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RESEARCH PAPER

Ovarian Tumor in Pediatrics and Adolescents: A Retrospective Clinicopathological Study in a Tertiary Care Hospital

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Abstract

Background: A small but significant portion of gynecological cancers in children and teenage girls is ovarian. They are responsible for 8% of all pediatric abdominal tumors and 1% of all pediatric cancers. These tumors were assumed to be uncommon in children since ovarian cysts are believed to develop from mature follicles.

Objectives: To determine the frequency, clinical features, radiological features and histological findings of various ovarian tumors in girls aged up to 19 years.

Methods: This retrospective study was done at Gynecological Oncology Department of BMU from 2016 to 2023 which included females aged 0–19 years who underwent surgery for ovarian masses with confirmed histopathology. Older patients (>19 years), incomplete records, missing imaging, and non-neoplastic lesions without histology were excluded. Data from medical records, imaging (USG/MRI) report, operation notes, and histopathology reports were abstracted, and tumors were classified as benign or malignant and by WHO histological category. According to age subjects were grouped as (0–9), (10–14), and 15–19 years. We estimated the proportion of pediatric/adolescent cases among all admissions at 95% CI and tested associations between tumor behavior and age group, presentation, size, laterality, and gross morphology. Malignant cases were staged by FIGO. Analyses used chi-square or Fisher's exact tests for categorical data and t-test or Mann–Whitney U for continuous data. P-value <0.05 was regarded as significant. IRB approval was obtained; consent was waived due to the retrospective design but strict confidentiality was maintained.

Result: Among 980 overian tumour, 63 were found in pediatric and adolescent age group. Among them 33 were benign and 30 were malignant. The majority of tumors occurred in the 15–19-year age group. Among benign tumors, mature cystic teratoma (45.5%) was the most common, while dysgerminoma (40%) predominated among malignant tumors. Clinically, benign cases mostly presented with abdominal pain (63.6%), while malignant cases more often presented with abdominal lump, acute abdomen, or ascites. Radiologically, benign tumors were typically smaller (<10 cm), unilateral, and unicystic, whereas malignant tumors were more often 10–15 cm, sometimes bilateral, and frequently cystic-solid.

Conclusion: Benign overian tumors slightly outnumbered malignant tumors. Mature cystic teratoma is the most common benign tumor and dysgerminoma the leading malignancy. Benign cases usually had abdominal pain, while malignant ones often presented with mass or acute abdomen.

Keywords: Benign ovarian tumors, malignant ovarian tumor, pediatrics and adolescent age group

Introduction

Ovarian tumor in children and adolescent girls constitute a rare but important group of gynecological malignancies. The reported incidence ranges from 0.9%-2% of all the childhood malignancies and 8% of all abdominal tumor in children.[1] Several studies showed an incidence of approximately 2.6 cases per 100000 females per year in children and adolescent age.[2] It is estimated that almost 10-30% of all the ovarian neoplasms occurring in girls up to 19 years of age are malignant.[3] According to the literature, germ cell tumor is the most common in pediatric age group in contrast to the tumors occurring in the adult females, which are mostly surface epithelial in origin.[1]

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Germ cell tumors are the commonest ovarian neoplasm in the first 2 decades of life constituting approximately 60%-80% of all ovarian tumors with mature teratoma representing the predominant histological type0.[4] Dysgerminoma are the most common malignant germ cell tumor accounting for approximately 30%-40%of germ cell malignancies.[5]

Epithelial tumors are rare in children and account for only 15%-20% of all pediatric ovarian neoplasms.[6] Serous and mucinous neoplasms constitute the vast majority of epithelial ovarian tumor in pediatric population.[7]

Sex-cord stromal tumors are rare accounting for 5%-8% of all ovarian malignancies and are also rare in this age group.[8] Juvenile granulosa cell tumor and Sertoli-Leydig cell tumor are the most common types in children and adolescents.[5] Patients with these tumors may present with manifestations related to a pelvic mass and hormonal disturbances.[9]

Ovarian pathology is occasionally discovered at laparotomy for presumptive appendicitis and surprises the surgeons.[10] In contrast to relatively slow growing epithelial ovarian tumors, germ cell malignancies grow rapidly and often are characterized by subacute pelvic pain. More advanced cases may present with abdominal distension.[11]

During the evaluation of an adnexal mass, the most important part is to assess the possibility of malignancy since the management of benign and malignant tumors is essentially different.[13] The differential diagnosis have to be based on clinical presentations, serum tumor markers and imaging characteristics.[14] In selected cases certain imaging characteristics can be useful to distinguish benign and malignant tumors like presence of solid component, heterogenicity, size >10 cm, presence of papillary projections and ascites.[15]

Important tumor markers of ovarian tumors include alpha fetoprotein(AFP), beta-HCG ,lactate dehydrogenase (LDH), cancer antigen-125, carcinoembryonic antigen, serum CA-19-9 and inhibin.[16] Raised AFP level is found in Immature teratoma, Yolk sac tumor and Embryonal carcinoma, LDH level is raised in Dysgerminoma and beta HCG level is found to be raised in non-gestational Choriocarcinoma. Where as S.CA-125 levels are elevated in epithelial ovarian tumor and Inhibin in Granulosa cell tumor in this age group.[4] The diagnostic accuracy of tumor markers is high when combined with clinical and imaging information.[17] In all cases of ovarian masses ,the definite diagnosis is established only after surgical removal and histopathological examination.[18]

Pediatric patients with ovarian neoplasm have a longer life expectancy after treatment. The preservation of ovarian function is of paramount importance for fertility maintenance and as well as for natural progression of puberty.[12] So, they should be evaluated by multidisciplinary team in specialized centers to ensure the best possible outcome.

Materials and methods

This retrospective observational study was carried out in Bangladesh Medical University (BMU) at Gynecological Oncology Department in Dhaka, to investigate the clinicopathological features of ovarian tumors up to the age of 19 years. All pediatric and adolescent females aged 0–19 years who underwent surgery for ovarian masses and had available histopathology reports were included from hospital record during the previous eight years (2016–2023). Patients older than 19 years, those with incomplete records, missing imaging, or non-neoplastic ovarian lesions without histological confirmation were excluded. Data were retrieved from hospital medical records, surgical registers, and pathology archives, and included demographic details, clinical presentation, radiological findings operation notes, and histopathology reports. The tumors were categorized into benign and malignant groups and further classified according the WHO histological classification into germ cell tumors, surface epithelial tumors, sex cord-stromal tumors, and other variants as documented. Slides were re-examined and immunohistochemistry applied in difficult cases. Age of subjects stratified into three categories (0–9, 10–14, and 15–19 years) to facilitate comparison. Data were entered into a structured proforma and analyzed using standard statistical software. The proportion of pediatric/adolescent cases among all ovarian-

tumor admissions was estimated at a 95% confidence interval. Within this group, associations were assessed between tumor behavior (benign vs malignant) and age group (0–9, 10–14, 15–19), clinical presentation (abdominal pain, palpable lump, acute abdomen, irregular menstruation, ascites, asymptomatic), radiologic size categories (<10cm), (10–15)cm >15cm), laterality (unilateral, bilateral), and gross morphology (unicystic, multicystic, cystic-and-solid). Histopathological profiles were summarized separately for benign and malignant tumors, and their distribution across age groups was described. For malignant tumors, FIGO stage was tabulated by histologic subtype. Categorical comparisons used Pearson's chi-square test (or Fisher's exact test when assumptions were not met). Continuous variables were summarized as mean ± SD or median (range) and compared using t-test or Mann–Whitney U test. Two-sided $p<0.05$ was considered statistically significant. Ethical clearance was obtained from the Institutional Review Board of BMU, and as this was a retrospective review of records from archive, individual patient consent was waived, but strict confidentiality maintained at all stages.

Results:

Among 980 ovarian tumor patients admitted, 63 were in the pediatric and adolescent age group. This represents 6.4% of the total cases, with a 95% confidence interval ranging from 4.9% to 8.0%. This indicates that ovarian tumors were relatively uncommon in younger patients compared to the overall admitted population(table-I). Benign tumor was about 52.4% which was slightly higher than the malignant one(47.6%) in paediatrics and adolescent age (table-II).

In the 0–9 years group, only 2 benign tumors were found (6%), with no malignant cases. Among those aged 10–14 years, 21 cases were recorded, with 12 malignant (40%) and 9 benign (27.3%). In the 15–19 years group, which had the highest number of cases (40), malignant tumors accounted for 18 (60%) while benign tumors were slightly more frequent at 22 (66.7%). This indicates that ovarian tumors were rare in very young children, and most cases occurred in the 10–19 years group, with benign and malignant tumors showing a relatively balanced distribution in adolescents (table-III).

Table I: Frequency of ovarian tumor in paediatrics and adolescents during 2016-2023

Total number of ovarian tumor patients	Paediatric & Adolescent ovarian tumor patient		
	Frequency	Percentage (%)	95% Confidence Interval
980	63	6.4	4.9 – 8.0

Data presented as frequency and percentage over the columns

Table II: Histological types of ovarian tumour in paediatrics and adolescents (N=63)

Total	Benign (%)	Malignant (%)
63	33(52.4%)	30(47.6%)

Table III: Age distribution of benign & malignant ovarian tumors in pediatric and adolescent patients by tumor type (N=63)

Age (in year)	Malignant (30) Frequency (%)	Benign (33) Frequency (%)
0–9	0 (0%)	2(6.0%)
10–14	12(40.0%)	9(27.3%)
15–19	18(60.0%)	22(66.7%)

Data presented as frequency and percentage over the columns

Among malignant tumors (n=30), dysgerminoma was the most common, accounting for 12 cases (40.0%). Immature teratoma was the next frequent type with 7 cases (23.3%), followed by yolk sac tumor in 5 cases (16.7%). Less common malignant tumors included serous cystadenocarcinoma and mixed germ cell tumor with 2 cases each (6.7%), while mucinous cystadenocarcinoma and granulosa cell tumor were rare, observed in only 1 case each (3.3%). For benign tumors (n=33), mature cystic teratoma predominated, comprising nearly half of the cases (15 cases, 45.5%). Endometriotic cyst and serous cystadenoma were equally frequent with 5 cases each (15.2%). Mucinous cystadenoma was found in 4 cases (12.1%), simple cysts in 3 cases (9.1%), and corpus luteal cyst in only 1 case (3.0%) (table-IV).

In malignant tumors, no cases were found in the 0–9 years group. Among 10–14-year-olds, yolk sac tumor was the most common (4 cases, 19.0%), followed by immature teratoma and dysgerminoma with 3 cases each (14.3%). Granulosa cell tumor and mixed germ cell tumor were rare, with 1 case each (4.8%). In the 15–19 years group, dysgerminoma predominated (9 cases, 22.5%), followed by immature teratoma (4 cases, 10.0%). Other malignant tumors, including serous cystadenocarcinoma, mucinous cystadenocarcinoma, yolk sac tumor, and mixed germ cell tumor, were each observed in 1–2 cases (2.5–5.0%). For benign tumors, the 0–9 years group showed only serous cystadenoma (2 cases, 100%). In the 10–14 years group, mature cystic teratoma was the most frequent (7 cases, 33.3%), while other benign lesions such as mucinous cystadenoma and serous cystadenoma appeared sporadically. In the 15–19 years group, mature cystic teratoma remained the leading benign tumor (8 cases, 20.0%), followed by endometriotic cyst (5 cases, 12.5%). Simple cysts and serous cystadenoma were each seen in 2–3 cases (5.0–7.5%), and corpus luteal cyst appeared in only 1 case (2.5%) (table-V).

Abdominal pain was significantly more common in benign tumors (21 cases, 63.6%) compared to malignant tumors (6 cases, 20.0%), with a p-value of 0.001. Feeling a lump was more frequent among malignant cases (43.3% vs 15.2%). Acute abdomen presentation was also higher in malignant tumors (16.7% vs 3.0%). Irregular menstruation (10.0%) and ascites (10.0%) were seen only in malignant cases.

Table IV: Types of benign and malignant ovarian tumors in pediatric and adolescent (N=63)

	Types of tumors	frequency (n)	Percentage (%)
Malignant (n-30)	Dysgerminoma	12	40.0
	Immature teratoma	7	23.3
	Yolk sac tumor	5	16.7
	Serous cystadenocarcinoma	2	6.7
	Mixed germ cell tumor	2	6.7
	Mucinous cystadenocarcinoma	1	3.3
	Granulosa cell tumor	1	3.3
Benign (n=33)	Mature cystic teratoma predominated	15	45.5%
	Granulosa cell tumor	1	3.3
	Endometriotic cyst	5	15.2
	Serous cystadenoma	5	15.2
	Mucinous cystadenoma	4	12.1
	Simple cyst	3	9.1
	Corpus luteal cyst	1	3.0

Data presented as frequency and percentage over the columns

Table V: Age distribution of the types of benign & malignant ovarian tumors in pediatrics and adolescents (N=63)

	Histopathology	0-9	10-14	15-19
Malignant (n=30)	Dysgerminoma	0 (0.0%)	3 (14.3%)	9 (22.5%)
	Immature teratoma	0 (0.0%)	3 (14.3%)	4 (10.0%)
	Yolk sac tumor	0 (0.0%)	4 (19.0%)	1 (2.5%)
	Serous cystadenocarcinoma	0 (0.0%)	0 (0.0%)	2 (5.0%)
	Mixed germ cell tumor	0 (0.0%)	1 (4.8%)	1 (2.5%)
	Mucinous cystadenocarcinoma	0 (0.0%)	0 (0.0%)	1 (2.5%)
	Granulosa cell tumor	0 (0.0%)	1 (4.8%)	0 (0.0%)
Benign(n=33)	Mature cystic teratoma	0 (0.0%)	7 (33.3%)	8 (20.0%)
	Endometriotic cyst	0 (0.0%)	0 (0.0%)	5 (12.5%)
	Serous cystadenoma	2 (100.0%)	1 (4.8%)	2 (5.0%)
	Mucinous cystadenoma	0 (0.0%)	1 (4.8%)	3 (7.5%)
	Simple cyst	0 (0.0%)	0 (0.0%)	3 (7.5%)
	Corpus luteal cyst	0 (0.0%)	0 (0.0%)	1 (2.5%)

Data presented as frequency and percentage over the columns.

In contrast, asymptomatic presentation occurred only in benign tumors (18.2%) (table-VI).

For tumor size, malignant cases were more often in the 10–15 cm range (50.0%), while benign tumors were slightly more common in the <10 cm group (54.5%). Very large tumors (>15 cm) were relatively uncommon in both groups. The difference in size distribution was statistically significant (p=0.001). Regarding laterality, most tumors were unilateral in both malignant (73.3%) and benign (78.8%) cases, with bilateral involvement being less frequent and not statistically significant (p=0.76).In terms of gross radiological appearance, benign tumors were predominantly unicystic (75.8%), whereas malignant tumors were much more likely to show a mixed cystic and solid pattern (60.0%). Multicystic features appeared in both groups but more in malignant cases (23.3% vs 15.2%). The gross appearance difference was significant (p=0.001) (table-VII).

Most cases presented at an early stage: 21 tumors (70%) were Stage I, 7 cases (23.3%) were Stage II, and only 2 cases (6.6%) reached Stage III. No Stage IV tumors were reported. Dysgerminoma was the most common type across stages, with 9 cases in Stage I, 2 in Stage II, and 1 in Stage III. Immature teratoma followed, with 5 cases in Stage I and 2 in Stage II. Yolk sac tumor was mostly seen in Stage I (4 cases) and 1 in Stage II. Mixed germ cell tumor had 1 case each in Stage I and II. Advanced-stage tumors were rare, with only serous cystadenocarcinoma reaching Stage III (1 case). Other types like mucinous cystadenocarcinoma and granulosa cell tumor were confined to Stage I (table-VIII).

Table VI: Clinical presentations of benign & malignant ovarian tumors in pediatrics and adolescents (N=63)

Variables	Types of tumors		P value
	Malignant (30)	Benign (33)	
Symptoms			
Abdominal pain	6 (20.0%)	21 (63.6%)	$^{s}0.001^{a}$
Feeling lump	13 (43.3%)	5 (15.2%)	
Acute abdomen	5 (16.7%)	1 (3.0%)	
Irregular menstruation	3 (10.0%)	0 (0.0%)	
Ascites	3 (10.0%)	0 (0.0%)	
Asymptomatic	0 (0.0%)	6 (18.2%)	

Data presented as frequency and percentage over the columns. P-value reached through:
a = Chi-square test for categorical variables
s = significant

Table VII: Radiological and gross findings of benign & malignant ovarian tumors in pediatrics and adolescents

	Radiological findings	Types of tumors		P value
		Malignant (30)	Benign (33)	
Size	<10cm	13 (43.3%)	18 (54.5%)	s0.001[a]
	10–15cm	15 (50.0%)	12 (36.4%)	
	>15cm	2 (6.7%)	3 (9.1%)	
Laterally	Unilateral	22 (73.3%)	26 (78.8%)	ns0.76[a]
	Bilateral	8 (26.7%)	7 (21.2%)	
Gross finding	Unicystic	5 (16.7%)	25 (75.8%)	s0.001[a]
	Mult cystic	7 (23.3%)	5 (15.2%)	
	Cystic and solid	18 (60.0%)	3 (9.1%)	

Data presented as frequency and percentage over the columns. P-value reached through:
a = Chi-square test for categorical variables
ns = non-significant
s = significant

Table VIII: FIGO staging of malignant ovarian tumor in pediatrics and adolescents (n=30)

Histopathological type	Stages of tumor			
	Stage I	Stage II	Stage III	Stage IV
Dysgerminoma	9	2	1	0
Immatureteratoma	5	2	0	0
Yolk sac tumor	4	1	0	0
Mixedgermcelltumor	1	1	0	0
Serous cystadenocarcinoma	0	1	1	0
Mucinous cystadenocarcinoma	1	0	0	0
Granulosa cell tumor	1	0	0	0
Total (%)	21(70%)	7(23.33)	2(6.6)	0

Discussion

In this retrospective study, we evaluated the clinical, radiological, and histopathological features of ovarian tumors in pediatric and adolescent patients. Our findings showed that benign tumors slightly predominated over malignant ones, with mature cystic teratoma being the most common benign tumor, while dysgerminoma was the most frequent malignant subtype. These results are consistent with previous studies, which also identified mature cystic teratoma as the leading benign ovarian tumor and dysgerminoma as the predominant malignant tumor in this age group[7,22].

The mean age of presentation in our cohort was approximately 15 years, with the majority of tumors occurring in the 10–19-year age group. This parallel reports from China and Turkey, where the incidence of ovarian tumors increased with age, particularly after menarche[19]. The rarity of malignant tumors in children under 10 years, as observed in our data, has similarly been highlighted in large multicenter reviews[22.23].

Clinically, abdominal pain was the most common presenting symptom in benign tumors, whereas malignant tumors more often presented with a palpable mass, acute abdomen, or associated features like ascites and menstrual irregularities. This distinction has been described in earlier series, where benign lesions typically manifested with nonspecific abdominal pain, while malignant cases were more often associated with abdominal mass or systemic symptoms[22.23]. Interestingly, a small proportion of our benign cases were asymptomatic, echoing reports that some ovarian lesions are detected incidentally during imaging or surgery[24]

Radiologically, benign tumors were more likely to be small (<10 cm), unilateral, and unicystic, while malignant tumors frequently demonstrated cystic and solid morphology and were often larger in size. These features have been consistently described as radiological indicators of malignancy in pediatric ovarian tumors[7,20].Our findings reinforce the role of imaging in preoperative assessment, although histopathology remains the gold standard.

Histologically, germ cell tumors accounted for the majority of malignant cases, particularly dysgerminoma and immature teratoma, which together represented nearly two-thirds of all malignant tumors in our study. This predominance of germ cell tumors in the pediatric population has been well-documented, in contrast to adults where epithelial tumors predominate[19,25].

Serum tumor markers were abnormal in a subset of cases, with LDH being the most commonly elevated marker, particularly in dysgerminoma, followed by CA-125, â-hCG, and AFP. This aligns with current literature, which emphasizes the diagnostic utility of LDH in dysgerminoma, AFP in yolk sac tumors, and â-hCG in certain germ cell tumors[7,20].

However, as highlighted in multiple reviews, tumor markers alone cannot reliably distinguish benign from malignant tumors and should always be interpreted in conjunction with imaging and clinical findings[7].

Our study further demonstrated a significant association between age group and histopathological type, with malignant tumors more frequent in early adolescence (10–14 years), while benign tumors predominated in late adolescence (15–19 years). Similar age-related patterns have been observed in large-scale series, suggesting developmental and hormonal factors may influence tumor biology[21].

Taken together, our results reinforce several key points: most pediatric ovarian tumors are benign, germ cell tumors dominate the malignant spectrum, and clinical, radiological, and marker profiles can guide—but not replace—histopathological diagnosis. Importantly, fertility-preserving surgery should be prioritized whenever feasible, as strongly recommended in international guidelines and systematic reviews[7,25,24].

Conclusion

In this study, benign tumors were slightly more frequent, with mature cystic teratoma being the commonest benign type and dysgerminoma found to be the leading malignant tumor. Abdominal pain predominates in benign cases, while malignant tumors often presented with abdominal mass or acute abdomen. Adolescent ages dominated, with malignancy relatively more frequent at (10–14) years and benign tumors more common at (15–19) years. On imaging, cystic-solid masses favored malignancy, while unicystic/multicystic patterns were largely benign. Malignant tumors were chiefly germ-cell types and mostly stage-I pointing to good potential for early, fertility-sparing management.

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