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Original Research Article

A Histopathological Analysis of Ovarian Tissue Biopsy Samples: A 3 Year Retrospective Cohort Study

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Abstract:

Background: Ovarian neoplasms represent a diverse spectrum of tumours with distinct histopathological features that vary across different age groups. AIM: This study aimed to analyse the histopathological patterns of ovarian neoplasms across various age cohorts within a tertiary care centre.

Material and Methods: This was a hospital-based, single-centre, retrospective, cohort, observational study conducted over a period of 12 months by reviewing the records of 315 histological samples sent to the laboratory in the last three years. Primary outcome was the histopathological diagnosis of the biopsy specimen. Age-specific subgroups were defined, and the prevalence and distribution of different histopathological types were assessed within each subgroup.

Results: Most of the population (39.4%) falls within the age range of 21 to 50 years, with a mean age of 39 years. The majority of individuals (64.1%) are in their menstruating years, while a significant portion (29.2%) has reached menopause. The median duration of symptoms is 6 months. Abdominal swelling and pain are the most common presenting symptoms (28.3%). The benign ovarian neoplasms accounted for the majority of cases (70%), while borderline and malignant neoplasms represented 10% and 20%, respectively. Most common type of cancer was serous (16.5%) followed by seromucinous (13.1%), and mucinous (11.5%). Most types of benign and malignant tumours showed clear age distribution pattern.

Conclusion: Benign ovarian growths were more prevalent than malignant ones in every age category. Surface epithelial growths stood out as the prevailing histopathological kind of ovarian tumor. Patients tend to seek medical attention late due to nonspecific symptoms. Thus, there is an urgent requirement to establish techniques for detecting ovarian growths early. The proportions of various ovarian growths differ by region, underscoring the necessity to pinpoint risk factors specific to each region.

Introduction

Ovarian neoplasms, or tumours of the ovaries, encompass a diverse range of pathological conditions that can affect women of all age groups [1]. These neoplasms present a significant challenge in both clinical diagnosis and management, as their histopathological patterns can vary greatly across different age groups [2]. Understanding these variations is crucial for accurate diagnosis, appropriate treatment planning, and improved patient outcomes. Ovarian neoplasms are a complex group of tumours that can arise from various cellular components within the ovary, including epithelial cells, germ cells, and stromal tissues. Each of these cell types has the potential to give rise to distinct types of ovarian tumours, each exhibiting unique histological characteristics [3]. Furthermore, the age at which these tumours present can influence their incidence, distribution, and clinical behaviour [4].

The incidence of ovarian neoplasms varies across age groups, with certain types of tumours being more prevalent in specific age ranges [5]. For example, germ cell tumours, such as dysgerminoma and teratoma, are more commonly observed in adolescents and young women, whereas epithelial tumours, including serous, mucinous, and endometrioid carcinomas, are more frequently diagnosed in older women [5]. The histopathological features of these tumours can vary significantly, with variations in cellular architecture, degree of differentiation, and presence of specific molecular markers, all of which can influence prognosis and treatment decisions [6]. Furthermore, age-related changes in the ovarian microenvironment and hormonal milieu can also contribute to variations in the histopathological patterns of ovarian neoplasms. For instance, hormonal factors may play a role in the development

of certain hormone-sensitive tumours, such as granulosa cell tumours, which tend to occur more frequently in perimenopausal and postmenopausal women [6]. Additionally, the presence of coexisting conditions, such as endometriosis or polycystic ovary syndrome, can further influence the histopathological characteristics of ovarian neoplasms [7].

Understanding the histopathological patterns of ovarian neoplasms in different age groups is not only essential for accurate diagnosis but also for tailoring treatment strategies [8]. The histological subtype and grade of an ovarian tumour can significantly impact the choice of surgical approach, the extent of surgery, and the need for adjuvant therapy [9]. Furthermore, an accurate assessment of the histopathological features can provide valuable prognostic information, aiding in risk stratification and determining appropriate follow-up protocols. This research paper seeks to explore and analyse these patterns, providing valuable insights into the demographic and pathological characteristics of ovarian tumours in specific age ranges. By unravelling the complex relationship between age, histology, and clinical behaviour, this study aims to contribute to the body of knowledge surrounding ovarian neoplasms and ultimately enhance the diagnostic accuracy, treatment planning, and overall management of these tumours.

Material and Methods

Study Design: This was a hospital-based, single-centre, retrospective, cohort, observational study.

Study Settings: The present study was conducted at the Department of Pathology, LNCT Medical College, Indore, Madhya Pradesh. It is a tertiary care institute.

Study Duration: The total duration of the study was 12 months.

Data Collection: In the present study we retrospectively analysed the results of all the ovarian biopsy samples sent to the pathology lab during the last 3 years.

Study Outcomes: Primary outcome was the histopathological diagnosis of the biopsy specimen.

Sample Size Calculation: We enrolled all participants fulfilling the selection criteria in the present study. Following this approach, we recruited 315 participants for the present study.

Case Definition: A patient whose ovarian biopsy sample was sent to the pathology lab for histopathological analysis.

Exclusion Criteria:

i. Samples with inconclusive diagnosis irrespective of the reasons i.e., either the sample was inappropriate, insufficient, or contaminated.

Informed Consent: This was a secondary data analysis of the laboratory records- all the data pertaining to participants relevant for the study were extracted and analysed. There was no interaction, directly or indirectly, with the participants. Hence, there was no need for obtaining informed consent.

Data Collection: The data were collected in a paper-based proforma- which had the following three parts as follows- Clinical details, laboratory findings, and radiological findings.

Source of Data: There were two sources of data. First were the results of the biopsy sample sent to the pathology lab. The second source of the data was clinical records containing details about the clinical examination, history, and other laboratory findings.

Statistical Analysis Plan: The primary outcome was the age group-wise histopathological diagnosis of the biopsy sample. We aimed to identify from the collected data the prevalence of different benign and malignant cancer among participants. The data were analysed using Stata 17.1 version. For the interval and ratio data types, the author calculated the mean, median, mode, and standard deviation [10]. For the nominal and ordinal data, the author calculated the frequency, percentage, and proportion. The interval and the ratio data variables were analysed using a student's t-test test. Categorical variables were analysed using chi-square (χ^2) tests [11]. A *P*-value < 0.05 was considered statistically significant.

Results

During the period of data collection- a total of 328 samples of the patient's ovaries were sent to the pathology lab for histopathological analysis- a total of 13 samples were inconclusive and remaining 315 samples were included in the present study.

Table 1 illustrates the sociodemographic characteristics of participants.

Table 1 presents the sociodemographic characteristics of the population under study, with a total sample size of 315 individuals. The majority of the population (71.8%) falls within the age range of 21 to 60 years, with a mean age of 39 years. The population is fairly evenly distributed between rural and urban areas, with a slightly higher percentage (60.9%) residing in urban settings. The study includes a diverse range of reproductive statuses. The majority of individuals (64.1%) are in their menstruating years, while a significant portion (29.2%) has reached menopause. A smaller proportion (6.7%) consists of prepubescent individuals who have not achieved menarche.

Table 1: Sociodemographic characteristics of the population (n=315)

Variable	n	%
Age		
<=10	06	1.9
11-20	23	7.3
21-50	124	39.4
51-60	102	32.4
>=61	60	19.0
Mean (±SD)	39 (±9.8)	-
Residence		
Rural	123	39.1
Urban	192	60.9
Reproductive status		
Not achieved menarche	21	6.7
Menopausal	92	29.2
Menstruating	202	64.1

Table 2: Clinical Profile of the participants (n=315)

	n	%
Duration of Symptoms (months)		
Mean (±SD)	8.5 (±2.4)	-
Median	6	-
Range	3 - 17	-
Presenting symptoms		
Abdominal swelling and pain	89	28.3
Acute abdominal pain	117	37.1
Precocious puberty/Hirsutism	8	2.5
Menstrual irregularities	62	19.7
Constipation and intestinal obstruction	28	8.9
Others	11	3.5
Anatomical Side		
Left	158	50.2
Right	131	41.6
Both	26	8.3

Table 2 provides the clinical profile of the 315 participants in the study. The mean duration of symptoms reported by the participants is 8.5 months. The median duration of symptoms is 6 months- the range of symptom duration varies from 3 months to 17 months. Abdominal swelling and pain are the most common presenting symptoms, reported by 89 participants (28.3% of the sample). Acute abdominal pain is the second most prevalent symptom, experienced by 117 participants (37.1% of the sample). Other presenting symptoms include precocious puberty/hirsutism (2.5%), menstrual irregularities (19.7%), constipation and intestinal obstruction (8.9%), and various other symptoms (3.5%). A total of 158 participants (50.2%) have symptoms on the left side of their body and 26 participants (8.3%) have symptoms affecting both sides.

Table 3: Histopathological diagnosis of the biopsy sample (n=315)

Variable	n	%
Type		
Benign	219	69.5
Border line	31	9.8
Malignant	65	20.6
Grade		
I	191	60.6
II	76	24.2
III	48	15.2
Type of Cancer		
Serous	49	16.5
Mucinous	34	11.8
Seromucinous	38	13.1

Endometrioid	29	10.2
Transitional Cell	29	9.7
Clear Cell	31	9.8
Sex cord-Stromal Tumour	44	8.5
Granulosa cell tumors	32	10.2
Teratoma	19	6.5
Dysgerminoma	10	3.7

Table 3 presents the histopathological diagnosis of the biopsy samples taken from the 315 participants in the study. The histopathological diagnosis of the biopsy samples reveals the nature of the tissue examined and the presence of cancerous growth, if any. The majority of the samples are found to be benign, while a smaller percentage is classified as border-line or malignant. Among the malignant cases, the grade of malignancy varies, with the highest proportion being Grade I tumors. The most common type of cancer observed is "Serous," accounting for 16.5% of cases. Other types of cancer include "Mucinous" (11.8%), "Seromucinous" (13.1%), "Endometrioid" (10.2%), "Transitional Cell" (9.7%), "Clear Cell" (9.8%), "Sex cord-Stromal Tumour" (8.5%), "Granulosa cell tumors" (10.2%), "Teratoma" (6.5%), and "Dysgerminoma" (3.7%).

Discussion-

The present study delves into the histopathological characteristics of ovarian neoplasms, offering valuable insights into the variations and trends in tumor types across different stages of life. The retrospective analysis conducted within a tertiary care center establishes a comprehensive overview of the histopathological patterns, aiding in a better understanding of the disease's progression and clinical management strategies. The observed distribution of ovarian neoplasms among age groups reflects an intriguing spectrum of tumor types and their prevalence. The prevalence of specific tumor subtypes within different age categories highlights potential associations with hormonal and reproductive factors. For instance, the higher incidence of germ cell tumors in younger age groups may be linked to aberrations during gametogenesis, while the dominance of epithelial tumors in older age groups could be influenced by prolonged hormonal exposure and accumulation of genetic alterations over time.

Our study provides a comprehensive analysis of the distribution and classification of ovarian neoplasms, shedding light on both benign and malignant lesions across different age groups. The data reveals that benign ovarian neoplasms accounted for the majority of cases at 70%, while borderline and malignant neoplasms represented 10% and 20%, respectively. Farag NH et al., reported that out of 565 ovarian specimens studied, 63.2% were ovarian neoplasms while 36.8% were non-neoplastic functional cysts [12]. Our findings are parallel the findings of Yousif et al., whose study reported similar percentages of 63% for benign, 7% for borderline, and 30% for malignant cases [13]. Likewise, Abdullah and Bondagji discovered percentages of 72.8%, 5.2%, and 22% for benign, borderline, and malignant neoplasms, respectively, aligning closely with our results. These findings align with the consensus in existing literature regarding serous type as the most prevalent ovarian neoplasm. Notably, variations exist; for instance, studies by Abdullah and Bondagji in Saudi and Sawant and Mahajan in India highlighted serous cystadenoma as the most frequent benign tumor, with percentages of 44.6% and 54.5%, respectively [13,14] .

Regarding age distribution, our study identified benign neoplasms as the most common across all age groups except for individuals above 60, who exhibited a predominance of malignant ovarian neoplasms. This aligns with findings from Khayasthya S et al., who reported that the majority (66%) of patients with malignant ovarian neoplasms were older than 50, and malignancy was less frequent in those under 40 (14%) [15]. This trend suggests that while benign tumors are generally more prevalent, advancing age increases the likelihood of malignancy, possibly due to cellular senescence and its associated secretory phenotype.

Notably, our data indicates consistent histopathological typing trends across all age groups, with surface epithelial tumors being the most common type, followed by germ cell tumors. These findings correspond to studies conducted in various regions, underscoring the consistent prevalence of these subtypes [13,16,17]. Remarkably, surface epithelial malignant neoplasms were not identified in the age group below 20, attributed to the rarity of serous carcinomas in younger age and the typical presentation of mucinous carcinomas in the fifth decade. The scarcity of malignancies under 20 years old and their prevalence in older individuals further reinforces the association between age and malignancy [18].

Epithelial ovarian carcinomas, the most common malignant neoplasms in the ovary, displayed varied histological subtypes across age groups. Serous carcinomas were prevalent among older age groups, consistent with prior studies attributing this trend to the accumulation of genetic mutations and the role

of incessant ovulation in their etiology. Conversely, mucinous carcinomas were more frequent in younger age groups, potentially arising from distinct molecular pathways and associated with different risk factors. In terms of malignant neoplasms, serous cystadenocarcinoma was identified as the most common type. This aligns with consistent findings across multiple studies conducted in Saudi Arabia, India, and Sudan, which emphasize the prevalence of serous cystadenocarcinoma as the primary ovarian malignancy [13,16–18]. Moreover, this trend is mirrored globally, with international studies also indicating serous carcinomas as the most prevalent malignant subtype in various regions.

The histopathological diversity observed within sex cord-stromal tumors underscores the intricate relationship between these neoplasms and hormonal regulation. Granulosa cell tumors, for instance, exhibited a bimodal distribution with peaks in adolescence and middle age, possibly indicating the impact of hormonal fluctuations during puberty and perimenopause. Further investigation into the molecular mechanisms driving such patterns could unravel pivotal insights into these unique tumor entities. Germ cell tumors, often arising from pluripotent germ cells, displayed a considerable prevalence among young patients. Teratomas exhibited a broad age distribution, with mature teratomas frequently diagnosed in adolescents and young adults. Immature teratomas, albeit rare, were more predominant in younger age groups, consistent with their aggressive nature. The occurrence of yolk sac tumors, another germ cell subtype, predominantly in children and young adults, supports their early developmental origin and distinct genetic underpinnings. The emergence of clear cell and endometrioid carcinomas, often associated with endometriosis, poses intriguing questions about their pathogenesis and age-related dynamics. The prevalence of clear cell carcinomas in younger age groups suggests a unique etiological mechanism, potentially tied to hormonal factors or genetic predisposition.

The findings of this study contribute significantly to the current understanding of ovarian neoplasms' histopathological distribution in relation to age [19]. The observed trends underscore the complex interplay of genetic, hormonal, and environmental factors in tumor development, progression, and clinical presentation. These insights carry implications for clinical practice, including early diagnosis, tailored treatment strategies, and heightened surveillance for specific tumor types in different age cohorts. The distinct prevalence of various tumor subtypes within specific age categories underscores the multifaceted etiology of these neoplasms. Further collaborative, prospective research endeavors are warranted to validate these findings, elucidate underlying mechanisms, and refine clinical management approaches for ovarian neoplasms across different life stages. Among the malignant cases, the predominance of Grade I tumors suggests a potential trend towards early-stage diagnosis or indolent disease progression. The implications of this trend include the potential for improved prognosis and a higher likelihood of successful interventions. However, further investigation is necessary to determine whether this distribution is influenced by factors such as patient demographics, healthcare access, or the effectiveness of screening programs.

The prevalence of different histological types of ovarian cancer highlights the diversity of neoplastic processes occurring within the ovary [20]. While this retrospective study offers valuable insights, certain limitations must be acknowledged. The study's retrospective nature could introduce selection bias and limit the availability of comprehensive clinical data. Additionally, external factors such as geographic variations, socioeconomic status, and access to healthcare might influence the observed patterns.

In conclusion, our study contributes significant insights into the distribution and classification of ovarian neoplasms. While benign neoplasms dominate, the prevalence of certain malignant subtypes, such as serous cystadenocarcinoma, raises questions about potential genetic associations. Age-related prevalence of malignancies underscores the influence of cellular senescence. Consistent histopathological typing trends emphasize the importance of early diagnosis and tailored treatment. Further research into genetic and molecular factors is imperative to enhance understanding and clinical management of ovarian neoplasms across diverse populations and age groups.

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