

Optimization of Management Tactics for Pregnant Women with Cervical Pathology

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Abstract Background. Cervical pathology during pregnancy includes HPV-associated squamous and glandular lesions, invasive cervical cancer, benign cervical conditions, and structural abnormalities such as short cervix and cervical insufficiency. Pregnancy creates diagnostic difficulties because physiologic cervical changes can resemble pathology; at the same time, antenatal care provides an important opportunity to identify women who are overdue for screening and to prevent missed invasive disease. **Objective.** To synthesize current evidence and guideline recommendations and to propose an optimized, pregnancy-adapted management pathway for women with cervical pathology. **Materials and methods.** A narrative literature review was performed using international guidelines and peer-reviewed publications from WHO, ASCCP, ACOG, SMFM, ESGO/ESTRO/ESP, ESGO/INCIP, PubMed-indexed articles, and epidemiological reports relevant to Uzbekistan. Emphasis was placed on sources published from 2019 to 2025, while landmark studies were included when clinically relevant. **Results.** Pregnancy does not appear to accelerate the natural history of HPV-associated cervical precancer, and most CIN lesions can be managed conservatively once invasive cancer has been excluded. Risk-based triage, colposcopy by experienced specialists, avoidance of endocervical curettage, selective biopsy when clinically indicated, and structured postpartum follow-up are the core elements of safe management. High-grade lesions require surveillance during pregnancy, while treatment is generally deferred unless cancer is suspected. Invasive cervical cancer requires immediate multidisciplinary assessment in a gynecologic oncology and perinatal center. Structural cervical pathology requires a separate pathway based on obstetric history, standardized transvaginal cervical length assessment, progesterone therapy, and selective cerclage. **Conclusion.** Optimization of care for pregnant women with cervical pathology should combine oncologic safety, obstetric risk reduction, individualized counseling, and postpartum continuity. A unified clinical algorithm can reduce unnecessary invasive procedures while preventing delays in diagnosing clinically significant disease.

Keywords Pregnancy, Cervical pathology, Cervical intraepithelial neoplasia, HPV, Colposcopy, Cervical cancer, Cervical insufficiency, Short cervix, Postpartum follow-up

1. Introduction

Cervical pathology in pregnancy is a clinically heterogeneous concept. It may refer to abnormal cervical screening results, HPV-associated cervical intraepithelial neoplasia (CIN), adenocarcinoma in situ (AIS), invasive cervical cancer, benign inflammatory or vascular conditions, and structural cervical disorders associated with pregnancy loss or spontaneous preterm birth. These conditions differ in pathogenesis and urgency, but they share a central challenge: management must protect maternal health without causing avoidable fetal or obstetric harm.

The problem is particularly relevant for countries with evolving cervical cancer prevention programs. According to the ICO/IARC HPV Information Centre, cervical cancer remains one of the leading cancers among women in Uzbekistan, with an estimated 1,887 new cases and 1,103

deaths annually in the 2023 country fact sheet [1]. Uzbekistan has also made important progress in HPV vaccination, including the introduction of HPV vaccination into the national immunization calendar in 2019 and high first-dose coverage among adolescent girls reported by WHO/Europe [2]. Nevertheless, vaccination benefits will take decades to fully affect cancer incidence in adult women, meaning that organized screening, quality colposcopy, and rational management of detected pathology remain essential.

Pregnancy is not a contraindication to cervical screening when a woman is due or overdue for testing. However, pregnancy-related changes such as increased cervical vascularity, glandular eversion, mucus production, decidual reaction, and inflammation can complicate visual interpretation and may increase anxiety when contact bleeding or abnormal discharge is present. Therefore, the clinical objective is not aggressive treatment of all lesions, but accurate exclusion of invasive cancer, careful risk stratification, safe surveillance, and reliable postpartum completion of care.

This narrative review was developed from guideline documents, consensus statements, and peer-reviewed studies on cervical pathology in pregnancy. The core sources were WHO cervical cancer prevention recommendations, ASCCP risk-based management guidelines and pregnancy-specific practice guidance, SMFM recommendations on short cervix and cerclage, ACOG guidance on cervical insufficiency, ESGO/ESTRO/ESP cervical cancer guidelines, and ESGO/INCIP guidance on gynecologic cancers during pregnancy [3-14]. Additional sources were included for epidemiology, natural history of CIN in pregnancy, obstetric outcomes after previous cervical treatment, and management of benign cervical lesions.

Because the topic includes several clinical entities rather than one intervention, the review is organized by management pathway: screening and triage, colposcopy and diagnosis, management of CIN and AIS, suspected or confirmed invasive cancer, benign cervical conditions, and structural cervical pathology. The proposed optimization model is based on recurring principles across the literature: risk-based decision-making, minimizing unnecessary intervention, early referral for high-risk findings, and closing the postpartum follow-up gap.

2. Epidemiology and Clinical Significance

HPV-associated disease remains the major oncologic component of cervical pathology. Persistent high-risk HPV infection is the necessary cause of most cervical cancers, and population-level prevention depends on vaccination, screening, triage, diagnosis, and treatment of precancer. In Uzbekistan, the 2023 ICO/IARC fact sheet estimated cervical cancer as the second most frequent cancer among women overall and among women aged 15-44 years [1]. This epidemiologic context supports the need to use antenatal visits as a quality-control point for identifying women who have missed routine screening.

Pregnancy also intersects with prior cervical disease treatment. Women who have undergone excisional treatment for CIN or early invasive disease may have higher risk of spontaneous preterm birth, particularly when the excised cone depth is larger. Meta-analyses have reported a dose-response association between depth of cervical excision and adverse obstetric outcomes, although women with CIN may also have baseline risk factors for prematurity [15,16]. Thus, management of cervical pathology should consider both current disease and the obstetric consequences of previous cervical procedures.

The clinical significance of cervical pathology in pregnancy can be summarized in three questions. First, is invasive cancer present or reasonably suspected? Second, if the lesion is preinvasive, what is the likelihood of progression before postpartum reassessment? Third, is the cervix structurally or functionally compromised in a way that increases risk of pregnancy loss or preterm birth? Optimized care requires that these questions be answered separately rather than

treating all cervical findings as one disease.

3. Physiologic Cervical Changes During Pregnancy and Differential Diagnosis

Pregnancy causes predictable changes in the cervix: increased vascularity, softening, edema, glandular hypertrophy, cervical ectropion, mucus production, and decidualized stromal reaction. These changes may be visible on speculum examination or colposcopy and can resemble inflammation, low-grade lesions, or even high-grade colposcopic patterns. For this reason, the diagnostic accuracy of colposcopy in pregnancy depends strongly on examiner experience.

Benign cervical findings are common in pregnancy. Cervical ectropion is often physiologic and does not require treatment unless symptoms are persistent and other causes have been excluded. Cervicitis should be evaluated according to clinical context and local protocols, with attention to microbiological diagnosis and pregnancy-compatible treatment when infection is confirmed. Cervical polyps are usually benign, but management is individualized: observation is appropriate for asymptomatic lesions with benign appearance, while removal or biopsy is considered when malignancy is suspected, bleeding is clinically significant, or the diagnosis is uncertain [17,18].

A crucial optimization principle is that symptoms and visual findings should not be dismissed as physiologic without adequate evaluation. Conversely, physiologic ectropion or benign polyps should not automatically trigger destructive treatment. The safest strategy is targeted assessment: history, speculum examination, review of screening status, pregnancy-safe testing when indicated, and referral for colposcopy when risk thresholds are met or cancer is suspected.

Current evidence-based management favors risk-based triage rather than rigid algorithms based only on cytology categories. The 2019 ASCCP guidelines introduced a paradigm in which management is determined by the estimated immediate and future risk of CIN3+ using current and previous test results [4]. Pregnancy does not change the natural history of HPV, and pregnant patients with abnormal screening results are generally managed using the same clinical action thresholds as nonpregnant patients, while avoiding procedures and treatments that are unsafe or unnecessary during pregnancy [6].

Screening may be performed during pregnancy if the woman is due or overdue according to national or local screening recommendations. Cytology and HPV testing can be collected safely with appropriate sampling technique. However, pregnancy should not be used as a reason for excessive repeat testing in women who are already adequately screened and low risk. The aim is to detect clinically meaningful disease and ensure postpartum continuity, not to intensify screening without indication.

ASCCP pregnancy-specific guidance recommends colposcopy when the immediate risk of CIN3+ is 4% or greater. Expedited treatment is not recommended in pregnancy,

and excisional procedures are reserved for situations in which cancer is suspected [6]. This approach reflects a balance between the low short-term progression risk of most preinvasive lesions and the serious consequences of missing invasive cancer.

Colposcopy in pregnancy should preferably be performed by an experienced colposcopist. Pregnancy-related changes can reduce specificity, and the transformation zone may be more difficult to interpret. Documentation should include gestational age, indication for referral, cytology and HPV results, transformation zone visibility, colposcopic impression, biopsy sites if taken, and the plan for surveillance or postpartum assessment.

Directed cervical biopsy is considered safe in pregnancy when clinically indicated and is not generally associated with adverse surgical or obstetric outcomes [6]. Nevertheless, biopsy should be purposeful rather than routine: it is indicated when the colposcopic impression suggests high-grade disease or invasion, when cytology is high risk and a lesion is visible, or when the diagnosis will change management. Endocervical curettage and endometrial biopsy are contraindicated or unacceptable during pregnancy because of potential risk to pregnancy and because they do not align with conservative management principles [4,7].

The role of pathology is central. When biopsy confirms CIN1 or low-grade disease, observation is usually sufficient. When CIN2, CIN3, or AIS is diagnosed, treatment is generally deferred, but surveillance is required. If biopsy suggests microinvasive or invasive carcinoma, the patient should be referred urgently to gynecologic oncology and

maternal-fetal medicine for staging and individualized management.

The natural history of CIN during pregnancy supports conservative management after invasive cancer has been excluded. Studies report high postpartum regression rates and low progression to malignancy, particularly for low-grade lesions. A recent review summarized that LSIL/CIN1 in pregnancy regresses in a majority of cases, while the overall regression of HSIL/CIN2-3 is lower but still clinically meaningful; progression to invasive cancer during pregnancy is rare when appropriate evaluation has excluded invasion [8-10].

For CIN1, treatment is not indicated during pregnancy. Reassurance, documentation, and postpartum evaluation are appropriate. For CIN2 or CIN3, treatment is also generally deferred until postpartum, but surveillance is required. ASCCP practice guidance suggests surveillance with colposcopy and age-based testing every 12-24 weeks, with interval selection based on gestational age, colposcopic expertise, lesion appearance, and the likelihood of postpartum follow-up [6]. Repeat biopsy is recommended if the lesion worsens or invasion is suspected.

AIS deserves particular caution because glandular lesions may be endocervical and more difficult to assess fully during pregnancy. If AIS is diagnosed, referral to a gynecologic oncologist is preferred. If specialist access is limited, management should involve a gynecologist with expertise in colposcopic diagnosis and treatment of AIS, with postpartum excisional assessment planned unless cancer is suspected earlier [6].

Table 1. Optimized diagnostic and management tactics for HPV-associated cervical pathology in pregnancy

Clinical situation	Recommended pregnancy-specific tactic	Key optimization point
Screening due or overdue	Perform age-appropriate cytology and/or HPV testing according to the available national protocol.	Use antenatal care as an opportunity to close screening gaps without overtesting low-risk women.
ASC-US/LSIL or low immediate CIN3+ risk	Apply risk-based triage; colposcopy may be deferred when risk is below the guideline threshold and follow-up is reliable.	Avoid unnecessary procedures while maintaining a clear postpartum plan.
Immediate CIN3+ risk \geq 4% or high-grade cytology	Refer for colposcopy, preferably by a specialist experienced in pregnancy.	Do not use expedited treatment during pregnancy.
Suspicion of high-grade lesion or invasion on colposcopy	Perform directed biopsy of suspicious areas.	Biopsy is acceptable when clinically indicated; diagnosis should guide surveillance or referral.
Need for endocervical sampling	Avoid endocervical curettage and endometrial biopsy during pregnancy.	Use postpartum evaluation unless invasive cancer is suspected and specialist assessment is required.
Histologic CIN2, CIN3, or AIS	Surveillance with colposcopy and age-based testing every 12-24 weeks; repeat biopsy if lesion worsens or invasion is suspected.	Individualize interval by gestational age, colposcopy expertise, and risk of loss to follow-up.
Suspected or confirmed invasive cancer	Urgent referral to gynecologic oncology and maternal-fetal medicine; stage and plan treatment in a multidisciplinary center.	Maternal oncologic safety and fetal maturity must be balanced through shared decision-making.
Postpartum follow-up	Colposcopy no sooner than 4 weeks after delivery; full diagnostic evaluation or treatment depending on findings.	Recall systems are essential to prevent loss to follow-up.

The mode of delivery should be determined by obstetric indications in women with CIN or AIS unless there is invasive cancer or another obstetric reason for cesarean delivery. Vaginal delivery is not contraindicated by CIN alone. After delivery, the cervix should be allowed to involute and heal before definitive evaluation; ASCCP recommends postpartum colposcopy no sooner than 4 weeks after delivery [6].

Invasive cervical cancer during pregnancy is uncommon but requires immediate multidisciplinary care. Management depends on tumor stage, nodal status, histology, gestational age, maternal preferences, fetal viability, and local availability of gynecologic oncology and tertiary perinatal services. Contemporary ESGO/ESTRO/ESP and ESGO/INCIP guidance emphasizes treatment in specialized centers, multidisciplinary counseling, and individualized algorithms that include imaging, pathology review, surgical options, systemic therapy, obstetric planning, and psychological support [12,13].

Initial evaluation should include careful pelvic examination, expert colposcopy if relevant, histologic confirmation, and staging adapted to pregnancy. Magnetic resonance imaging without gadolinium is commonly used for local staging when needed, while ionizing radiation is avoided unless essential. Management options may include diagnostic conization for suspected microinvasion, observation for carefully selected very early lesions, surgery in selected early-stage cases, or neoadjuvant chemotherapy after the first trimester when preservation of pregnancy until fetal maturity is desired and oncologically acceptable [12-14].

When invasive disease is diagnosed, the counseling conversation should be explicit and compassionate. The patient should receive information about maternal prognosis, fetal risks, feasible treatment delays, possible need for pregnancy termination in advanced disease, timing and mode of delivery, and the postpartum oncologic plan. Psychological support is not optional; it is part of high-quality cancer care in pregnancy. The main optimization principle is early referral rather than local attempts at prolonged observation when invasion is possible.

Benign cervical conditions can cause anxiety during pregnancy because they may present with visible cervical changes or contact bleeding. Common entities include ectropion, cervicitis, nabothian cysts, decidualized polyps, endocervical polyps, and trauma-related changes. A rational management strategy begins with excluding high-risk conditions: review of screening history, assessment for symptoms that require investigation, speculum examination, and referral when the cervix appears suspicious or screening is abnormal.

Cervical ectropion is usually physiologic in reproductive-age and pregnant patients. Treatment is rarely needed during pregnancy unless symptoms are severe and other causes have been excluded. Destructive methods such as cautery should generally be avoided during pregnancy unless there is a compelling indication. For suspected cervicitis, microbiological testing and pregnancy-compatible antimicrobial therapy should follow local protocols and national STI guidance. Empirical treatment without evaluation may obscure the

diagnosis and should not replace cancer exclusion when suspicious findings are present.

Cervical polyps require individualized management. Some studies suggest that polypectomy during pregnancy may be associated with pregnancy loss or preterm birth, while newer analyses indicate that selected polypectomy can be safe, especially after the first trimester and when the lesion is symptomatic or suspicious [17,18]. Therefore, an optimized tactic is conservative observation for benign-appearing, asymptomatic polyps, with biopsy or removal when malignancy cannot be excluded, bleeding is persistent, or the lesion is large, necrotic, or atypical.

Structural cervical pathology is clinically distinct from HPV-associated lesions but is highly relevant to pregnancy outcome. A short cervix, cervical insufficiency, or a cervix shortened by previous excisional treatment can increase risk of second-trimester pregnancy loss and spontaneous preterm birth. Management should therefore be integrated into the antenatal plan for women with a history of cervical surgery, previous mid-trimester loss, previous spontaneous preterm birth, or sonographic cervical shortening.

SMFM Consult Series #70 recommends that cervical length measurements used to guide treatment should be performed transvaginally and according to standardized technique. In singleton pregnancies without a previous spontaneous preterm birth, a midtrimester cervical length of 25 mm or less is used to diagnose short cervix; vaginal progesterone is recommended when cervical length is 20 mm or less before 24 weeks, and may be considered for 21-25 mm by shared decision-making. In this group, cerclage is not recommended for a sonographic short cervix of 10-25 mm in the absence of cervical dilation, and cervical pessary is not recommended for prevention of preterm birth [11].

Cerclage remains important for selected high-risk patients. ACOG recognizes cerclage as a treatment option for cervical insufficiency, and SMFM guidance on transabdominal cerclage recommends considering it for patients with previous transvaginal cerclage and subsequent spontaneous singleton delivery before 28 weeks. Transabdominal cerclage may be placed before pregnancy or in the first trimester; it can still be considered before 22 weeks in selected patients presenting after the first trimester, with cesarean delivery planned at 37-39 weeks when the cerclage remains in situ [11,19,20].

An optimized management tactic for pregnant women with cervical pathology should be built as a stepwise pathway rather than as isolated decisions. The following model can be adapted for antenatal clinics, maternity hospitals, and colposcopy units.

At the first antenatal visit, the clinician should document the woman's cervical screening history, HPV vaccination status if known, previous abnormal cytology or histology, previous cervical procedures, history of second-trimester pregnancy loss or spontaneous preterm birth, and current symptoms. Women who are due or overdue for screening should be offered appropriate testing. Women with previous excisional treatment or preterm birth risk factors should be routed to the structural cervical pathway.

Table 2. Practical pathway for structural cervical pathology during pregnancy

Risk group or finding	Assessment	Management tactic
Previous cervical excisional treatment	Review type and depth of excision; assess obstetric history; consider transvaginal cervical length surveillance based on risk.	Avoid repeated cervical surgery during pregnancy unless cancer is suspected; manage short cervix according to cervical length and obstetric history.
Singleton pregnancy, no previous spontaneous preterm birth, cervical length ≤ 20 mm before 24 weeks	Confirm standardized transvaginal measurement and exclude symptoms or dilation.	Recommend vaginal progesterone; do not use 17-alpha hydroxyprogesterone caproate; pessary is not recommended.
Singleton pregnancy, no previous spontaneous preterm birth, cervical length 21-25 mm before 24 weeks	Confirm measurement and discuss absolute risk.	Consider vaginal progesterone using shared decision-making.
Short cervix 10-25 mm without dilation and no prior spontaneous preterm birth	Assess for cervical dilation and symptoms.	Do not place cerclage in the absence of dilation.
Physical exam dilation consistent with cervical insufficiency	Urgent specialist assessment; exclude labor, infection, membrane rupture, and major fetal anomaly according to local protocol.	Consider examination-indicated cerclage in appropriate candidates.
Failed previous transvaginal cerclage with delivery before 28 weeks	Maternal-fetal medicine consultation.	Consider transabdominal cerclage pre-pregnancy, in first trimester, or before 22 weeks in selected later presentations.
Twin pregnancy with short cervix	Individualized specialist assessment.	Routine progesterone, pessary, or cerclage is not recommended outside a clinical trial for cervical shortening alone.

Patients should be categorized into five pathways: (1) normal screening or benign physiologic findings; (2) low-grade abnormal screening or low immediate CIN3+ risk; (3) high-grade cytology, HPV-related high-risk results, or colposcopy threshold met; (4) suspected invasive cancer; and (5) structural cervical risk. Each pathway should have a written follow-up plan and a responsible clinician.

- Use colposcopy when the risk threshold is met or when the cervix appears suspicious.
- Prefer experienced colposcopists for pregnancy examinations.
- Perform directed biopsy when findings suggest high-grade disease or invasion.
- Avoid endocervical curettage, endometrial biopsy, and treatment without histologic confirmation during pregnancy.
- Do not perform expedited treatment for abnormal screening results in pregnancy.
- Refer suspected invasive cancer immediately to a gynecologic oncology and tertiary perinatal center.

For CIN2, CIN3, or AIS, surveillance intervals should be individualized within the 12-24 week framework. The postpartum appointment should be scheduled before delivery whenever possible. Electronic or paper recall systems are critical because loss to follow-up is one of the main preventable failures in conservative management. Postpartum colposcopy should be performed no sooner than 4 weeks after delivery, with full diagnostic evaluation if no lesion is visible and excisional treatment or complete evaluation if a lesion persists.

Clinical teams can monitor the effectiveness of the pathway through measurable indicators: proportion of pregnant women with documented screening history; time from high-grade cytology to colposcopy; proportion of colposcopies performed by trained specialists; rate of inappropriate endocervical curettage in pregnancy; proportion of CIN2+ cases with documented surveillance plans; postpartum follow-up completion rate; time from suspected cancer to oncology referral; and rate of preterm birth among women with prior cervical treatment or short cervix.

For Uzbekistan, optimization should align with national cervical cancer elimination goals. The high HPV vaccination coverage reported after national vaccine introduction is a major public health achievement, but adult women currently presenting for antenatal care may not have benefited from adolescent vaccination. Therefore, antenatal care remains an important point for screening history review, education, and referral.

A regional model for Samarkand and similar settings could include standardized antenatal documentation of cervical screening history, referral criteria for colposcopy, a pregnancy colposcopy registry, formal collaboration between obstetricians, cytologists, pathologists, gynecologic oncologists, and perinatologists, and a postpartum recall mechanism. Training should emphasize differentiation of physiologic pregnancy changes from suspicious colposcopic findings and avoidance of unsafe procedures such as endocervical curettage.

Public health integration is equally important. Women diagnosed with cervical pathology during pregnancy should receive counseling that is accurate and non-stigmatizing.

Counseling should explain that many preinvasive lesions regress postpartum, but follow-up is essential. This message can reduce fear while improving adherence. At the system level, linkage between antenatal clinics, family polyclinics, and specialized centers can reduce missed appointments after delivery.

4. Discussion

The literature supports a balanced strategy. Overly aggressive management can expose pregnant patients to unnecessary procedures, bleeding, anxiety, and potential obstetric risks. Excessively passive management can delay diagnosis of invasive cancer or allow loss to follow-up. The optimal tactic is therefore neither immediate treatment nor simple postponement, but structured risk-based care.

For HPV-associated lesions, the key clinical insight is that pregnancy does not substantially alter the progression risk of HPV-related precancer. Conservative management is safe when performed within a system that can reliably exclude invasion, monitor high-grade lesions, and complete postpartum evaluation. For structural cervical pathology, the logic differs: the goal is prevention of pregnancy loss and preterm birth, so decisions depend on cervical length, previous obstetric history, cervical dilation, and prior cervical surgery.

Several areas require further research in Central Asian populations. These include prevalence of high-risk HPV genotypes among pregnant women, postpartum regression rates of CIN in local cohorts, barriers to postpartum colposcopy attendance, pregnancy outcomes after cervical excisional procedures, and cost-effectiveness of integrated antenatal screening review. Local data would help adapt international guidelines to regional resources and patient pathways.

5. Conclusions

Management of pregnant women with cervical pathology should be individualized, evidence-based, and organized around maternal safety and fetal well-being. The principal steps are: identify overdue screening, use risk-based triage, refer appropriately for expert colposcopy, perform biopsy only when clinically indicated, avoid endocervical curettage and expedited treatment, surveil CIN2/3 and AIS during pregnancy, refer suspected cancer immediately, and ensure postpartum diagnostic closure. Structural cervical pathology requires a parallel obstetric pathway based on standardized transvaginal cervical length assessment, progesterone when indicated, and selective cerclage in high-risk patients.

The proposed optimized pathway can improve quality of care by reducing unnecessary interventions, preventing missed invasive disease, and linking antenatal findings to postpartum management. In Uzbekistan, where cervical cancer prevention is developing alongside successful HPV vaccination efforts, such an approach is clinically relevant

and suitable for implementation in obstetric and gynecologic practice.

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