GYNAECOLOGISTS' INSIGHTS AND REACTIONS TO ADDRESS MISINFORMATION ABOUT CERVICAL CANCER SCREENING AND HPV VACCINATION IN PUNJAB, INDIA

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Abstract

Past studies indicated several factors contributing to low acceptance of Human Papillomavirus (HPV) vaccine and cervical cancer screening in India. This study aims to investigate key factors behind low coverage of HPV vaccination and cervical cancer screening in India thorough the experiences of gynaecologists. Researchers conducted fifteen in-depth interviews with gynaecologists to gather their perspectives and insights on various factors contributing to low acceptance of HPV vaccine and cervical cancer screening in India. It was found that low health literacy, socio-economic inequalities, socio-cultural beliefs, societal stigma, and fear significantly hinder reach of cervical cancer screening and uptake of HPV vaccine. Therefore, culturally informed and tailored interventions are crucial for the success of cervical cancer vaccination and screening programs. This paper underscores the need for effective communication strategies, collaborative efforts grounded in culturally nuanced approaches, and multidimensional interventions to improve the acceptance and uptake of HPV vaccination and cervical cancer screening in India.

Keywords: Cervical Cancer, HPV, Culturally Informed Interventions, Cancer Misinformation, Screening

1.0. INTRODUCTION

Cervical cancer remains the most prevalent form of cancer among women; with India accounting for approximately 20% of cases worldwide [World Health Organization (WHO), 2024a]. Notably, it is one of the few cancers that can be effectively prevented through vaccination and regular screening. In response to the growing burden of cervical cancer, the Indian government implemented preventive measures, including the introduction of the Human Papillomavirus (HPV) vaccine in 2008 and the establishment of the Cervical Cancer Screening Programme for women aged 30 years and above under the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCDs) in 2016. However, despite these initiatives, India's cervical cancer incidence and mortality rates remain higher than the global average (Ong et al., 2023). As the country prepares to integrate the HPV vaccine into its National Immunization Programme, this research article aims to identify the challenges hindering the effectiveness of

India's HPV vaccination and cervical cancer screening programmes.

Cervical cancer has affected human civilization from thousands of years, but its first screening tool Pap Smear (Papanicolaou test) was developed by George Papanicolaou in 1920s (Tan & Tatsumura, 2015). A significant milestone in this field was the demonstration of the link between genital HPV and cervical cancer by German virologist, Harald zur Hausen in 1980s (Lowy, 2024), which led to the discovery of the HPV vaccine in the 1990s (Center for Cancer Research, 2017). In 2006, the U.S. Food and Drug Administration (FDA) approved Merck's quadrivalent vaccine 'Gardasil' as the first HPV vaccine for the prevention of cervical cancer and genital warts in women (Kumar & Butler, 2013).

The government of India has taken several steps to reduce the incidences of Cervical Cancer and expand opportunities for its early detection. For instance, the Drug Controller General of India (DCGI) licensed bivalent and quadrivalent HPV vaccines in 2008 and nonavalent HPV vaccine in 2018 (Sankaranarayanan et. al, 2019). In 2016, the Cervical Cancer Screening Programme was introduced for women aged 30 years and above, along with Population-Based Screening (PBS) for common non-communicable diseases under National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCDs), (Van Dyne et. al., 2019). The success of India's COVID-19 vaccination drive with prominent contributing factors such as government stewardship, planning and implementation, and community participation (Dhawan et. al., 2023) as well as effective introduction of HPV vaccination in some states of the country such as Sikkim and Punjab; successful introduction of opportunistic HPV vaccination in Delhi (Sankaranarayanan et. al, 2019), and the launch of indigenous HPV vaccine 'Cervavac' (Ministry of Science & Technology, 2022) has raised the possibility of successful nationwide execution of HPV vaccination in India and enhanced the requirement for its inclusion in country's Universal Immunisation Programme (UIP).

HPV vaccination received a further boost in Budget 2024 when the Indian Finance Minister Nirmala Sitharaman, in her budget speech, announced that all girls between the ages of 9 and 14 years will receive the vaccines in their schools or nearby government primary health centres over the next three years (Panda, 2024). More recently, during fourth QUAD Leaders' Summit held on September 21, 2024, India along with United States, Japan and Australia, launched a QUAD Cancer Moonshot Initiative to reduce the cancer burden in the Indo-Pacific region, starting with cervical cancer- a largely preventable disease that continues to be a major health crisis in this region (Ministry of External Affairs, 2024). These initiatives of Government of India are well aligned to meet Sustainable Development Goal (SDG) 3.4, aiming to reduce NCD mortalities by one-third by 2030 and achieving the WHO's 90-70-90 target for elimination of cervical cancer by 2030. The target includes 90% of girls fully vaccinated with the HPV vaccine by age 15 years, 70% of women screened with a high-performance test by ages 35 and 45 years, and 90% of women identified with cervical disease receiving treatment (WHO, 2020).

Despite persistent efforts to curb cervical cancer, India accounts for one in five cases globally, according to the Global Cancer Observatory Report, 2022. Cervical cancer remains the second most common cancer among women in India compared to the fourth most common cancer among women worldwide (Sathishkumar, 2023; World Health Organization, 2024). The establishment of Population-Based Cancer Registries (PBCRs) by the Indian Council of Medical Research (ICMR) in 1982 has played a crucial role in providing essential data on the burden of HPV-related cancers including cervical cancer. A study by Sathishkumar et al. (2023) analysing data from 11 population-based cancer registries under the National Cancer Registry Programme, observed survival rates (with 95% CI) for cervical cancer across the registries from 2012 to 2015. The findings revealed that while cervical cancer survival rates in India have improved over time, the 5-year survival rate remains lower compared to high-income countries. Studies on the epidemiology of cervical cancer highlight that developing countries contribute to nearly 85% of cervical cancer mortalities globally, with India accounting for 23% of these deaths (Zhang et al., 2020a; WHO, 2024a). This indicates that most cervical cancer cases in

India are diagnosed at a late stage, primarily due to low screening rates and limited HPV vaccination coverage among the targeted population.

This low coverage of HPV vaccination and cervical cancer screening is linked to several factors, including limited knowledge of cervical cancer and HPV vaccine, stigma associated with receiving the vaccine, misinformation, vaccine safety concerns, and high cost of the HPV vaccine (Shah et al., 2021). As India prepares to introduce the HPV Vaccine in National Immunization Programme, it must learn from the challenges faced by other 140 plus countries who had introduced HPV vaccine in their NIP by the end of 2023 (WHO, 2024b). The action plan must consider local cultural perceptions and sensitivities to ensure success, similar to the COVID-19 vaccination rollout (Vorsters & Van Damme, 2018).

an indigenous perspective with a focused on combating HPV in the south Asian region. The study seeks to further assess the factors responsible for low rate of HPV vaccination and cervical cancer screening through review of literature and interviews of medical professionals. The study aims to investigate three research questions outlined below.

1.2 Research Questions

RQ 1: What are the key challenges impeding the effectiveness of India's HPV vaccination and cervical cancer screening programs in Punjab, India?

RQ 2: What are the primary barriers contributing to the limited coverage of HPV vaccination and cervical cancer screening in India?

RQ 3: How can effective communication strategies be designed to improve the acceptance of preventive approaches to cervical cancer screening and HPV vaccination in India?

Table 1 - Factors Affecting Uptake of HPV Vaccination and Cervical Cancer Screening in India

Factors Affecting HPV Vaccination	Studies
Low knowledge and awareness about cervical cancer risk factors and available HPV vaccines among the target population	Rashid et al. (2016); Shah et al. (2021); Mahajan et al. (2019)
Limited understanding of HPV vaccine efficacy among medical students and low confidence in recommending the vaccine among healthcare professionals	Radhika et al. (2018); Canon et al. (2016)
Concerns about the quality of vaccine delivery, safety, adverse effects, and its impact on fertility	Bingham et al. (2009)
Limited knowledge of HPV and vaccine, stigma associated with receiving the vaccine, vaccine safety concerns, and cost-related obstacles	Shah et al. (2021)
Health system, financial, health literacy, and socio-cultural factors	Rajkhowa et al. (2023)
Socio-economic factors like parents' education and employment indirectly linked to reduced vaccination rates	Degarege et al. (2020)
Factors Affecting Cervical Cancer Screening	**Studies**
Limited understanding of cervical cancer screening options and techniques among paramedical staff	Karena & Faldu (2024)
Feelings of not being at risk, discomfort with pelvic exams, and fear of negative test results	Rahman & Kar (2015)
Psychological barriers such as embarrassment, anxiety about the screening process, fear of being judged for immodesty, and societal stigma	Dsouza et al. (2020)
Absence of disease symptoms leading to reluctance for screening	Swapnajaswanth et al. (2014)

1.1. Objective of the Study

The objective of this study is to identify the challenges behind India's HPV National Immunization Programme, referring to relevant studies, and proposing solutions from

2.0 RESEARCH METHODOLOGY

This research study employs a qualitative methodology, incorporating an extensive thematic literature review i.e. recent and past studies on cervical cancer screening and HPV

vaccination in India. Researchers conducted semi-structured in-depth interviews of medical practitioners (gynaecologists) of Punjab region. Using a purposive sampling technique, 15 face-to-face semi-structured in-depth interviews with medical practitioners (gynaecologists) from Punjab region were conducted in September 2024. Each interview lasted approximately 30 minutes and was recorded via diary notes. The interviewees were asked questions on various themes including- awareness of cervical cancer and HPV risk factors; knowledge, attitudes and practices of cervical cancer screening and HPV vaccine in India; fear of stigma and judgement associated as obstacle to HPV vaccination and screening; impact of misinformation and myths related to cervical cancer and HPV vaccine; and effectiveness of interventions for designing strategies to increase the uptake of cervical cancer preventive measures. The main objective of the study is to examine the challenges and barriers related to success of cervical cancer screening and HPV vaccination programs in India and to further propose effective communication strategies to address these challenges.

The purpose of focusing on interview questions around these five themes is to understand the ground reality, validate the inferences drawn from extensive literature review, and to gain new insights to understand the barriers and facilitators for uptake of cervical cancer screening and HPV vaccination.

To ensure the confidentiality and safety of the interviewees, all participants have been anonymized using numerical identifiers (ranging from 1 to 15). Additionally, this study employs thematic analysis as outlined by (Braun & Clarke, 2006) to analyse the data collected through in-depth interviews. This qualitative methodology enabled the researchers to achieve the objectives of this study by providing a deeper understanding of the factors influencing the acceptance of preventive approaches to cervical cancer in India and devising effective communication strategies.

3.0 FINDINGS AND DISCUSSION

3.1 Awareness of Cervical Cancer Risk Factors

Awareness of cervical cancer risk factors is crucial for the prevention and early detection of the disease. Human papillomavirus (HPV) infection is widely recognized as the most significant risk factor for cervical cancer (American Cancer Society, 2020). In addition to sexual history such as becoming sexually active at a young age and having multiple sexual partners, other factors that may increase the risk of HPV infection leading to cervical cancer include a family history of cervical cancer, smoking, a weakened immune system, long-term use of oral contraceptives, or having multiple full-term pregnancies (American Cancer Society, 2020). As per National Cancer Institute (2022), cervical cancer is often asymptomatic in its early stages making detection challenging. Symptoms typically appear after the cancer has progressed and may include post-sex or post-menopause vaginal bleeding, abnormal bleeding between periods, watery or blood-tinged vaginal discharge with a strong odor, and pelvic pain or discomfort during intercourse. This fact underscores the critical role of regular screening in the early detection of precancerous cervical cell changes, which are primarily caused by persistent HPV infection, ultimately leading to cervical cancer. The level of general awareness regarding cervical cancer risk factors in India is a cause of concern, as all the 15 interviewed medical practitioners indicated that majority of their patients lack knowledge about common risk factors associated with cervical cancer.

"In my observations, most women, especially in rural areas, have very little knowledge about cervical cancer. They often don't see it as a serious health issue until symptoms appear, and by that time, it's usually too late. The lack of awareness is a significant barrier to prevention and is the major reason for diagnosis of cervical cancer at later stage in India." (Interviewee No. 6)

"It is commonly misperceived among patients that safe sexual contact with their partner is sufficient to prevent them from the risk of cervical cancer. The lack of understanding on other significant risk factors including family history of cervical cancer, a weakened immune system, smoking, long term use of oral contraceptives, and multiple full-term pregnancies among young women, also enhanced reluctance to undergo cervical cancer screening". (Interviewee No. 12).

Furthermore, all interviewed medical practitioners indicated that a limited number of their patients possess an understanding of the connection between cervical cancer and the HPV vaccine.

"There's a huge gap in understanding the connection between HPV and cervical cancer. Many patients don't even know what HPV is, let alone its link to cancer. When we explain it to them, they are often surprised and sceptical, partly because discussions around sexual health are still taboo in many communities". (Interviewee No. 4).

"Both young adults and parents often lack the adequate knowledge about HPV as a major cause of cervical cancer. However, young adults tend to be more receptive to information about HPV and, when educated, generally respond positively by avoiding smoking, moderating oral contraceptive use, and adopting effective family planning strategies". (Interviewee No. 9)

This suggests that the awareness on cervical cancer risk factors is limited and targeted educational efforts for young adults are crucial for empowering them to make informed health choices that can reduce their risk of cervical cancer.

3.1.1. Knowledge, Attitudes and Practices of Cervical Cancer Screening and HPV Vaccine in India. Preventive approaches to cervical cancer are critical in reducing its incidence and improving outcomes. Current guidelines recommend initiating cervical cancer screening at age 25 years, utilizing HPV-based tests or Pap smears, with screenings continuing every five years until the age of 65 years (American Cancer Society, 2021). In addition to regular screening, vaccination plays a vital role in prevention. The HPV vaccine protects against several common HPV types linked to cervical cancer. In India, the quadrivalent vaccine 'Gardasil' and the bivalent vaccine 'Cervarix' were licensed in 2008, followed by the nonavalent vaccine 'Gardasil-9' in 2018. Most recently, the Drug Controller General of India (DGCI) approved the indigenous quadrivalent vaccine 'Cervavac' developed by the Serum Institute of India Pvt. Ltd. in 2022 for individuals aged 9–26 years. The preferred target age for HPV vaccination is 9-14 years, with a catch-up age extending to 15-26 years (Rajiv Gandhi Cancer Institute & Research Centre, 2024). These guidelines and vaccination efforts are essential components in the fight against cervical cancer. Thus, to ensure compliance with HPV vaccination and cervical cancer screening, public health measures must consider the knowledge, attitudes, and practices of various groups, including young adolescents, adults, medical students, healthcare professionals, and parents.

3.1.2. Knowledge and Awareness of Cervical Cancer Screening and HPV Vaccine among Students and Women. The literature review of several studies highlighted that the knowledge and awareness of cervical cancer, screening, and HPV vaccine is low among students and women. Rashid et al. (2016), in a study conducted among students of college/ university located in the NCR region of India, found that female college students and biology majors in the National Capital Region (NCR) of India, had more knowledge about cervical cancer than others, though their understanding of HPV and available vaccines was notably low. Shah et al. (2021, in a study of 237 women aged 18–45 years in Mangalore, India, found that a lack of knowledge about genital warts caused by HPV was strongly associated with reluctance to receive or recommend the HPV vaccine. Similarly, Mahajan et al. (2019) also reported low awareness of cervical cancer and its risk factors among women in rural villages.

The interview data with medical practitioners from Punjab also indicated similar results, with less than 25% of patients (based on an average of 15 responses) being aware of cervical cancer preventive approaches.

"On an average, one out of four patients possesses some amount of awareness on cervical cancer screening methods such as Pap smear and HPV Testing. Their level of awareness also depends on their education, socio-economic factors and whether they reside in rural or urban area. In general, the overall awareness on cervical cancer preventive approaches is quite low especially in rural areas". (Interviewee No. 3)

3.1.3. Knowledge Gaps among Medical Students and Healthcare Workers (Paramedical Staff). Several studies have highlighted gaps in knowledge and

understanding of HPV and its vaccine among medical and healthcare students, despite general awareness of its role in preventing cervical cancer. Sangar and Ghongane (2013) observed that although most MBBS students across preclinical, paraclinical, and clinical stages were aware that a HPV virus causes cervical cancer their understanding of the epidemiology and ethology of cervical cancer, HPV, and HPV vaccines was initially poor but it improved as they advanced through their studies. In a study involving final-year medical students, Radhika et al. (2018) noted that while most were aware that cervical cancer is preventable, their understanding of the HPV vaccine's efficacy was limited. Consistent with these results, Balaji et al. (2020) found moderate levels of knowledge and awareness regarding HPV and its prevention among dental and medical undergraduates from a tertiary-care teaching hospital exhibit. Canon et al. (2016) further observed low confidence levels among healthcare professionals in recommending the HPV vaccine to patients, suggesting that increasing education on HPV and vaccination for healthcare providers could improve vaccine recommendations.

On the other hand, nearly all respondents (13/15) during in-depth interviews observed that senior medical students and paramedical staff possess sufficient knowledge of cervical cancer screening and HPV vaccine. However, some respondents (6/15) expressed concerns regarding confidence of frontline healthcare workers in communicating the benefits of adopting cervical cancer preventive approaches to patients.

"In my assessment, medical students and paramedical staff generally demonstrate a satisfactory understanding of cervical cancer and HPV vaccines. However, they often struggle with communicating long-term benefits of HPV vaccine and effectively addressing patient concerns. A proper training could help bridge these gaps". (Interviewee No. 13)

3.1.4. Factors affecting Parents' Perceptions towards HPV Vaccine. Parents' perceptions are influenced by both awareness and socio-economic factors and significantly affect their decision-making regarding HPV vaccination for their child. Degarege et al. (2018) highlighted that most parents in Mysore district were unaware that their daughters could contract HPV or develop cervical cancer, with rural parents being more reluctant to support preventive behaviours against HPV infection. In a separate study, Degarege et al. (2020) found that parents' positive perceptions of childhood vaccination were directly associated with higher rates of full vaccination, while socioeconomic factors such as education and employment were indirectly linked to a reduction in full vaccination rates. These findings indicate that while favourable perceptions of vaccination enhance adherence, socio-economic barriers such as employment and education can hinder achieving vaccination coverage.

Bingham et al. (2009) pointed out that the vaccine inoculation decision-making is primarily done by parents who are often influenced by concerns related to the quality of vaccine administration, safety, potential side effects, and perceived effects on fertility. Furthermore, Shah et al. (2021) also identified barriers to HPV vaccination, such as limited knowledge of HPV and vaccine, stigma associated with receiving HPV vaccine, vaccine safety concerns, and cost-related obstacles. However, Rajkhowa et al. (2023), in a comprehensive scoping review, identified key challenges impeding the successful implementation of HPV vaccination programs in South Asia, including economic, health system, financial, health literacy, and socio-cultural factors.

Similar results were reflected in the thematic analysis of our data, as all respondents indicated that parents frequently exhibit mixed attitudes toward HPV vaccination. While some demonstrate strong support for vaccination, others express considerable concerns rooted in cultural beliefs, misinformation, and a lack of awareness regarding the benefits of the vaccine.
"In my observations, I have noted that many patients, post receiving information about benefits of HPV vaccine in reducing the risk of cervical cancer, expressed a willingness to vaccinate their daughters. But they often raised concerns about vaccine safety, potential side effects on sexual health and fertility, and other misconceptions rooted in cultural beliefs. Effectively addressing their concerns can help

build a more positive attitude towards HPV Vaccine". (Interviewee No. 10)

The price of the HPV vaccine is also one of the major concerns for parents, with all interviewees (15/15) identifying it as a crucial factor in shaping their decisions.

3.1.5. Other Factors affecting Cervical Cancer Screening. Beyond the limited awareness of cervical screening techniques among women, contributing to the low cervical cancer screening rates in India, there are others factors which also affect cervical cancer screening practices and screening rates. Karena and Faldu (2024) identified a lack of awareness among nursing staff about cervical cancer and its screening modalities, contributing to low self-screening rates among healthcare professionals. Similarly, Rahman and Kar (2015) noted that nurses in a north-eastern state refrained from undergoing Pap smear tests due to feelings of low personal risk, discomfort with pelvic exams, and fear of negative test results. Dsouza et al. (2020) in their study observed that besides insufficient knowledge about screening advantage, the healthcare workers also face psychological barriers such as embarrassment, anxiety about the screening process, fear of being judged for modesty, and societal stigma, which hinders the screening uptake. Despite these challenges, Jones et al. (2023), in a study involving 211 adult women in South India, found that while cancer screening rates remained low in the target population, proactive recommendations from medical practitioners could significantly improve the suboptimal screening participation. Additionally, Swapnajaswanth et al. (2014) found out that the absence of disease symptoms further contributed to the reluctance to undergo cervical cancer screening, as many individuals perceived no immediate need for testing in the absence of visible deteriorating health issues.

Thematic analysis of interviews also pointed out in the same direction that beyond the limited awareness and knowledge; discomfort with pelvic exams, fear of negative test results, embarrassment, anxiety about the screening process, fear of being judged for modesty, and societal stigma were some of the other contributing factors which affect cervical cancer screening practices and low screening rates.

"I see that cervical cancer screening rates in villages are still quite low compared to urban centres. Many women in these regions are unaware of the importance of regular screenings, such as Pap smears, due to limited health education and cultural barriers". (Interviewee No. 2)

"I observe that while cervical cancer screening rates are better in urban areas compared to rural regions, they are still not as high as they should be. Further, many women who are even aware of the need for Pap smears still feel hesitant due to discomfort with the screening procedure and misconception and misconception of not being at risk". (Interviewee No. 11)

Furthermore, on the question regarding identification of pattern in adoption of regular screening, most interviewees (8/15) reported that younger women, particularly from higher socio-economic backgrounds, were more likely to adopt regular screening after learning about its benefits. However, many interviewees observed greater reluctance among patients with lower education levels due to deeply rooted cultural beliefs.

Thus, our study findings insinuate that lack of knowledge, low health literacy, and low income contribute to limited coverage of HPV vaccination and cervical cancer screening There are some psychological barriers which negatively affect the screening behaviour and decision making such as societal stigma, fear of judgment, embarrassment, and anxiety about the screening process.

3.2 Analysing the Fear of Stigma and Judgement Associated as Obstacle to HPV Vaccination and Screening

Social stigma (Shah et al., 2021), and the fear of being judged for perceived immodesty (Dsouza et al., 2020) are among of many crucial socio-cultural factors that require comprehensive analysis within the Indian context to formulate effective strategies for promoting HPV vaccination and cervical cancer screening. In the micro-social context, decision-making regarding HPV vaccination for unmarried girls is typically undertaken by parents, particularly fathers, while post-marriage, this responsibility shifts to the husband. These decisions are profoundly influenced by socio-economic and socio-

cultural dynamics. Moreover, it is important to recognize that discussions surrounding sexuality are rarely held within Indian family settings, as topics related to HPV, often linked to sexually transmitted infections (STIs), are perceived as taboo in the Indian and broader Asian societies (Wong et al., 2020). Therefore, it is vital to highlight risk factors associated with cervical cancer and to position the HPV Vaccine as a preventive measure against cervical cancer during vaccination campaigns. Nyblade et al. (2017) identified social stigma as a significant barrier to screening, early diagnosis, and the pursuit of treatment for women experiencing symptoms.

In our findings also, interview respondents (14 out of 15) confirmed that they have observed many female patients experiencing anxiety, fear of being judged for modesty and embarrassment about cervical cancer screenings.

"During pelvic examinations, many women expressed anxiety, shyness, embarrassment and fear of being judged regarding their modesty. I addressed their concerns with sensitivity by explaining the importance of regular screening process for the early diagnosis of HPV infection. Additionally, a proper briefing about the screening procedure and an assurance to maintain privacy help reduce their anxiety". (Interviewee No. 5)

Societal stigma surrounding HPV vaccination appears to grow stronger with advancing age. Shah et al. (2021) found that participants aged 18 to 26 years reported a lower perception of societal stigma and judgment, whereas those in the 27 to 45 years age group exhibited a heightened fear of stigma and judgment concerning vaccination. In contrast, Ooi et al. (2024) conducted a study utilizing secondary data from 3,310 women which revealed that factors such as education, high household income, and reduced fear of judgment play reinforcing roles in shaping preventive health behaviours. Wong et al. (2020) underscores the importance of understanding the multidimensional social and cultural norms that contribute to HPV vaccine hesitancy and the need for partnerships with religious authorities and spiritual organizations in improving the acceptability of the HPV vaccine. Therefore, addressing social stigma and fear of judgment is critical in encouraging greater participation in HPV vaccination and cervical cancer screening programs. Culturally informed interventions are essential for enhancing public health of the society and increasing vaccine uptake.

During the in-depth interviews (7/15) respondents also confirmed that college going girls after receiving information about HPV vaccine benefits show less reluctance to HPV vaccination as compared to matured women. Hence, this finding suggests that educational campaigns at school or graduate levels could prove to be an effective tool in fostering a positive attitude toward the HPV vaccine among younger and adult individuals.

3.3 Measuring the Impact of Misinformation and Myths Around Cervical Cancer and HPV Vaccine

Social media has become a crucial platform for connection and community of patients, lot of users are actively seeking health-related information, specifically, related to cancer from social media platforms (He & Li, 2021). Fridman et al. (2024) revealed that nearly two-thirds of cancer patients or their caregivers were willing to use social media as a source for making medical decisions. However, the credibility of information shared on these platforms demands critical evaluation, as misinformation- particularly concerning cervical cancer screening and HPV vaccine has been widely disseminated. This misinformation has contributed to increased vaccine hesitancy and reluctance to participate in cervical cancer screening.

3.3.1. Prevalence of Cervical Cancer Misinformation on Social Media. Rajkhowa et al. (2024), through an analysis of 1,010 tweets from India, identified widespread misinformation about HPV vaccination, primarily focused on vaccine safety, efficacy, ethical considerations, and uncertainty in vaccine selection. Similarly, Chen et al. (2018) examined 2,691 tweets related to gynaecological cancers, including breast and cervical cancer on Weibo and found that approximately 30% of these tweets contained misinformation. Kornides et al. (2022) echoed these findings in their analysis of 3,876 unique tweets related to HPV vaccine on Twitter, where one in four tweets was identified as containing disinformation or misinformation.

Johnson et al. (2021), in a study of 50 popular social media articles on each of the 4 most common cancers, reported that one-third of these articles contained misleading information, with articles featuring misinformation generating more engagements than those presenting factual information. Boatman et al. (2024) further highlighted that social media posts designed to appear educational or express anti-vaccine sentiments had a higher proportion of misinformation within the associated comment sections. They found highest proportion of HPV vaccine misinformation in the comment sections of Facebook. Similarly, Ekram et al. (2018), in a study examining the tone of HPV vaccine-related videos on YouTube, found that a majority of the videos portrayed a negative stance towards the vaccine. Anti-vaccine videos were particularly prone to disseminating misinformation, often emphasizing themes related to serious side effects, conspiracy theories, and the general belief that vaccines are harmful. Shay et al. (2024) also observed misinformation in one fourth articles shared on Facebook. Therefore it is prevalent in the existing literature that social media platforms are rife with the misinformation related to HPV vaccine and cervical cancer.

3.3.2. Misinformation Related to Cervical Cancer and HPV Vaccine. Massey et al. (2020) identified key characteristics of misinformation regarding the HPV vaccine, noting that anti-vaccine posts, predominantly originate from individuals sharing personal anecdotes. These posts frequently highlight themes such as specific HPV vaccine names, allegations of concealed information, conspiracy theories, unverified claims, and risks of vaccine-related injury risks. In a related study, Taumberger et al. (2022) identified nine common myths about HPV vaccine- 1) Pap smear is also effective; no need for vaccination; 2) HPV vaccines are new, hence, there is no safety and efficacy; 3) HPV vaccine can cause ovarian failure; 4) The vaccine can cause autoimmune disease, neurological disease, and even death; 5) Children are not sexually active, hence, there is no need to vaccinate them early; 6) Boys and men do not get cervical cancer, hence, they do not need a vaccine; 7) After first sexual intercourse, the vaccine does not work any longer; 8) Natural HPV infection already creates a protective antibody response, hence, there is no need for vaccination; and 9) HPV vaccination increases risky sexual behaviour and promiscuity. The leading healthcare providers in India have also debunked common myths about cervical cancer, highlighting misconceptions about the necessity of screening, prevention, and risk factors that contribute to misinformation and impede effective public health efforts (Dangi, 2024). However, the prevalence of misinformation related to HPV vaccination and cervical cancer screening is still high on social media platforms. Social media posts containing disinformation or misinformation about the HPV vaccine receive higher audience engagement, including likes and retweets (Kornides et al., 2022), and prevention-related misinformation diffuse significantly more broadly and deeply than true information on social media (Chen et al., 2018). Hence, it is crucial to design a targeted plan to counter the misinformation which has emerged as a significant obstacle in success of HPV vaccination and cervical cancer screening programmes in various countries (Sundstrom et al., 2021).

The dissemination of misinformation about the HPV vaccine and cervical cancer screening on social media is subtly contributing to increased reluctance toward preventive measures by reinforcing false beliefs and intensifying concerns. In the present study too, 10/15 of medical practitioners indicated that social media contributes to the dissemination of misinformation related to HPV vaccine and results in heightened vaccine hesitancy among patients.

“Misinformation related to HPV vaccine certainly enhances vaccine hesitancy among youngsters and their parents. Many times, patients express reluctance to receive HPV vaccination because of their false perception of exaggerated side effects based on unverified claims. Evidence-based and authentic information help debunk these myths”. (Interviewee No. 6)

Moreover, nearly all the interviewees (14/15) agreed that incredible information on social media exacerbates misconceptions about cervical cancer screening including the false belief that Pap smear test is painful and HPV screening is unnecessary in the absence of

symptoms. Gynaecologists also emphasized that clinicians and oncologists can contribute in disseminating accurate information on social media, particularly, regarding the importance of cervical cancer prevention strategies so as to aid in the effort to combat cervical cancer.

3.4 Evaluating the effectiveness of Interventions for designing strategies to Increase the Uptake of Cervical Cancer Preventive Measures

Several studies have been conducted to analyse the impact of various interventions to improve knowledge, attitudes, and practices towards cervical cancer and its prevention strategies. These interventions also seek to mitigate the effects of misconceptions, disinformation, and misinformation regarding HPV vaccine and cervical cancer screening as well as to overcome social stigma and fear among targeted population.

3.4.1 Effect of Educational Intervention. Educational interventions have consistently been shown to be effective in raising awareness and improving knowledge regarding cervical cancer and its preventive measures, including HPV vaccination. Zhang et al. (2020), in a study of 13 to 14-year-old students in China, demonstrated that a 45-minute educational session significantly enhanced students' understanding of HPV and the associated vaccines, as well as their willingness to get vaccinated. Similarly, Thanasas et al. (2022) reported positive outcomes following intervention of interactive health education seminars for high school students in Greece, with increased knowledge and vaccine acceptance. Notably, the educational impact was particularly effective among students who valued the opinions of their parents and teachers (Zhang et al., 2020b). In India, Verma et al. (2024) found that an educational session among healthcare students aged 19-25 years also increased knowledge and awareness as well as willingness to receive the HPV vaccine.

However, the impact of educational interventions on willingness to get vaccine may not be uniform across all demographics. Joshi et al. (2018), in a study of females aged 16 to 40 years in Western India, reported that while educational intervention by physician improved general awareness about cervical cancer and HPV, they did not significantly enhance vaccine acceptance. The primary obstacles cited by respondents in that study included religious beliefs, high vaccine costs, and the lack of persuasive information. Almatrafi et al. (2024) conducted study among secondary school girls in Saudi Arabia and underscored the importance of introducing tailored educational intervention in correcting misconceptions, promoting accurate knowledge, and increasing vaccination acceptance.

In the present study, most of the medical practitioners (10/15), in their interview responses, expressed the belief that educational interventions help foster a favourable attitude towards the HPV vaccine. Some of them (4/15) mentioned that they had the opportunity to deliver lectures on cervical cancer in schools, where they observed that students, post-lecture, demonstrated a willingness to receive the HPV vaccine. However, the respondents emphasized that since the final vaccination decision is made by parents, it is crucial to address their concerns about vaccine cost, efficacy, misconceptions, and cultural beliefs. These findings suggest that while educational interventions are effective in raising awareness, additional strategies are needed to overcome socio-cultural and economic barriers to HPV vaccine uptake.

3.4.2. Effect of Web Based Intervention. In addition to educational intervention, web-based interventions have also shown positive results for increasing awareness and willingness to vaccinate against HPV. Suzuki et al. (2021) conducted short online interventions among 1660 participants and found that brief web-based educational program improved the willingness of adults, particularly men, to consider HPV vaccination for their children. Similarly, Si et al. (2022) reported positive results of interventions among college going Chinese women, such as enhanced knowledge, motivation, and positive attitude towards HPV vaccination from a week long, 10-minutes a day, online intervention model based on the Information-Motivation-Behavioural model (IMB). Zhang et al. (2022) also identified web-based health education as a feasible and effective method to increase awareness and acceptance of HPV vaccines, though the impact was limited on

actual vaccine uptake. Additionally, Suzuki et al. (2022) found that a web-based short film featuring the story of a cervical cancer survivor significantly increased the immediate willingness of adults aged 30-59 years to vaccinate their children.

Analysis from the in-depth interviews with medical practitioners reflects similar findings, as majority of the respondents (9 out of 15) stated that patients do engage with online educational materials in their native language. However, they observed that short-term web-based educational interventions are only effective in raising initial awareness, while sustained online engagement is perceived more effective in addressing common misconceptions. Furthermore, most of the interviewees (13/15) agreed that medical practitioners could play an important role in curation of authentic online educational content in the form of blogs and videos. The above findings suggest that while web-based interventions are effective in raising awareness and initial willingness, sustained engagement is necessary to ensure long-term positive impact on HPV vaccination behaviours.

3.4.3. Interventions Targeting Inoculation Against HPV and Cervical Cancer Misinformation on Social Media. The rising prevalence of misinformation regarding HPV and cervical cancer has prompted researchers to develop effective interventions aimed at inoculating social media users against such misinformation. Kim et al. (2022), in a web-based message-testing experimental study found that evidence-based messages directly countering misinformation and promoting HPV vaccination in social media environments can positively influence parents' attitudes and behavioural intentions to vaccinate their children against HPV. In another study, Sundstrom et al. (2021) highlighted the potential of social media campaigns by organizations focused on HPV vaccination and cervical cancer screening; emphasizing that these campaigns offer opportunities for audience engagement with the campaign messages. They found that peer-to-peer dialogue was an effective strategy to counter comments promoting misinformation about the HPV vaccine. Moreover, Ortiz et al. (2019) underscored the necessity of collaborative inoculation initiatives involving healthcare professionals and social media influencers—especially those associated with anti-vaccine communities—to disseminate accurate, evidence-based information regarding vaccine safety and efficacy. Such collaborations can create credible counter-narratives that resonate with hesitant audiences, thereby, mitigating the impact of misinformation in social media environments.

During the in-depth interviews, all of the (15/15) respondents emphasized that debunking misinformation with evidence-based information could be an effective strategy to mitigate cervical cancer and HPV vaccine-related misinformation on social media. Furthermore, majority of medical practitioners (8/15) expressed their willingness to collaborate with social media influencers to create and promote accurate information related to cervical cancer and screening practices. However, few (5/15) gynaecologists highlighted the challenge of finding suitable social media influencers to collaborate with to effectively communicate their messages about cervical cancer on social media platforms.

Regarding other innovative social media approaches, only a few (2/15) practitioners suggested that testimonials by patients receiving cervical cancer treatment could inspire females to adopt preventive measures. Majority of the gynaecologists commented that peer-to-peer discussion is important to address cervical cancer myths.

"Social Media campaign regarding cervical cancer could only grab attention of social media user, but their misconceptions can only be resolved through one-to-one discussion. I firmly believe live seminars by medical experts on Facebook and YouTube could be an effective strategy to address participant's concerns and misconceptions". (Interviewee No. 14)

These findings suggest that evidence-based social media posts, interactive peer discussions, and collaborative information dissemination strategies are critical in combating misinformation, fostering trust, and ultimately increasing HPV vaccine uptake.

3.4.4. Interventions for Specific Groups. Several scholars have identified psychological barriers, such as social stigma and fear of

being perceived as immodest, as key factors contributing to reluctance in adopting cervical cancer prevention measures (Dsouza et al., 2020; Shah et al., 2021; Nyblade et al., 2017; Wong et al., 2020). Therefore, culturally tailored interventions could be tested in achieving broader uptake of HPV vaccination and cervical cancer screening among the communities with deep rooted religious and cultural beliefs. Most of the gynaecologists (11/15) suggested the need for culturally sensitive interventions, especially, for communities with deep rooted religious and strong cultural beliefs, with the aim of reducing socio-cultural and religious stigmas and hesitancy to HPV vaccination and screening.

Majority of the (13/15) gynaecologists also emphasized the importance of community-participatory based approach, wherein healthcare providers, along with local religious and community leaders, should collaborate to implement sustained efforts. The innovative suggestions of gynaecologists are listed below:

"In my experience, providing culturally tailored educational materials in regional languages, along with organizing local health camps, can help address misconceptions effectively". (Interviewee 7)

"Appeals from religious leaders advocating for the adoption of cervical cancer preventive approaches, emphasizing their importance for overall family health, are crucial. Such advocacy can help foster a positive attitude among both men and women towards the HPV vaccine and cervical cancer screening". (Interviewee10)

"The HPV vaccine should be promoted as a shield against cervical cancer during discussions on public platforms, with an emphasis on the various risk factors associated with the infection and vaccine efficacy. By adopting this approach, we can cultivate a favourable attitude among parents and young women toward full vaccination". (Interviewee1)

"Art and culture have long been effective mediums for conveying important messages. '*Nukkad Natak*' (street theatre), and theatrical plays in regional languages can similarly serve as powerful tools to communicate the importance of HPV vaccination and cervical cancer screening and building a favourable attitude". (Interviewee 8)

"NGOs and charitable organizations in collaboration with healthcare providers need to come forward to organize special camps to provide HPV vaccination and cervical cancer screening service without any cost to the BPL (Below Poverty Line) families". (Interviewee 15)

The summary of interventions discussed above by various practioners is tabulated in Table2.

Table 2: Table of Interventions Recommended in the Past Literature

Intervention and Age Group	Researcher(s)	Findings	Suggestions
Educational Interventions			
45-minute class to 13–14-year-old students in China	Zhang et al. (2020)	Improved knowledge about HPV and HPV vaccines, along with increased willingness to vaccinate.	Integrating health education into school-based sexual health curriculum to boost HPV vaccination coverage.
Health education seminars for high school students in Greece	Thanasas et al. (2022)	Significant increase in HPV knowledge and willingness to vaccinate after interactive sessions.	School-based interactive informational interventions are effective in increasing awareness and vaccination rates.
Physician-led educational intervention for women aged 16–40 years	Joshi et al. (2018)	Enhanced awareness of cervical cancer etiology, symptoms, and vaccines; however, low acceptability of the vaccine.	Addressing religious beliefs, reducing vaccine costs, and providing persuasive information are key factors to improve vaccine acceptability.

Intervention and Age Group	Researcher(s)	Findings	Suggestions
Educational sessions for healthcare students aged 19–25 years in India	Verma et al. (2024)	Enhanced knowledge and willingness to vaccinate against cervical cancer.	Targeted educational interventions in healthcare settings are valuable for increasing vaccine uptake.
Educational program for secondary school girls in Saudi Arabia	Almatrafi et al. (2024)	Significant improvement in cervical cancer and HPV vaccine knowledge post-intervention.	Tailored programs that correct misconceptions and promote accurate information play a critical role in increasing vaccination acceptance.
Web-Based Interventions			
Web-based education for participants aged 20 years or older	Suzuki et al. (2021)	Increased willingness among adults, especially men, to consider HPV vaccination for their children.	Additional web-based interventions targeting parents could enhance willingness to vaccinate.
Web-based short film on cervical cancer survivor story (aged 30–59 years)	Suzuki et al. (2022)	Immediate increase in willingness to vaccinate, though the effect diminished after three months.	Sustained web-based education is needed to maintain long-term impact on vaccine willingness.
10-minute daily IMB model-based education for 7 days (college women)	Si et al. (2022)	Positive effects on participants' knowledge, motivation, and perception towards HPV vaccination.	Implementing short, frequent web-based educational modules could effectively enhance HPV vaccine acceptance.
Social Media Interventions against Misinformation			
Evidence-based messaging on social media	Kim et al. (2022)	Positively influenced parents' attitudes and behavioural intentions to vaccinate their children.	Developing evidence-based messages to counter misinformation on social media platforms can enhance vaccine uptake.
Peer-to-peer dialogue on HPV campaigns	Sundstrom et al. (2021)	Peer-to-peer dialogue was an effective strategy for countering misinformation about the HPV vaccine.	Encouraging peer-to-peer discussions on social media platforms to combat misinformation and promote vaccine awareness.
Collaborative initiatives with healthcare professionals and influencers	Ortiz et al. (2019)	Collaborative inoculation initiatives with healthcare professionals and influencers can create credible counter-narratives.	Leveraging social media influencers and healthcare professionals to share accurate information can resonate with hesitant audiences and combat vaccine misinformation.

4.0. CONCLUSION

The thematic literature review and insights from the in-depth qualitative interview responses of medical practitioners indicated several critical factors contributing to the low coverage of HPV vaccination and cervical cancer screening in India. A primary barrier to HPV vaccination uptake among parents and children is the widespread lack of awareness and insufficient knowledge about cervical cancer risk factors and preventive measures. Even healthcare workers and paramedical staff also face challenges in communicating benefits of HPV vaccination and cervical cancer screening, hence, reducing their ability while dealing with patients concerns over vaccine safety and potential side effects of the vaccine. Other influential factors include low

health literacy, socio-economic disparities, and deep-rooted socio-cultural beliefs, which significantly limit the reach of vaccination efforts.

Similarly, cervical cancer screening is hindered by inadequate awareness of screening options and misconceptions, not only among women eligible for the vaccine but also among healthcare workers. Psychological barriers such as anxiety related to screening procedures, fear of being judged for modesty, and societal stigma further reduce participation rates. Many women perceive themselves as of not being at risk, and discomfort with pelvic exams, along with fear of adverse screening results, compounds to the reluctance to undergo screening. Misinformation related to HPV vaccine and cervical cancer screening, act as another paramount obstacle to the success of national programs aimed at combating cervical cancer. The findings of Shah et al. (2021) which revealed that younger female participants exhibited lower perceptions of stigma and judgment compared to their older counterparts, align with the demonstrated efficacy of educational interventions in increasing knowledge and acceptance of the HPV vaccine among targeted adolescents (Zhang et al., 2020; Thanasas et al., 2022). However, the results of Joshi et al. (2018) and the thematic analysis of interview responses in the present study showed that while clinicians-led educational interventions improved overall awareness of cervical cancer and HPV among young women, it did not lead to substantial improvements in vaccine uptake, as the decision is ultimately made by parents or spouse's family. It was also observed that young females felt hesitant to discuss about cervical cancer screening and HPV vaccination due to social stigma and fear of being judged for modesty. This disparity in outcomes is likely influenced by deep-rooted religious beliefs prevalent among the older age group, which acted as a barrier to vaccine uptake. It underscores the need for additional strategies along with educational and web-based interventions.

In the Indian socio-cultural context, social stigma and fear of judgment play a significant role in discouraging women from engaging in cervical cancer screening and HPV vaccination programs. Decisions regarding the HPV vaccination of young girls are often made by parents, and cervical cancer screening are made by women, typically in their 30s and above, are more likely to be influenced by deeply ingrained religious beliefs and societal expectations. A lack of awareness about the various risk factors of cervical cancer, social stigma, misconceptions surrounding HPV and HPV vaccine, fear of judgement for modesty during screening create substantial barriers to the acceptance of both screening and vaccination. These socio-cultural dynamic highlights the importance of culturally tailored public health interventions to counter the hesitancy related to vaccination and screening of HPV.

The medical practitioners in their interview responses emphasized the importance of addressing cervical cancer with sensitivity, particularly, in communities where deep-rooted cultural or religious beliefs may shape perceptions and acceptance. Ortiz et al. (2019) indicated that a community-based approach would be effective in designing art and culture centric interventions. Collaborative initiatives involving healthcare professionals, religious organizations, and social influencers are recommended to sensitively communicate the importance of adopting cervical cancer prevention measures for overall family health and to foster a favourable attitude in society regarding HPV vaccination.

Therefore, to achieve the WHO's 90-70-90 target for the elimination of cervical cancer by 2030, comprehensive communication strategies incorporating a community-based approach should be devised to navigate the complexities of the Indian cultural landscape. This should include a particular focus on reducing social stigmas, countering misinformation, and alleviating the fear of judgment, thereby, enhancing participation in HPV vaccination and cervical cancer screening behaviour.

5.0. RECOMMENDATIONS

As India prepares to integrate HPV vaccination into its National Immunization Programme, it is imperative to formulate a comprehensive communication strategy that incorporates cultural nuances and multi-dimensional interventions to increase the acceptability of the HPV vaccine and cervical cancer screening. Based on the literature

review and responses of interviewees, following interventions are recommended:

- Schools should organize special interactive sessions by medical practitioners under health education programmes to sensitize youngsters on cervical cancer and HPV vaccination. The programmes should be carefully designed while considering cultural differences and sensitivities in India aiming to improve awareness and acceptance of HPV vaccine.
- Educational institutions, in collaboration with medical practitioners, should develop and promote web-based educational interventions for parents in native languages focusing on risk factors associated with cervical cancer and highlighting the importance of HPV vaccination to safeguard their children from this disease.
- Healthcare providers and social media influencers should share evidence-based information across social media platforms in native languages about cervical cancer and its preventive approaches aiming to debunk common myths, mitigate the impact of misinformation, and foster a positive attitude towards HPV vaccine and cervical cancer screening.
- Religious and local leaders during public gatherings should promote scientifically backed culturally-tailored information for the adoption of cervical cancer preventive measures.
- Surrogate campaigns can be launched to sensitize public about how smoking cessation during pregnancy and supporting family planning by avoiding multiple pregnancies can reduce the risk of cervical cancer. This will raise awareness about contributing risk factors for HPV infection.
- Art and culture-based interventions, such as theatrical plays and '*Nukkad Nataks*' (Street Plays) should be designed to tackle societal stigmas related to HPV and highlight the importance of women's health and safety for family well-being through the adoption of cervical cancer preventive approaches.
- Banners and posters in regional languages and dialects informing about various cervical cancer risk factors and associated preventive approaches should be installed at primary, secondary, and territory care health centres to sensitise the masses about the importance of HPV vaccination and cervical cancer screening.
- Medical practitioners and paramedical staff should recommend women visiting for regular health check-ups to get HPV vaccination and regular screening to stay safe from cervical cancer.
- Charitable organizations and NGOs in collaboration with healthcare providers should organize health check-up camps to provide HPV vaccination and cervical cancer screening service at very nominal rates or without any cost for low-income families.
- Medical practitioners in collaboration with social media influencers should organize interactive online seminars on Facebook, YouTube and other social media platforms to address queries and misconceptions related to cervical cancer and preventive measures.
- Media houses in collaboration with healthcare providers should launch myth busting campaigns in local languages related to cervical cancer and importance of HPV vaccination to mitigate the impact of disinformation/ misinformation prevailing on social media.

The above communication strategies, if carefully implemented considering Indian cultural nuances, can prove to be effective in increasing the coverage of cervical cancer screening and HPV vaccination.

6.0. LIMITATIONS OF THE STUDY

One of the key findings of this study is that socio-cultural factors, in addition to socioeconomic determinants, significantly influence decisions regarding HPV vaccine uptake and cervical cancer screening. The extensive thematic literature review highlighted the importance of socio-cultural studies in understanding the complexities surrounding the introduction of new vaccines in society (Bingham et al., 2009). However, there is a notable dearth of comprehensive studies focused on the Indian socio-cultural context, which serves as a limitation to the present research. Given the complex interplay

of cultural beliefs, religious practices, and societal norms, future research should prioritize exploring these factors to better understand their impact on vaccine acceptance and screening participation. Additionally, future research needs to assess effectiveness of recommended interventions to contribute to the success of national HPV vaccination campaign. Such studies would be instrumental in guiding the design of culturally appropriate, art-centred, and culture-centred interventions aiming for increasing HPV vaccination rates and improving cervical cancer screening. Addressing this gap in research would significantly contribute to the success of India's national HPV vaccination and cervical cancer eradication efforts.

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