unimpressive. We recommend the adoption of intervention programmes to improve the knowledge and encourage the uptake of the vaccine among adolescents in this population.

Li et al., 2021	Tanzania's human papillomavirus (HPV) vaccination program: Community awareness, feasibility, and acceptability of a national HPV vaccination program, 2019	Assess awareness, feasibility, and acceptability of the HPV vaccination program among health workers and community-level stakeholders	Health workers, school personnel, community leaders, and council leaders	Tanzania	Over half of each respondent group attended a training or orientation on HPV vaccine. Almost 75% of the health workers and school personnel respondent groups, and less than half of community leaders correctly identified the target age group for HPV vaccine. Most of the health workers indicated HPV vaccination was available at health facilities and schools; most indicated that the majority of girls receive HPV vaccine in school. Approximately half of all respondents reported hearing misinformation about HPV vaccine, but 97% of all respondents indicated that HPV vaccine was either "very accepted" or "somewhat accepted" in their community.	The HPV vaccination program in Tanzania was well accepted by community stakeholders in 18 councils; adequate knowledge of HPV vaccine and the HPV vaccination program was demonstrated by health workers and school personnel
Oluwole et al., 2019	Knowledge, attitude and uptake of human papillomavirus vaccination among female undergraduates in Lagos State, Nigeria	To assess knowledge, attitude and uptake of HPV vaccine among female undergraduates in Lagos State	Female undergraduates	Nigeria	Only 3% of the respondents had good knowledge of HPV and the vaccine. Majority of the respondent 92.7% had positive attitude towards uptake of HPV vaccine. Only 2.6% of the respondents had received a single dose of HPV vaccine. The most common reason stated by the respondents for none uptake of HPV vaccine was lack of information.	Knowledge and uptake of HPV vaccination among the respondents were poor
Rabiu et al., 2020	Parental acceptance of human papillomavirus vaccination for adolescent girls in Lagos, Nigeria	To examine the degree of parental acceptance of HPV vaccination for adolescent secondary-school girls in Lagos, Nigeria.	Parents	Nigeria	45.9% had poor knowledge of cervical cancer and HPV infection, whereas 29.6% had good knowledge. Majority 54.7% also had poor knowledge of HPV vaccine, whereas 26.7% had good	HPV vaccination was acceptable to most parents only if offered free. Poor knowledge of cervical cancer, HPV infection, and vaccine may hinder acceptability.

					knowledge. Most 72% would vaccinate their daughters if vaccines were free, whereas only 35.5% would, if not free. Poor knowledge of cervical cancer and HPV infection significantly reduced the likelihood of vaccination even if free, whereas good knowledge of HPV vaccines and tertiary education in the mother increased the likelihood, if not free.	
Ramathuba et al., 2018	Knowledge and Attitudes of Women towards Human Papilloma Virus and HPV Vaccine in Thulamela Municipality of Vhembe District in Limpopo Province, South Africa	To assess the knowledge of human papilloma virus and HPV vaccine among rural women in Vhembe district in Limpopo Province	Women	South Africa	97.8% of women lacked knowledge about Human Papilloma Virus and HPV vaccine and were also not aware of the transmission methods of HPV virus. 94.3% were not aware who was eligible for HPV vaccine and the age range for vaccination and 92.1% displayed negative attitudes to the use of vaccines if given a pamphlet to let their daughters be immunized.	The awareness on human papilloma virus and HPV vaccine among women in Vhembe district is limited.
Turiho et al., 2014	Effect of school-based human papillomavirus (hpv) vaccination on adolescent girls' knowledge and acceptability of the HPV vaccine in Ibanda District in Uganda	Assess girls' knowledge of cervical cancer and HPV vaccine, and their acceptance of future vaccination of friends and hypothetical daughter	Adolescent girls	Uganda	HPV vaccination was positively associated with knowledge but knowledge and HPV vaccination did not predict vaccine acceptability.	Important motivations for vaccine acceptance were: its role in cancer prevention and advancement of reproductive health, minimal side effects, and positive peer role models. Major deterrents to vaccine acceptance were: rumours and misconceptions about possible side effects, perceived inadequate information about vaccine, and fear of side effects.

Table 3: Themes and subthemes identified from reviewed studies

Themes	Sub-themes	References
Individual factors	Age	28
	Maternal tertiary education and knowledge	16,19,20,24,28
	Fear and mistrust	11,12,23
	Socioeconomics	4,12,14,15,16,17,26
Interpersonal factors	Family structure	30
	Proximity to cancer/STI	28
Community and societal factors	Misinformation from social media	18,20,22,25,27,28,29,30
	Religion	12,21,30
Organisational factors and public policy	Free vaccine programme	8,16,24
	Lack of engagement	11,12,13,14,22,27

However, the predominate consensus across most studies is that maternal decision-making played a pivotal role in determining vaccine uptake.

Proximity of family history: Moreover, a study highlighted the relevance of proximity to family history of cancer and sexually transmitted infections as a contributing factor to the decision-making process²⁸. The study found that those who had personally cared for a family member living with cancer were motivated by the trauma and challenges that came with it, hence the developed a favourable opinion towards the vaccine.

Theme III: Community and societal factors

Misinformation from social media: One study found that society did approve of the vaccination²¹. While another research indicated that individuals obtained information about the HPV vaccine primarily from social media⁴. Eight studies found that misinformation regarding the vaccination was spread via social media, rumours, and faith-based sources^{18,20,22,25,27,28,29,30}. Two studies found that religious views influenced vaccination uptake^{12,21,30}. In contrast, one study revealed no significant detrimental influence of tradition and cultural views on HPV vaccination uptake³⁰. A recurring misconception, noted in six studies, suggested that the HPV vaccine promoted promiscuity and affects fertility^{18,22,27,28,29,30}. Parents in four studies perceived the provision of the vaccine in their communities as an effort to cause infertility for population control purposes^{18,27,29,30}. In one study, participants questioned why the vaccination exclusively targeted females, citing worries about infertility²⁶. According to one of these studies,

parents attributed their low-resource neighbourhood for the population control intentions.

Religion: Another consistent worry expressed in five studies was the belief that the vaccine promoted promiscuity^{18,22,26,28, 29}. In one study, parents felt that the HPV vaccination protected young girls against other STIs, potentially promoting risky sexual behaviour¹⁸. Furthermore, community members related HPV with HIV and poor sexual morality²². Another study found that some religious groups opposed modern medicine, citing fears that the vaccination would encourage immoral behaviour and expose young girls to sex and abortion²⁶.

Theme IV: Organisational factors and public policy

Free vaccination programme: Two studies highlighted the positive impact of a free vaccine program for preadolescent girls^{16,24}. However, one study revealed that vaccination rates differed significantly between schools with (where free vaccination is not provided) and without tuition fees where the vaccine is free, standing at 65.5% and 82.2%, respectively⁸.

Lack of engagement: In the context of school-based vaccination programme, parental feedback from one study indicated disappointment with the perceived lack of engagement, expressing preference of communicating with healthcare workers about the HPV vaccine rather than just receiving a consent form²⁷. Parents reported that they felt ignored and inadequately engaged with the school-based vaccination programme^{14,27}. Concerns were raised in two studies by parents, regarding the unclear criteria for girls who are eligible for the vaccine and the poor integration between schools and healthcare

services^{13,22}. Furthermore, two studies indicated that the distance to vaccine centre negatively impacted vaccine uptake^{11,12}.

Discussion

The aim of the scoping review was to identify and discuss the factors that influence HPV vaccine uptake among preadolescent girls. The identified factors include socioeconomic status, age, knowledge and fear, and the implementation of HPV vaccination. The collective findings of this review showed that different factors contributed to the misconception of the HPV vaccine. In this scoping review, we found that women who are at risk of cervical cancer are young and illiterate who live in the world's poorest nations, where pre-screening and treatment options are limited. As a result, primary preventive techniques are required to address the low rates of secondary prevention²³. However, a study conducted in Kenya found that scheduling, information gaps, behavioural components, myths, and misunderstandings all influence vaccination acceptance¹².

Furthermore, a study by Isabirye *et al*¹⁵ found that socioeconomically challenged populations tend to have comparable healthcare utilisation habits. A study done in Nigeria reported that maternal education has substantial influence on the child's health^{36,37}. Similar results were reported in Malawi, Tanzania and Zimbabwe regarding the association between maternal education and malnutrition among children³⁸. Another research found that poor use of preventive treatments like contraception is impacted by sociocultural variables including religion, culture, and gender³³. According to the ecological model, risk perceptions of infectious diseases is influenced by a community's social context and the concerns that communities express, which in turn influence how communities respond to infectious diseases and preventative measures³². The poor HPV vaccination uptake may be ascribed to how the community reacts to preventive actions and how the community perceives the danger of HPV. Therefore, it is important for healthcare workers to understand the societies that they are serving so that they can promote awareness that communities can relate to. A study states that the trust of mothers increased by 21 times when a health service was recommended by

a community health worker (CHW)¹⁴. We recommend that health education should be optimised by CHWs as they are able to simplify health education.

This review found that those who had completed the entire course of vaccination were motivated by the belief that the vaccine is helpful to their health and prevents cervical cancer²⁴. Another study found that parents' fear of cancer motivated them to consent to vaccination. Individual attitudes such as fear and mistrust influence people's health decisions; the COVID-19 pandemic exemplifies such²³. This is also described by the Social Ecological Model, which predicts that individual components such as behaviours, attitudes, and knowledge influence health-related choices³². Furthermore, one study found that participants' willingness to accept the HPV vaccination was strongly related to their degree of comprehension⁴. In that study, 82.8% of participants were not aware of the HPV vaccination and were hesitant to provide it to their children, compared to 49.4% who were aware of the vaccine and expressed interest. However, a study in Kenya found that communities were enthusiastic about receiving the vaccine despite having limited knowledge about cervical cancer and HPV⁴³. We recommend that more education and information should be provided to communities where the education levels are low.

Fear is one of the emotions that might occur as a result of a lack of information and comprehension. Misconceptions and conspiracy theories may heighten fear, leading to mistrust in health interventions, which affects the choices people make. The COVID-19 pandemic is one example of how misconceptions and conspiracy theories affect health choices³⁴. Mistrust and conspiracy theories surrounding the HPV and COVID vaccine have created anxiety and undermine the relevance of the vaccine^{23,34,35}. Contrary to other studies, one study suggested that fear can lead to positive health decisions and found that fear was a precursor for parents consenting to the vaccine²³. A solution to the fear is for healthcare workers and civil groups to provide extensive and routine health education to parents of preadolescent girls. This will equip parents with the correct information which will provide clarity on the vaccine, its purpose and impact on the individual.

Misinformation as the idea that the vaccine causes infertility, was another factor contributing to the vaccine's poor uptake. In a study that was conducted in Ethiopia, participants questioned why the vaccine was only for females and linked it to a government hoax designed to control population growth²³. Some teenagers voiced their mistrust of the vaccine due to information that they received and social pressure for girls not to take the vaccine. Similarly, a study conducted in Zimbabwe showed that there were concerns that the vaccine would cause infertility²⁴. Family disapproval has also been reported as a reason for non-vaccination owing to misconceptions about infertility³⁷. However, authors indicated that parental, family, and peer support can facilitate uptake. They argued that husbands who showed a positive attitude increased the uptake of childhood vaccination, regardless of maternal education³⁰. This observation can be useful in developing interventions that focus on encouraging fathers to attend activities that promote HPV vaccine.

The organisational level of the social-ecological model is associated with how health facilities and healthcare workers shape healthcare decision-making³². This is exemplified by study which claims that healthcare workers do not routinely discuss or promote the HPV vaccine to eligible clients, thereby impacting the uptake of the vaccine³⁹. This review found that healthcare workers have a high potential of influencing vaccine uptake. Unfortunately, a study that was conducted in Tanzania concluded that healthcare workers were among people who had limited to no knowledge concerning cervical cancer, HPV, and the HPV vaccine^{41,42}. The most common reason of incomplete vaccination was due to HCWs' inability to fully follow the initiative and vaccinator absenteeism. Similarly, research suggests that inadequate programme integration and inconsistent stakeholder conduct affect community attitudes towards vaccination^{11,23}. We found that communities mistrust the project because of conflicting viewpoints held by stakeholders and healthcare professionals in the previously cited study. There is need for continuous professional development for healthcare workers to refresh their knowledge on vaccination and the aetiology of the infection. In addition, another study reported that there is a weak integration of the programme and lack of regular schedule²³. Unlike other standardised Extended Programmes on

Immunisation, the HPV programme is mostly school-based with only two windows of vaccination. This has been reported as a challenge because the vaccine is not available in public health facilities due to the school-based approach²⁴. In addition, an absenteeism of vaccinators, and vaccine shortages especially during the COVID pandemic affected uptake¹². We recommend that HPV vaccine rollout initiatives should consider increasing the number of school-health nurses and availability of the vaccine.

Lastly, policies have a significant impact on the use of healthcare services and the adoption of health behaviours. As earlier indicated, in most underdeveloped countries such as South Africa, HPV vaccination is limited to public schools and is not included in the Extended Immunisation Programme. A participant in a study that was conducted in Nigeria indicated that their children are being used as "Guinea Pigs" because their community is low-resourced²⁹. Combined with findings of the study by Egbon *et al.*, and the fact that the HPV vaccination programme in SA target public, non-fee-paying schools, it would be necessary to reassure parents that their children are not being used as "guinea pigs". Policies and campaign strategies need to emphasise that HPV vaccination bridges the health inequality which can be undermined by low uptake of the HPV vaccine. Another policy issue is the age criteria which excludes individuals who qualify to receive the vaccine. There has been calls for the inclusion of adolescent girls and young women who qualify to receive the vaccine, decentralisation of the vaccine to primary healthcare, inclusion of the vaccine in the EPI schedule, and integration with other adolescent services⁴². This observation is useful for policy makers as they explore future vaccination interventions.

This scoping review has some limitations. First is the restriction to studies conducted in SSA as most of these countries have similar contexts to SA. Secondly, only articles published in English language were considered for inclusion in this review. Thirdly, most articles retrieved were quantitative studies that did not provide explorative and descriptive reasons to the factors that affect HPV uptake.

Fourthly, only one article was specific to South Africa, meaning that the results were more reflective of Sub-Saharan Africa rather than South

Africa. Lastly, our scoping review was not registered with a relevant database which might influence the methodology of our study. However, a strict adherence to our inclusion and exclusion criteria, proposed guidelines and Levac's six-step framework did add a quality dimension to our review.

Conclusion

The review identified socioeconomic factors, fear and mistrust, misinformation and misconception, as factors that contribute to low vaccine uptake in many African countries. There is a need for a multisectoral approach and more context specific health education to address the challenges related to vaccine uptake. There is also a need to strengthen regulatory processes and policy decision to ensure successful immunization programs. The findings can inform strategies to promote uptake of the vaccine. This review will also guide future studies to understand how communities in South Africa and other African countries perceive the HPV vaccination programme and the utilisation of it.

Conflicting interests

The Authors declare that there is no conflict of interest.

Author contributions

BPM conceived the idea and prepared the first draft of the manuscript. RG and FMM provided important inputs to the study, reviewed and edited the manuscript. BPM, RG and FMM have read and agreed to the final manuscript.

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