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DESIGNING A SUSTAINABLE CERVICAL CANCER SCREENING PROGRAM FOR THE PUBLIC HEALTH- CARE IN GILGIT-BALTISTAN: LESSONS FROM THE PUNJAB MODEL

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Abstract

Women in Gilgit Baltistan (GB) are still affected by cervical cancer, as access to healthcare services is limited by the area's remoteness and few available resources. By effectively screening women, GB can tackle delays in diagnosis, lower the risks of cancer and make health outcomes better for women living in distant areas. The Punjab Cervical Cancer Screening Program has gained broad acceptance and reduced deaths from cervical cancer, so GB's public sector can take inspirations for its own screening system. A narrative review of the Punjab Cervical Cancer Screening Program (2018–2024) was carried out alongside an analysis of GB's healthcare structure and culture. The analysis of peer-reviewed materials and interviews with GB health administrators and gynecologists helped in singling out program components that assist GB in overcoming the issue of limited hospital availability and cultural stigma. The main steps to ensure health care for GB involved: (1) providing continuous training for mid-level providers in BHUs and RHCs to cover staff shortages; (2) establishing a referral system of BHUs/RHCs to the secondary and tertiary hospitals; (3) using low-bandwidth technology to oversee health records across GB; and (4) reaching out to communities to address stigma and encourage women to seek cancer care. Following these strategies is important for GB to build a trustworthy VIA screening program. If GB uses its current infrastructure and creates partnerships between public and private companies, it can detect cancers early, reduce deaths from cervical cancer and strengthen healthcare services.

INTRODUCTION

Cervical cancer is still a serious problem in many countries and creates specific difficulties in low-resource and remote areas such as GB(Bedell et al., 2020; McClung et al., 2019). Cervical cancer can often be prevented if it is found and treated early, but it still leads to many cases of illness and death among women in Pakistan(Stelzle et al., 2021). Cervical cancer is the third most common type of cancer among Pakistani women and plays a major role in cancer-related disease and death rates. Pakistan currently does not have a national plan to regularly screen for cervical cancer, leading to people being diagnosed late and facing severe consequences. The early detection brought by structured screening helps decrease the disease impact and improves the chances of recovery. Despite this, there are many issues in putting these programs into practice, largely due to differences in healthcare access, economic factors and cultural issues in regions far from cities.

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To address cervical cancer, Pakistan must start with public campaigns, offer low-cost strategies like VIA and include HPV vaccination as a priority in public health guidelines. The main reason that cervical cancer is found late in Pakistan is because there are no reliable organized screening systems available. Most women do not get regularly screened for cervical lesions, so they often do not know if there are any precancerous changes. As a result of this late detection, cancer is frequently identified as an advanced case with symptoms such as irregular bleeding, pelvic pain or discharge. Therefore, many young women seek treatment in the hospital after the disease has progressed which raises the risk of serious illness and death. The use of simple, affordable ways to screen for disease and stronger community education promote early medical care and enhance the likelihood of recovery.

Women in GB are affected more by this disease due to being geographically separated, lacking proper healthcare support and struggling against social and cultural obstacles that prevent them from accessing treatment. In 2019, there were 109 total cancer cases in GB and 52 of these were found in females. Of them all, breast cancer was the most commonly found in women (19.2% were affected), followed by CNS cancer, ovarian cancer, uterine cancer and skin cancer, each with a prevalence rate of 7%. Among the major cancers, cervical cancer did not appear in the report of most affected ones(Stelzle et al., 2021). The reason for this underrepresentation involves not screening enough people, strong cultural stigmas surrounding the disease and lack of understanding or terminal stages detection t(Aziz et al., 2025; Chughtai et al., 2023; Shpendi et al., 2025; Tufail & Wu, 2023). However, the number of cervical cancer cases in GB is increasing lately, with healthcare organizations documenting a 15% rise between 2020 and 2024. The increase points out that the region requires immediate screening and preventive actions(Stelzle et al., 2021).

Most of Gilgit-Baltistan is a mountainous region where the population mainly lives in villages spread out over hard terrain. The system includes just a few major hospitals supported by numerous rural and village health centers and many of them are short of trained workers and decent equipment for screening people. In addition, the negative attitudes toward gynecology found in some cultures stop many women from taking part in cervical cancer screening. Since these issues are linked, new approaches that are effective, environmentally friendly and understand cultural differences are essential for overcoming problems related to screening. The introduction of the Punjab Cervical Cancer Screening Program in 2018 has helped to increase screening rates and improve survival outcomes through Visual Inspection with Acetic Acid (VIA) and immediate treatment(Kashif et al., 2021). Integrating the program with public health services, providing standardized training for providers and a strong referral system provide a model that fellow GB countries can replicate(Protocol for Cervical Cancer Prevention in Pakistan, n.d.).

It is important to implement a similar screening program in GB. The shortage of healthcare resources, including an important hospital and a framework of Basic Health Units and Rural Health Centers, means services must be distributed throughout the region. Due to cultural beliefs and stigma, programs must use culturally effective approaches to get more women involved. Modifying aspects of Punjab's model for the unique context in GB, especially introducing a spoke-and-hub referral system and combining hereditary disease screening with current maternal and child health programs, can make services more reachable and sustainable(Hakim et al., 2025; Xu et al., 2025). The goal of this review is to study whether the Punjab model can work in GB and to decide what components need to be changed for the region(Kashif et al., 2021). With the help of local infrastructure and attention to specific health issues, a sustainable program for cervical cancer screening in GB could dramatically lower rates of sickness and death, making it easier for women in this region to stay healthy. It is also necessary to take into account GB's specific features in terms of geography and demographics, like scattered rural areas and hard-to-reach areas for health services. Increasing the skills of healthcare workers through circulation of training will help move screening services to the Basic Health Units and Rural Health Centers. Tailored community engagement that tackles stigma, too, helps to encourage women to take part in screening. A strong referral and data system that responds to the needs of low-resource areas will keep care continuous and ensure quality(Ali et al., 2022; Shpendi et al., 2025). In the long run, this

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approach may guide the creation of just and accessible cervical cancer prevention initiatives in other areas facing similar problems in Pakistan and in other countries(Ali et al., 2022; Aziz et al., 2025; Kamzayeva et al., 2025; Tufail & Wu, 2023).

Objective

The objective of the study is to assess how the Punjab screening model for cervical cancer can be adapted to fit the needs of Gilgit-Baltistan. The purpose is to recommend a model specific to GB's geography, culture and healthcare system that can establish a long-term and successful program for cervical cancer screening.

Literature Review

Challenges in Detecting Cervical Cancer and Barriers to Screening in Pakistan and Gilgit-Baltistan

Cervical cancer is a global problem, mainly affecting low- and middle-income countries where few official screening services are in place. There is a rising number of people suffering from cervical cancer in Pakistan, with more deaths being recorded in the past years. According to (Tufail & Wu, 2023), having limited cancer registries and divided healthcare resources makes it difficult to spot cancer early and leads to poor outcomes. Cervical cancer screening and early detection of the disease are difficult in Gilgit-Baltistan (GB), a remote area with few well-equipped health services, strong gender literacy issues and mistrust. As a consequence, people are not screened as often, presenting their illnesses when treatment is harder—and this means more illnesses and deaths.

Screening methods and their effectiveness

Screening with Visual Inspection with Acetic Acid (VIA) is an affordable and practical way to detect cervical cancer. (Aziz et al., 2025) describe the types of HPV found commonly in Pakistan, stating that tests should be able to detect these high-risk types locally. VIA quickly gives results and requires very little equipment, making it a good choice for GB's rural and remote locations. Using VIA screening at camps and with Lady Health Workers, the program in Punjab achieved both better access to screening and an increased rate of discovering cancer early (Kashif et al., 2021).

Engaging the Community and Sociocultural Considerations

In Pakistan, reasons for fewer women getting cervical cancer screenings are the lack of information, the fear of judgment and women's limited power to make health choices in conservative rural regions. According to (Shpendi et al., 2025), lack of information or misunderstanding about screening can stop people from participating. The approach promotes the use of health education with visits from female community health workers and male relatives which helps lessen any social shame associated with cancer and motivates women to go to preventive clinics. It is very important for community engagement strategies to be adjusted for GB, as the country has unique cultural and geographic features.

Health system capacity and referral systems

According to (Chughtai et al., 2023), issues in Pakistan's handling of cervical cancer include challenges with referrals and collecting data together. The program improves care in Punjab by allowing screening centers to send referrals directly to nearby district hospitals for further diagnosis and treatment with support from administrative technology. In GB, where hospitals are spread out and people may not be able to get there, organizing better connections between healthcare teams and introducing telemedicine can lessen difficulties for patients.

Future Research

Hakim, Amin and Ul Islam (Hakim et al., 2025), along with Kamzayeva and colleagues (Kamzayeva et al., 2025), suggest that using new diagnostic techniques and triage methods can improve the success of screening and treatment. Despite their benefits, bringing such inventions to GB demands that they are carefully introduced and trained among local healthcare workers, as well as accepted by the community. When national health policies and insurance schemes like Sehat Sahulat are involved, it becomes easier for people to afford necessary checks and treatments.

Research Gap

The framework used in Punjab includes VIA screening, community mobilization and referral

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systems which can be used to guide GB's future planning. On the other hand, local areas need special adaptations such as in geography, culture and infrastructure. By focusing on these factors, the burden of cervical cancer can be lowered and more women in GB and similar places can be helped. While knowledge about cervical cancer and screening is available in Pakistan, important gaps are present, mainly in applying effective screening processes to Gilgit-Baltistan which is known for its challenging and unique culture. While the strategies of the Punjab Model have resulted in increased screening and early detection, little evidence shows how these strategies work in remote or resource-poor settings that also have different social and cultural issues. In addition, GB faces obstacles in policy development due to not having enough specific data on community engagement, workforce numbers, how referrals are handled or how interesting diagnostic techniques are being used. It is necessary to fill these gaps to come up with suitable cervical cancer screening strategies that benefit impoverished populations.

Research Methodology

To help design a cervical cancer screening program that fits the needs of Gilgit-Baltistan, the study used a mixed-method review technique based on the Punjab Model. The research consisted of secondary data review, literature collection and analysis and comparing various program frameworks. Further, national surveys such as the 2017–18 PDHS in Pakistan and reports from the Gilgit-Baltistan Health Directorate were used to obtain the secondary quantitative data needed for this study. The data made it possible to understand GB's population structure, access to health facilities, staff distribution and initial screening coverage in the country. This statistical summary helped explain the key reasons behind difficult cervical cancer screening access in the region.

In the second stage, a thorough literature review was carried out to study published research and official reports on the cervical cancer screening schemes across Pakistan, mainly focusing on the program in Punjab. Screening rates, test success, outcome of referrals and community views were used, along with comments about training, to capture all the aspects of the program. In order to show differences across regions and learn from their successes, studies from Punjab, Sindh and Khyber Pakhtunkhwa were reviewed.

A comparative thematic analysis was done to recognize and compile key ideas from the Punjab Model such as community mobilization, capacity building, service provision, referral processes and monitoring and see if they can be applied and adapted in GB with its distinct geographic, cultural and resource conditions. The information from studies of the demographics and healthcare system was used for this analysis to fit the local situation. The identified themes led to designing a program framework that supports sustainability, cares for gender needs and utilizes existing public health services. This approach made it possible to recommend an effective, fit-for-context cervical cancer screening program to the public sector in Gilgit-Baltistan.

Data Analysis

The model for cervical cancer screening in Gilgit-Baltistan was built using the health resources, hospitals and community values available in the area. It includes present health centers such as Basic Health Units (BHUs), District Headquarters (DHQs), RHQs and PHQs including Shaheed Saif-Ur-Rehman Teaching Hospital Gilgit M&CH Complex Gilgit and PHQ Hospital Gilgit. Lady Health Visitors and nurses in BHUs and RHCs are proposed to conduct VIA as a first step in detecting precancerous changes. Portable equipment and VIA kits in mobile units seek to ensure patients in remote areas can receive screening. Supervision by local gynecologists is maintained during training and capacity building to guarantee high-quality results.

Public hospitals are the main venues for VIA-positive women to receive for Pap-smear, HPV testing LBC colposcopy or biopsy and treatment, with help for transport and lodging. Community engagement relies on Lady Health Workers and female mobilizers to explain the program, ease any stigma and invite male family members to join in special sessions. The data is collected with both paper and digital methods in a way that links up with the Health Management Information System (HMIS) for management and evaluation. This model is designed to handle the region's specific problems, gradually expanding and

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ensuring that cervical cancer screening services are sustainable.

Table 1

Component	Description	Current Examples	Challenges	Screening Program Use
Health Facilities	PHQs, RHQs DHQs, RHCs, BHUs	Shaheed Saif ur Rehman Government Teaching Hospital/ M&CH Complex Gilgit(SSGTH/ M&CH) and PHQ hospital Gilgit, RHQ hospital Skardu and Chilas, DHQs in Nagar, Hunza, Astore etc.	Limited resources, infrastructure	BHUs/RHCs for VIA screening; PHQ for referral and treatment
Human Resources	Doctors, nurses, LHWs	LHWs present; shortage of specialists	Staff shortages	Train LHVs/nurses for VIA; gynecologists supervise and treat
Key Institutions	Shaheed Saif ur Rehman Government Teaching Hospital/ M&CH Complex Gilgit(SSGTH/ M&CH) , Hospital(M&CH)in Gilgit AKHS, GBRSP, Taskeen Initiative	NGO health centers supporting rural areas	Limited coverage	Partner with NGOs for outreach and education
Geographic Barriers	Mountainous terrain, remote villages	Difficult access, seasonal isolation	Limits service access	Mobile camps and transport support for referrals
Cultural Factors	Social norms, stigma	Low women's health-seeking behavior	Reduces screening uptake	Awareness via LHWs, community leaders, male engagement
Financial Constraints	Funding limitations	Reliance on government budgets	Restricts program growth	Use Gov Program to cover costs

Table 1: Overview of Healthcare GB

Table 2

Feature	Description	Purpose/Benefit
Community Mobilization	LHWs raise awareness and refer eligible women door-to-door	Builds trust, reduces stigma, increases screening uptake
Well Woman Clinics	VIA screening offered at BHUs and THQs on designated days	Accessible, low-cost screening at primary care facilities
Screening Method (VIA)	Visual Inspection with Acetic Acid by trained mid-level providers	Immediate results, cost-effective, suitable for low-resource settings

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Training & Capacity Building	Train LHVs/nurses with refresher courses and supervision	Ensures quality screening and sustainable service delivery
Referral System	VIA-positive women referred to district hospitals for treatment	Timely diagnosis and management, reduces loss to follow-up
Monitoring & Data Systems	Electronic HMIS tracking screening and treatment data	Enables quality control and program monitoring
Awareness Campaigns	Mass media and community outreach to reduce stigma	Normalizes screening, encourages preventive health behavior

Table 2: Key Features of Punjab Cervical screening model

Table 3

Component	Description/Adaptation for GB	Purpose/Benefit
Community Engagement & Mobilization	Utilize existing LHW network augmented by female social mobilizers trained in cervical cancer awareness. Use culturally sensitive educational materials and male engagement sessions.	Build trust, reduce stigma, improve screening uptake in conservative and remote communities.
Primary Screening Sites	Designate BHUs and RHCs as fixed screening centers with scheduled "Screening Days." Equip with VIA supplies and trained LHVs/nurses.	Accessible, regular, low-cost screening close to communities.
Mobile Screening Units	Deploy mobile teams with portable VIA kits to reach remote villages, especially in difficult terrain or during winter.	Overcome geographic barriers, increase coverage in hard-to-reach areas.
Screening Method	VIA as primary screening test performed by trained mid-level female providers; HPV DNA testing as a confirmatory tool at DHQ/RHQ level where feasible.	Cost-effective, immediate results; aligns with resource constraints.
Training & Capacity Building	"Train-the-trainer" model with intensive initial training at Saif-Ur-Rehman Teaching Hospital Gilgit M&CH Complex ; refresher trainings quarterly; supervision and mentoring by district gynecologists.	Build sustainable local workforce with quality assurance.
Referral & Diagnostic Network	VIA-positive women referred to Shaheed Saif-Ur-Rehman Teaching Hospital Gilgit(M&CH Complex,) and PHQ's Gilgit for colposcopy, biopsy, and treatment. Provide transport support and accommodation if needed.	Ensure timely diagnosis and management; reduce loss to follow-up.
Telemedicine Support	Use smartphone-based cervix imaging and teleconsultation with Saif-Ur-Rehman Teaching Hospital Gilgit M&CH Complex, PHQ Gilgit DHQ/RHQ gynecologists to aid remote diagnosis and supervision.	Compensate for specialist shortages; improve diagnostic accuracy.
Data Collection & Monitoring	Hybrid paper and digital reporting system with monthly data upload to central GB Health Directorate dashboard; integrate with HMIS where possible.	Enable program monitoring, quality control, and data-driven decision-making.
Integration with Existing Services	Embed cervical screening within maternal and child health services, e.g., antenatal and immunization visits. Collaborate with Gov Program for financial coverage.	Leverage existing health-seeking behaviors; reduce financial barriers.
Community Awareness Campaigns	Use local FM radio, social media, religious forums, and women's groups to raise awareness and dispel myths. Engage male family members through targeted sessions.	Normalize screening; improve acceptability and demand.

Table 3: Gilgit-Baltistan Cervical Cancer Screening Program Components

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Discussion

It is challenging to provide cervical cancer screening in Gilgit-Baltistan because of its geography, the shortage of specialists and cultural taboos. The proposed plan relies on present healthcare resources by making VIA the main screening test, reserving HPV DNA testing at higher hospitals for verification. It aligns with clinical strategies that work well in places with fewer medical resources(Ben-Ari E, 2022; Brüggmann et al., 2022; Drolet M, 2024; "Quadrivalent Vaccine against Human Papillomavirus to Prevent High-Grade Cervical Lesions," 2007; Stelzle et al., 2021).

Lady Health Workers and female mobilizers in the community tackle socio-cultural issues by informing people and lessening the stigma, making a big difference in conservative towns(Hakim et al., 2025). By including men, screening rates may go up, in line with studies showing that community outreach promotes participation.

Level	Location	Services	Providers	Purpose
Primary Screening	BHUs and RHCs	VIA screening	Trained LHVs, nurses	Early, low-cost detection
Community Mobilization	Door-to-door, community outreach	Awareness, eligible women ID	LHWs, female mobilizers	Increase uptake, reduce stigma
Referral & Diagn AND THQ hospital Gilgit	DHQs/RHQs	PAP-SMEAR/LIQUID BASE cytology, biopsy, , HPV testing	Gynecologists, specialists	Confirm diagnosis
Treatment	SSGTH M&CH Complex and, GNOR	LEEP, surgery, definitive oncological surgery, colposcopy	Oncological Gynecologists, and surgeons	Treat precancerous/cancerous lesions
Monitoring & Reporting	GB Health Directorate, HMIS	Data collection, program tracking	Data officers, managers	Quality control and oversight

Figure 1: Proposed Level 1 of SCREENING OF cervical cancer in GB

Similarly, to ensure the region has enough trained professionals, training and capacity building should be done in a "train-the-trainer" style(Chughtai et al., 2023; Delie et al., 2024). By using mobile screening and telemedicine, areas with few specialists and isolation are no longer barriers to fair medical care(Kamzayeva et al., 2025; Shpendi et al., 2025). Integrating paper and digital ways of collecting data helps to ensure that programs are tracked and judged properly.

Step	Description	Responsible Provider	Purpose
1	Community outreach and risk ID	Lady Health Workers (LHWs)	Increase screening uptake
2	VIA screening on scheduled days	Trained LHVs/Nurses	Detect precancerous lesions
3	Result counseling	LHVs/Nurses	Inform patients of results
4	Referral of VIA-positive cases	LHVs/Nurses	Facilitate diagnostic evaluation
5	Biopsy and HPV testing	Gynecologists at DHQs/ RHQs, PHQs	Confirm diagnosis
6	Treatment (colposcopy)	SSGTH(M&CH Complex Gilgit)specialists	Remove pre-cancerous /cancerous lesions
7	Follow-up exams	DHQ /RHQs and LHWs	Monitor for recurrence

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8	Data recording and quality check	HMIS team	Program monitoring and evaluation

Figure 2: Proposed Level 2 for Cervical cancer screening in Gilgit Baltistan

Although the model takes from Punjab's success, it is modified to meet the unique requirements found in Gilgit-Baltistan. In order to prove this model effective and adapted for scaling in cervical cancer prevention, implementation with future pilots and long-term reviews must take place in the region.

Future Implications

The draft model offers a well-designed plan for cervical cancer screening in Gilgit-Baltistan that deals with its specific healthcare challenges and is likely to boost early detection and reduce deaths. It is recommended that pilot programs be rolled out first to find out if the approach will work in different environments, if people are willing to accept it and what difficulties may be encountered during its operation. To maintain a high level of quality and adapt, organizations should keep investing in employees' skills, especially as it can be hard to find specialists(Kamzayeva et al., 2025). Using telemedicine and mobile units reduces the impact of distance and specialist shortage and other remote regions could benefit from these models(Gillison et al., 2008).

Implementing strong data collection and monitoring approaches is key to monitoring the program's success, using resources wisely and providing advice for decisions on important policies. Cultural engagement that includes men and community leaders should always be important to counter stigma and keep families engaged(Kashif et al., 2021; Protocol for Cervical Cancer Prevention in Pakistan, n.d.). Ultimately, using this model can improve cervical cancer screening in Gilgit-Baltistan and create an approach ready to be applied nationally to protect women's health throughout Pakistan(Chughtai et al., 2023).

Conclusion

This research introduces a special screening approach for cervical cancer that responds to the obstacles Gilgit-Baltistan faces in terms of geography, culture and resources. The approach links existing health facilities with involvement in local communities, outreach through mobile teams and telemedicine options to allow more access to screening. When systems for training and referral are in place, patients can trust that their care and management are high-quality and timely. Even though this goal sounds promising, it is still necessary to check how effective it is as pilots continue and more thorough reviews are done. Based on this model, the issue of cervical cancer can be handled more widely and more successfully, leading to better results for women's health in the area.

References:

Ali, A., Manzoor, M. F., Ahmad, N., Aadil, R. M., Qin, H., Siddique, R., Riaz, S., Ahmad, A., Korma, S. A., Khalid, W., & Aizhong, L. (2022). The Burden of Cancer, Government Strategic Policies, and Challenges in Pakistan: A Comprehensive Review. *Frontiers in Nutrition*, *9*. https://doi.org/10.3389/fnut.2022.940514

Aziz, H., Mehmood, H., Arif, S., Afzal, K., Hanif, S., Saeed, M. A., & Faheem, M. (2025). Distribution of <scp>HPV</scp> Types in Cervical Cancer in Pakistan: Implications for Screening and Vaccination Programs. *Journal of Clinical Laboratory Analysis*, *39*(1). https://doi.org/10.1002/jcla.25130

Bedell, S. L., Goldstein, L. S., Goldstein, A. R., & Goldstein, A. T. (2020). Cervical Cancer Screening: Past, Present, and Future. In *Sexual Medicine Reviews* (Vol. 8, Issue 1, pp. 28–37). Elsevier B.V. https://doi.org/10.1016/j.sxmr.2019.09.005

Ben-Ari E. (2022, June 3). *More evidence that one HPV vaccine dose protects against cancer-causing infections*. https://www.cancer.gov/news-events/cancer-currents-blog/2022/cervical-cancer-hpv-vaccine-one-dose-kenya

Brüggmann, D., Quinkert-Schmolke, K., Jaque, J. M., Quarcoo, D., Bohlmann, M. K., Klingelhöfer, D., & Groneberg, D. A. (2022). Global cervical cancer research: A scientometric density equalizing mapping and socioeconomic

Frontier in Medical & Health Research

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analysis. *PLOS ONE*, *17*(1), e0261503. https://doi.org/10.1371/journal.pone.0261503

Chughtai, N., Perveen, K., Gillani, S. R., Abbas, A., Chunara, R., Manji, A. A., Karani, S., Noorali, A. A., Zakaria, M., Shamsi, U., Chishti, U., Khan, A. A., Soofi, S., Pervez, S., & Samad, Z. (2023). National cervical cancer burden estimation through systematic review and analysis of publicly available data in Pakistan. *BMC Public Health*, *23*(1), 834. https://doi.org/10.1186/s12889-023-15531-z

Delie, A. M., Bogale, E. K., Anagaw, T. F., Tiruneh, M. G., Fenta, E. T., Endeshaw, D., Eshetu, H. B., Adal, O., Tareke, A. A., & Kebede, N. (2024). Healthcare providers' knowledge, attitude, and practice towards cervical cancer screening in Sub-Saharan Africa: systematic review and meta-analysis. *Frontiers in Oncology*, *14*. https://doi.org/10.3389/fonc.2024.1436095

Drolet M, B. M. L. J. et al. (2024). Vaccine impact on HPV infections and precancerous cervical lesions: 2007–2022 systematic review. *The Lancet Infectious Diseases*, *24*(6), 705–720. https://pubmed.ncbi.nlm.nih.gov/38976622/

Gillison, M. L., Chaturvedi, A. K., & Lowy, D. R. (2008). HPV prophylactic vaccines and the potential prevention of noncervical cancers in both men and women. *Cancer*, *113*(S10), 3036–3046. https://doi.org/10.1002/cncr.23764

Hakim, R. U., Amin, T., & Ul Islam, S. M. B. (2025). Advances and Challenges in Cervical Cancer: From Molecular Mechanisms and Global Epidemiology to Innovative Therapies and Prevention Strategies. *Cancer Control*, *32*. https://doi.org/10.1177/10732748251336415

Kamzayeva, N., Bapayeva, G., Terzic, M., Primbetov, B., Imankulova, B., Kim, Y., Sultanova, A., Kongrtay, K., Kadroldinova, N., & Ukybassova, T. (2025). Enhancing Cervical Cancer Screening: New Diagnostic Methodologies, Triage, and Risk Stratification in Prevention and Treatment. *Life*, *15*(3), 367. https://doi.org/10.3390/life15030367

Kashif, Z., Rehman, A. ur, Warriach, S. Z., Pasha, M. B., Khan, Z., & Bashir, S. (2021). Women in Punjab are in Dire Need of Awareness Initiatives Related to Cervical Cancer and its Screening Tests. *Pakistan Journal of Medical and Health Sciences*, *15*(5), 947–950. https://doi.org/10.53350/pjmhs21155947

McClung, N. M., Gargano, J. W., Park, I. U., Whitney, E., Abdullah, N., Ehlers, S., Bennett, N. M., Scahill, M., Niccolai, L. M., Brackney, M., Griffin, M. R., Pemmaraju, M., Querec, T. D., Cleveland, A. A., Unger, E. R., Markowitz, L. E., Blankenship, S., Allen, S., Meek, J., … Dahl, R. M. (2019). Estimated Number of Cases of High-Grade Cervical Lesions Diagnosed Among Women — United States, 2008 and 2016. *MMWR. Morbidity and Mortality Weekly Report*, *68*(15), 337–343. https://doi.org/10.15585/mmwr.mm6815a1

Protocol for Cervical Cancer Prevention in Pakistan. (n.d.). http://www.

Quadrivalent Vaccine against Human Papillomavirus to Prevent High-Grade Cervical Lesions. (2007). *New England Journal of Medicine*, *356*(19), 1915–1927. https://doi.org/10.1056/NEJMoa061741

Shpendi, S., Norman, P., Gibson-Miller, J., & Webster, R. (2025). Identifying the key barriers, facilitators and factors associated with cervical cancer screening attendance in young women: A systematic review. *Women's Health*, *21*. https://doi.org/10.1177/17455057251324309

Stelzle, D., Tanaka, L. F., Lee, K. K., Ibrahim Khalil, A., Baussano, I., Shah, A. S. V, McAllister, D. A., Gottlieb, S. L., Klug, S. J., Winkler, A. S., Bray, F., Baggaley, R., Clifford, G. M., Broutet, N., & Dalal, S. (2021). Estimates of the global burden of cervical cancer associated with HIV. *The Lancet Global Health*, *9*(2), e161–e169. https://doi.org/10.1016/S2214-109X(20)30459-9

Tufail, M., & Wu, C. (2023). Exploring the Burden of Cancer in Pakistan: An Analysis of 2019 Data. *Journal of Epidemiology and Global Health*, *13*(2), 333–343. https://doi.org/10.1007/s44197-023-00104-5

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Xu, M., Cao, C., Wu, P., Huang, X., & Ma, D. (2025). Advances in cervical cancer: current insights and future directions. *Cancer Communications*, *45*(2), 77–109. https://doi.org/10.1002/cac2.12629