

Histopathological Spectrum of Malignancies in the Female Genital Tract in a Tertiary Care Hospital in Central India

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Abstract

Background: Female genital tract malignancies comprise diverse tumors with distinct anatomical and histopathological characteristics. Hospital-based studies can describe the local diagnostic spectrum and complement cancer registry data.

Aim and objectives: To evaluate the histopathological spectrum and age-wise distribution of female genital tract malignancies at a tertiary care hospital in Central India.

Materials and methods: This prospective observational study was conducted over 18 months in the Department of Pathology, Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh, India. It included 126 women aged ≥ 30 years with histopathologically confirmed female genital tract malignancies. Benign and inflammatory lesions, recurrent or previously treated malignancies, and unsuitable specimens were excluded. Clinical information and gross and microscopic findings were recorded. Histological classification followed the 2020 World Health Organization classification. Data were analyzed descriptively.

Results: The mean age was 56.67 ± 12.92 years (range: 31-85 years), with 90 (71.4%) patients aged 41-70 years. Lower abdominal pain occurred in 59 (46.8%), postmenopausal bleeding in 28 (22.2%), and menorrhagia in 26 (20.6%). Squamous cell carcinoma was the most frequently recorded histological type. Other diagnoses included adenocarcinoma, endometrioid carcinoma, serous and mucinous carcinomas, mesenchymal malignancies, germ cell tumors, and granulosa cell tumors. Histopathological diagnoses were presented separately from documented tumor grade.

Conclusions: Squamous cell carcinoma categories predominated within a diverse institutional histopathological spectrum. Most patients were middle-aged or older. Standardized pathological reporting and larger multicenter studies would strengthen understanding of regional patterns.

Categories: Medical Education, Pathology, Oncology

Keywords: cancer cervix, endometrial carcinoma, histopathology examination, malignancy surgery, ovaries, vulva cancer

Introduction

Malignancies of the female genital tract comprise a diverse group of tumors involving the cervix, uterine corpus, ovaries, fallopian tubes, vagina, and vulva. These tumors differ in epidemiology, histology, biological behavior, and clinical outcomes. Global cancer estimates demonstrate substantial geographical variation in cancer occurrence, highlighting the importance of understanding disease patterns within individual populations [1]. In India, cervical, ovarian, and uterine corpus cancers are among the leading cancers affecting women. Estimates from the National Cancer Registry Program identified these three sites among the five most common cancer sites in Indian women in 2022 [2].

Histopathological examination is central to diagnosing and classifying female genital tract malignancies. Assessment of tissue architecture and cellular features establishes the tumor type and provides information relevant to prognosis and treatment planning. However, these malignancies encompass numerous histological subtypes, making accurate classification essential. The World Health Organization classification provides a standardized framework for diagnosis and increasingly integrates morphological findings with molecular characteristics [3].

The diversity of gynecological malignancies is particularly evident in ovarian cancer, which comprises distinct tumor types with different pathways of development. Recognition of these differences has challenged the view of epithelial ovarian cancer as a single disease and improved understanding of its origins [4]. Similarly, developments in the classification of uterine and lower genital tract tumors have

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emphasized biologically meaningful distinctions, including human papillomavirus-associated and independent carcinomas. These changes reinforce the value of precise histological characterization when documenting the spectrum of malignancies encountered in clinical practice [5].

Although national cancer estimates provide an essential overview, registry coverage varies across India, and rural populations remain less extensively represented [2]. Hospital-based histopathological studies can complement these data by describing the malignancies encountered within a defined referral setting. Recording their anatomical distribution, age patterns, and histological subtypes can provide a useful basis for local diagnostic planning and comparison with other institutions.

The present study therefore aimed to evaluate the histopathological spectrum of female genital tract malignancies at Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh, India. Specifically, it assessed the frequency, age-wise and site-wise distribution, and histological subtypes of these malignancies in patients attending this tertiary care hospital in Central India.

Materials And Methods

Study design and setting

This prospective observational study was conducted in the Department of Pathology, Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh, India. The institution is a tertiary care teaching hospital serving patients from urban and rural areas of Central India. The study was conducted over 18 months following institutional ethics approval and evaluated the histopathological spectrum, anatomical distribution, and age-related patterns of female genital tract malignancies diagnosed in routinely received biopsy and surgical specimens.

Study population and eligibility criteria

The study included female patients aged ≥ 30 years whose female genital tract biopsy or surgical resection specimens were received during the study period and diagnosed as malignant on histopathological examination. Eligible specimens included those from the cervix, uterine corpus, ovaries, fallopian tubes, vagina, and vulva.

Patients with benign or inflammatory lesions, recurrent malignancies, or previously treated malignant disease were excluded. Autolyzed, inadequately sampled, or poorly preserved specimens that were unsuitable for reliable histopathological assessment were also excluded. All patients meeting the eligibility criteria during the 18-month study period were included consecutively. The final study population comprised 126 women with histopathologically confirmed female genital tract malignancies.

Sample size

The planned sample size was 126 patients. The available study documentation specified an absolute precision of 8% and a significance level of 5%, but did not record the anticipated proportion or the formula used to derive this number. Consequently, the original calculation could not be independently verified. The final analysis included 126 patients and was descriptive.

Clinical data collection

Clinical and pathological information was recorded using a structured study proforma. The recorded variables included age, presenting complaints, anatomical site of the lesion, specimen type, gross pathological findings, microscopic diagnosis, histological subtype, and tumor differentiation or grade. Presenting complaints were documented as recorded in the clinical information accompanying the specimens. These included lower abdominal pain, postmenopausal bleeding, menorrhagia, bleeding per vaginum, vaginal discharge, vulvar growth, and combinations of symptoms.

For descriptive analysis, patients were categorized into the age groups 31–40, 41–50, 51–60, 61–70, and >70 years, corresponding to the observed age distribution. The study did not describe a symptom severity scale or patient-reported outcome instrument.

Specimen collection and fixation

Specimens were obtained through clinically indicated biopsy or surgical procedures performed in the Department of Obstetrics and Gynecology and submitted to the Department of Pathology for routine diagnostic examination. Specimen types included cervical and cone biopsies, endometrial biopsies or curettings, hysterectomy specimens, oophorectomy and salpingo-oophorectomy specimens, and vulvar or vaginal biopsies.

After removal, specimens were immersed in 10% neutral-buffered formalin. The reported fixation period ranged from 6 to 24 hours, depending on specimen size and tissue characteristics. No additional tissue sampling or clinical intervention was undertaken solely for research purposes.

Gross examination and tissue sampling

Gross examination was performed under supervision in the histopathology laboratory. Specimens were assessed for their dimensions, external appearance, lesion location, color, consistency, and cut-surface characteristics. Hemorrhage, necrosis, cystic change, apparent depth of invasion, and involvement of adjacent structures were documented where assessable.

Representative tissue sections were obtained from the tumor, its interface with adjacent tissue, relevant surgical margins, and areas suspicious for secondary involvement. For hysterectomy specimens, sections were obtained from the cervix, endometrium, and myometrium. Attached fallopian tubes and ovaries were sampled when present, including areas without obvious gross abnormalities, to assess associated microscopic lesions.

Tissue processing and staining

Tissue samples were processed using routine paraffin-embedding techniques. Processing involved dehydration through ascending concentrations of ethanol, clearing in xylene, and impregnation with molten paraffin wax at 58–60°C. Following embedding, sections 3–5-μm-thick were cut with a rotary microtome and mounted on adhesive-coated glass slides.

Sections were stained with hematoxylin and eosin to assess tissue architecture and cellular morphology. The stained sections were dehydrated, cleared in xylene, and mounted using dibutyl phthalate polystyrene xylene mounting medium.

Histopathological assessment

Hematoxylin-and-eosin-stained sections were examined by light microscopy. Assessment included the anatomical site of involvement, tumor morphology, histological subtype, and differentiation or grade. Stromal or myometrial invasion, lymphovascular invasion, perineural invasion, and associated precursor or concurrent lesions were recorded when identifiable in the submitted material. Adjacent organs were examined, when available, for secondary involvement or synchronous lesions.

Histological classification followed the World Health Organization Classification of Female Genital Tumors, Fifth Edition, published in 2020 [6]. This classification provides the diagnostic framework for tumors arising at different female genital tract sites. Histopathological diagnoses were based on routine hematoxylin-and-eosin-stained sections. Diagnostically ambiguous cases were reviewed by a senior pathologist. Immunohistochemistry and molecular testing were not performed.

For presentation, recorded anatomical site, histopathological diagnosis, and tumor grade or differentiation were tabulated separately. Invasion status and keratinizing morphology were not treated as grades. Metastatic involvement was reported separately from the histopathological diagnosis. Where the available records did not establish a specific subtype or grade, the recorded description was retained without assigning additional diagnostic information.

Study outcomes

The principal outcome was the distribution of histopathological diagnoses among the included patients. Additional descriptive outcomes were age distribution, presenting complaints, recorded anatomical sites, specimen types, and age-wise distribution within anatomical sites. Metastatic involvement of pelvic lymph nodes or adjacent structures was recorded where documented.

The study evaluated the frequency of malignancies within the hospital-based study population. It did not estimate population incidence because a defined catchment population and person-time denominator were not available.

Quality control

Routine internal laboratory quality-control procedures were followed. These included using freshly prepared and filtered hematoxylin and eosin solutions and routinely maintaining and calibrating the microtome and microscope. A senior pathologist reviewed diagnostically ambiguous cases. A formal blinded review procedure or assessment of interobserver agreement was not described.

Statistical analysis

Data were compiled in Microsoft Excel (Microsoft® Corp., Redmond, WA) and analyzed using Statistical Product and Service Solutions (SPSS, version 26.0; IBM SPSS Statistics for Windows, Armonk, NY). Categorical variables were summarized as frequencies and percentages, and age was expressed as mean ± standard deviation and range. Percentages for overall characteristics were calculated using the total study population of 126 patients as the denominator. For age distributions within individual anatomical sites, the number of cases recorded at each site was used as the denominator. Two-sided 95% confidence intervals for

major proportions were calculated using the Wilson score method. Overall proportions used the total study population (N = 126) as the denominator, whereas site-specific histopathological proportions used the number of patients within the corresponding verified primary-site group. The analysis was descriptive; no inferential statistical tests were performed. Confidence intervals describe the precision of the observed proportions within this hospital-based sample and do not account for selection or referral bias.

Ethical considerations

The study was approved by the Institutional Ethics Committee of Amaltas Institute of Medical Sciences, Dewas, India. The supplied approval letter records approval at the committee meeting held on February 15, 2024. The study followed the 2013 Declaration of Helsinki and the Indian Council of Medical Research's 2017 ethical guidelines for biomedical and health research involving human participants [7,8]. Patient confidentiality was maintained, and study records were anonymized. Informed consent was obtained where necessary; the supplied approval letter did not document a formal consent waiver.

Results

A total of 126 patients with histopathologically confirmed female genital tract malignancies were included. The mean age was 56.67 ± 12.92 years (range: 31-85 years). Patients aged 41-70 years accounted for 90 (71.4%) of the study population. Lower abdominal pain was the most frequent recorded presenting complaint, reported in 59 patients (46.8%; 95% CI: 38.3-55.5%), followed by postmenopausal bleeding in 28 (22.2%; 95% CI: 15.8-30.2%) and menorrhagia in 26 (20.6%; 95% CI: 14.5-28.5%). Patient characteristics are summarized in Table 1.

Characteristic	Category or measure	Value	Percentage (%)
Age (years)	Mean ± standard deviation	56.67 ± 12.92	-
	Range	31-85	-
Age group (years)	31-40	15	11.9
	41-50	29	23.0
	51-60	31	24.6
	61-70	30	23.8
	>70	21	16.7
Presenting complaint	Lower abdominal pain	59	46.8
	Postmenopausal bleeding	28	22.2
	Menorrhagia	26	20.6
	Vulvar growth	4	3.2
	Lower abdominal pain with postmenopausal bleeding	3	2.4
	Vaginal discharge	3	2.4
	Bleeding per vaginum	2	1.6
	Abdominal pain with menorrhagia	1	0.8

TABLE 1: Demographic characteristics and clinical presentation of the patients (N = 126)

The Value column reports patient counts for categorical variables and the stated summary measures for age. Percentages are calculated using N = 126. - indicates not applicable.

The histopathological spectrum was dominated by squamous cell carcinoma categories and adenocarcinoma. Moderately differentiated squamous cell carcinoma was the largest individual category, followed by adenocarcinoma and large-cell keratinizing squamous cell carcinoma. Together, these three categories accounted for 78 (61.9%) patients. Mesenchymal, germ cell, and granulosa cell tumors formed smaller proportions of the overall spectrum (Table 2).

Recorded anatomical site	Histopathological diagnosis	Grade/differentiation	n	%
Cervix	Adenocarcinoma	Not stated	4	3.2
Cervix	Adenosquamous carcinoma	Not stated	1	0.8
Cervix	Carcinoma, subtype unspecified	Poorly differentiated	3	2.4
Cervix	Squamous cell carcinoma	Moderately differentiated	15	11.9
Cervix	Squamous cell carcinoma, reported as non-invasive*	Not stated	1	0.8
Cervix	Squamous cell carcinoma	Not stated	33	26.2
Cervix	Squamous cell carcinoma	Poorly differentiated	10	7.9
Cervix	Squamous cell carcinoma	Well differentiated	1	0.8
Endometrium	Adenocarcinoma, subtype unspecified	Not stated	2	1.6
Endometrium	Carcinoma, subtype unspecified	Not stated	11	8.7
Endometrium	Carcinoma, subtype unspecified	Poorly differentiated	3	2.4
Endometrium	Endometrioid carcinoma	Grade 1	1	0.8
Endometrium	Endometrioid carcinoma	Not stated	5	4.0
Endometrium	Papillary carcinoma/adenocarcinoma†	Not stated	1	0.8
Endometrium	Uterine sarcoma/malignant mesenchymal tumor†	Not stated	4	3.2
Endometrium	Villoglandular/endometrioid adenocarcinoma†	Not stated	1	0.8
Ovary	Fibrosarcoma	Not stated	1	0.8
Ovary	Germ cell tumor; recorded subtypes include dysgerminoma/mixed germ cell tumor†	Not stated	2	1.6
Ovary	Malignant neoplasm, subtype unspecified	Not stated	3	2.4
Ovary	Malignant neoplasm, subtype unspecified	Poorly differentiated	2	1.6
Ovary	Mucinous carcinoma	Grade 2	1	0.8
Ovary	Mucinous carcinoma	Not stated	1	0.8
Ovary	Serous carcinoma	High grade	5	4.0
Ovary	Serous carcinoma	Not stated	6	4.8
Ovary	Granulosa cell tumor	Not stated	3	2.4
Vulva	Squamous cell carcinoma, large-cell keratinizing morphology	Not stated	1	0.8
Vulva	Squamous cell carcinoma	Well differentiated	3	2.4
Indeterminate site	Adenocarcinoma; endocervical versus endometrial origin unresolved	Not stated	1	0.8
Multiple reported sites	Endometrial adenocarcinoma and endocervical adenosquamous carcinoma†	Not stated	1	0.8
Total			126	100.0

TABLE 2: Histopathological diagnoses by recorded anatomical site and tumor grade (N = 126)

Values are presented as number of patients and percentage of the total study population (N = 126). Anatomical site, histopathological diagnosis, and grade/differentiation are presented separately. "Not stated" indicates that grading information was unavailable in the supplied records. Keratinization and invasion status are not treated as tumor grades. Percentages may not sum to 100% because of rounding.

Age distributions differed descriptively across the three major recorded anatomical sites. Cervical

malignancies were most frequent in the 41-50-year age group, ovarian malignancies in the 51-60-year group, and endometrial malignancies in the 61-70-year group. Ovarian cases were distributed across all age groups, whereas endometrial cases were more concentrated in older patients (Table 3). These patterns are descriptive; the reported analysis did not assess statistical significance.

Age group (years)	Cervix, n (%)	Ovary, n (%)	Endometrium, n (%)	Lymph node metastasis, n (%)	Vulva, n (%)	Fallopian tube metastasis, n (%)
31-40	6 (8.8)	3 (12.5)	5 (14.7)	0 (0.0)	0 (0.0)	1 (50.0)
41-50	20 (29.4)	5 (20.8)	5 (14.7)	0 (0.0)	0 (0.0)	0 (0.0)
51-60	16 (23.5)	7 (29.2)	8 (23.5)	4 (36.4)	0 (0.0)	1 (50.0)
61-70	16 (23.5)	4 (16.7)	13 (38.2)	5 (45.5)	1 (25.0)	0 (0.0)
>70	10 (14.7)	5 (20.8)	3 (8.8)	2 (18.2)	3 (75.0)	0 (0.0)
Total	68 (100.0)	24 (100.0)	34 (100.0)	11 (100.0)	4 (100.0)	2 (100.0)

TABLE 3: Age distribution of malignancies by recorded anatomical site and metastatic involvement

Values are presented as frequency (percentage). Percentages are calculated within each column using its total as the denominator. Percentages may not sum to 100.0% because of rounding.

Representative gross and microscopic findings are shown in Figure 1, including a sectioned surgical specimen and hematoxylin-and-eosin-stained sections of cervical squamous cell carcinoma and cervical adenocarcinoma. Additional recorded findings included pelvic lymph node metastasis in 11 (8.7%) patients and Fallopian tube metastasis in one (0.8%). Vulvar involvement was reported in four (3.2%) patients; of these, three (75.0%) were aged >70 years, and one (25.0%) was aged 61-70 years.

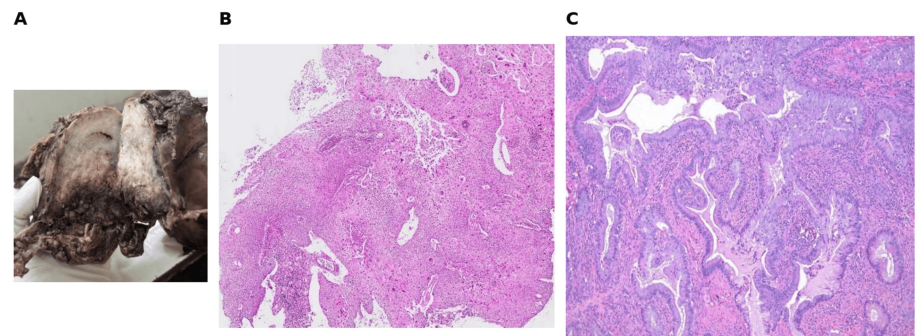


FIGURE 1: Representative gross and microscopic findings in female genital tract malignancies

(A) Gross appearance of a sectioned surgical specimen reproduced from the thesis case illustrations. (B) Cervical squamous cell carcinoma showing atypical squamous cells arranged in nests and sheets. (C) Cervical adenocarcinoma showing infiltrative glandular structures with surrounding inflammatory cells. Microscopic images are stained with hematoxylin and eosin. Panels represent separate illustrations and are not established as matched gross-microscopic images from the same patient.

Discussion

The present study describes the histopathological spectrum of female genital tract malignancies diagnosed in 126 patients at a tertiary care hospital in Central India. The main findings were the predominance of squamous cell carcinoma categories, the concentration of patients in middle- and older-age groups, and variation in age distribution across the major recorded anatomical sites. Squamous cell carcinoma was the most frequently recorded histological type, within a spectrum that also included other epithelial malignancies, mesenchymal tumors, germ cell tumors, and granulosa cell tumors. These findings provide an institutional overview of gynecological malignancies, but do not reflect population incidence.

Cervical malignancies formed the largest recorded anatomical group in this institutional series. This finding is broadly consistent with Agarwal et al., who reported cervical malignancies as the most common gynecological cancers at an Indian tertiary care center, while their international comparison showed a greater contribution from uterine malignancies in some populations [9]. National estimates also identify cervical, ovarian, and uterine corpus cancers as important contributors to the cancer burden among Indian women [2]. However, these sources differ in their populations, inclusion criteria, and methods of case ascertainment. The present study included only women aged ≥30 years with histopathologically confirmed malignancies and excluded recurrent and previously treated disease. Its proportions therefore cannot be directly compared with population-based incidence estimates or unrestricted hospital series. Differences may reflect referral pathways, access to biopsy or surgery, and institutional case selection, as well as underlying disease patterns.

The substantial contribution of cervical malignancies is clinically relevant because cervical cancer has an established pathway of prevention, screening, diagnosis, and treatment. Bhatla et al. emphasize the importance of histological confirmation and assessment of disease extent in cervical cancer management [10]. In the present study, squamous cell carcinoma was the most frequently recorded histological type. Its distribution is presented by recorded anatomical site in Table 2, with differentiation grade reported separately. Ambiguous diagnoses and uncertain primary-site assignments require confirmation before definitive site-specific proportions can be interpreted. Furthermore, differentiation grade alone cannot establish clinical stage or prognosis. The absence of complete staging and follow-up information prevents assessment of whether the observed histological patterns were associated with advanced disease or adverse outcomes.

The predominance of squamous tumors also requires consideration within the modern classification of lower genital tract malignancies. The WHO classification distinguishes HPV-associated and HPV-independent carcinomas and increasingly integrates morphological findings with relevant ancillary tests [5,6]. The current study relied primarily on routine histomorphology, and no defined HPV-testing or immunohistochemical protocol was documented. Consequently, the observed squamous tumors cannot be assigned an HPV association solely from their morphology. The findings describe the diagnostic spectrum but do not establish the etiological contribution of HPV or other risk factors.

Published evidence supports prevention and early detection as important responses to the cervical cancer burden. Sankaranarayanan et al., in a cluster-randomized trial in rural India, demonstrated that a single round of HPV testing reduced advanced cervical cancers and cervical cancer deaths compared with standard care [11]. Complementing screening evidence, Drolet et al. reported population-level reductions in vaccine-type HPV infections and cervical intraepithelial neoplasia following the introduction of HPV vaccination programs [12]. These studies provide broader context for the present findings. However, this cohort did not record screening exposure, vaccination status, HPV status, or delays in seeking care. The institutional frequency of cervical malignancy therefore cannot be directly attributed to inadequate screening or low vaccination coverage.

The mean age of the study population was 56.67 ± 12.92 years, and 90 (71.4%) patients were aged 41-70 years. The site-specific age distributions showed an earlier peak for cervical malignancies than for endometrial malignancies. This distinction matters because gynecological cancers have different epidemiological and biological characteristics. Crosbie et al. describe endometrial cancer in the context of age, metabolic risk factors, and considerable histological and molecular heterogeneity [13]. Although the concentration of endometrial cases in older patients is compatible with this broader clinical profile, the present study did not provide sufficient information on menopausal status, obesity, diabetes, or reproductive history to examine these relationships. Moreover, excluding patients younger than 30 years limits interpretation of the overall age spectrum.

Lower abdominal pain was the most frequent presenting complaint, followed by postmenopausal bleeding and menorrhagia. These findings demonstrate the range of symptoms encountered among patients with confirmed malignancy. Goff et al. showed that abdominal and pelvic symptoms occur in women with ovarian cancer, while also emphasizing differences in symptom patterns between patients with cancer and comparison groups [14]. In the present study, symptom frequency, duration, severity, and change from baseline were not systematically assessed. Therefore, abdominal pain cannot be considered a site-specific diagnostic indicator, and its frequency cannot establish the sensitivity or specificity of this symptom for ovarian or other genital tract malignancies.

Postmenopausal bleeding was reported in 28 (22.2%) patients across the entire cohort. Its clinical importance is supported by the systematic review and meta-analysis by Clarke et al., which found that approximately 91% of women with endometrial cancer experienced postmenopausal bleeding and that approximately 9% of women presenting with postmenopausal bleeding had endometrial cancer [15]. These estimates address different questions and use different denominators. The present cohort included malignancies from several anatomical sites, so its overall bleeding frequency is not directly comparable with the prevalence of bleeding among women with endometrial cancer alone. Nevertheless, the finding highlights the importance of accurately documenting abnormal bleeding and its relationship to the final pathological diagnosis.

The ovarian diagnoses illustrate the diversity of tumors encountered in gynecological pathology. Kurman et al. proposed that epithelial ovarian cancers arise through distinct pathways rather than representing a single disease [4]. Lheureux et al. further describe epithelial ovarian cancer as a group of histological subtypes with different genomic characteristics and treatment implications [16]. In this context, a broad category such as "adenocarcinoma" provides limited information for comparison with contemporary ovarian cancer series. The present study would be strengthened by verification of specific histotypes against the original pathology reports. However, additional subtypes should not be assigned retrospectively without supporting morphological or ancillary findings.

Accurate primary-site assignment is particularly important for high-grade serous carcinoma. Labidi-Galy et al. provided molecular evidence supporting a fallopian tube origin for the high-grade serous carcinomas examined in their study [17]. This finding reinforces the need to distinguish the anatomical site where a tumor is detected from its assigned primary origin. Although the present study recorded ovarian tumors and fallopian tube involvement, it did not document a specific tubal examination protocol or sufficient findings to reassess primary-site assignment. Fallopian tube involvement should therefore not automatically be interpreted as a primary tubal malignancy, and the recorded metastatic involvement should remain separate from primary-site classification.

The uterine findings also require interpretation within an increasingly detailed diagnostic framework. The Cancer Genome Atlas analysis identified four major molecular groups of endometrial carcinoma, demonstrating biological heterogeneity beyond conventional histological categories [18]. These developments have influenced subsequent classification and clinical research [5,13]. Molecular assessment was not documented in the current study; therefore, its uterine diagnoses should be interpreted as morphological categories. The reported histological labels alone do not allow inference of molecular risk group, hereditary predisposition, or treatment response.

Vulvar involvement was recorded in four patients, three of whom were older than 70 years. Although this suggests a concentration in older patients within the institutional series, the small number precludes reliable age-related conclusions. The European Society of Gynaecological Oncology guidelines emphasize accurate histological diagnosis, assessment of HPV association where appropriate, and evaluation of local and nodal disease in vulvar cancer [19]. The present dataset did not contain sufficient information on precursor lesions, HPV association, or complete disease extent to investigate these features. These cases contribute to the breadth of the reported spectrum but cannot support detailed subgroup analysis.

The prospective design and histopathological confirmation are strengths of this study. Nevertheless, the observed case distribution reflects the patients referred to this institution and the specimens submitted for examination. Patients managed elsewhere or without tissue confirmation were not represented. Referral patterns may also affect the relative frequency of common and diagnostically complex tumors, although the direction and magnitude of this bias were not assessed. These findings should therefore be interpreted as a description of institutional diagnostic workload. Population-based and hospital-based cancer registries provide complementary information, but their different denominators and methods of case ascertainment must be considered when comparing findings [20].

The principal clinical implication is the need for consistent, site-specific pathological reporting. Primary anatomical site, histological type, and applicable tumor grade should be documented separately, with metastatic involvement recorded independently. Broad or ambiguous diagnostic labels should prompt review of the original slides and reports and, where indicated, ancillary testing or specialist consultation. These practices would improve the comparability of institutional data and the clarity of information available to treating clinicians. The observed spectrum may also help identify priorities for local pathology training and diagnostic resources. However, this study did not evaluate diagnostic accuracy, changes in treatment, or patient outcomes and therefore cannot demonstrate that these measures improve prognosis.

Several limitations require consideration. The single-center design, modest sample size, and inclusion of patients undergoing biopsy or surgery limit generalizability. Exclusion of patients younger than 30 years, recurrent cases, and previously treated malignancies narrows the represented disease spectrum. Incomplete information on risk factors, screening history, stage, treatment, and survival prevents etiological and prognostic analysis. Small numbers in uncommon diagnostic categories limit the precision of subgroup estimates and the scope for meaningful comparisons. The descriptive analysis does not establish associations between age, anatomical site, and histological type. Incomplete staging and follow-up information also prevents assessment of prognosis or survival. Restricting eligibility to women aged ≥ 30 years excluded younger patients and limits the applicability of the findings to the full age spectrum of female genital tract malignancies. Exclusion of recurrent and previously treated malignancies further narrows the represented disease spectrum.

Conclusions

This hospital-based study demonstrated a diverse histopathological spectrum of female genital tract malignancies, with squamous cell carcinoma categories predominating. Most patients were aged 41–70 years, and the age distribution varied across the major recorded anatomical sites. Lower abdominal pain and

abnormal uterine bleeding were prominent presenting complaints. These findings highlight the importance of histopathological examination for establishing the diagnosis and characterizing the tumors encountered in routine gynecological practice.

The findings describe the institutional case spectrum and should not be extrapolated to population incidence or prognosis. Reconciliation of the reported counts and standardization of histological terminology are necessary before final interpretation. Larger multicenter studies incorporating verified primary-site assignment, stage, relevant risk factors, and clinical follow-up would provide stronger evidence on regional disease patterns and outcomes.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Ethics Committee of Amaltas Institute of Medical Sciences, Dewas issued approval CDSCO Reg.No. ECR/1145/Inst/MP/2018/RR-22 NECR,DHR Reg.No. : EC/NEW/INST/2022/2692. The study was approved by the Institutional Ethics Committee of Amaltas Institute of Medical Sciences, Dewas. The supplied approval letter records approval at the committee meeting held on February 15, 2024. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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