Correlation among Symptomatic Presentation, Ultrasound Imaging, and Surgical Findings in Ovarian Neoplasms

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Abstract

There is a wide range of gynecological disorders with ovarian neoplasms that are clinically heterogeneous and have an obscure presentation, making early diagnosis difficult. The association of the clinical presentation with ultrasonographic findings and intraoperative findings are critical determinants in planning surgical management. A prospective, observational study was conducted in the Department of Obstetrics & Gynaecology, Community Based Medical College, Bangladesh (CBMC,B) Hospital, Mymensingh, Bangladesh, between June and December of 2024, to observe correlation among symptomatic presentation, ultrasound imaging, and surgical findings in ovarian neoplasms. Our study included 60 patients with ovarian neoplasms. Sociodemographic, clinical, menstrual and reproductive characteristics, use of contraceptives, ultrasound findings and results from laparotomy were recorded. 30% of the patients were young adults 31-40 years and 50% were in middle class social economic status. The presenting symptoms in the present study were predominantly abdominal mass (75%). 78.3% of ovarian tumors were found benign histopathogically, while 21.7% were malignant. Patients' symptoms had no association with USG findings (p>0.05), while ultrasonographic findings were in high agreement with laparotomy features (kappa=0.82, p<0.001). A significant association was found between patients' age and malignancy, as 80% of malignant tumors occurring in women >40 years (p=0.01). The diagnostic performance of ultrasound in differentiating benign from malignant tumors demonstrated 76.9% sensitivity, 95.7% specificity, PPV of 83.3%, and NPV of 93.8%, with overall diagnostic accuracy of 91.7%. Integration of clinical, radiological and surgical features improves the diagnostic accuracy and influences the appropriate treatment for ovarian neoplasia.

Keywords: Ovarian neoplasms, ultrasound imaging, symptomatic presentation, surgical findings, histopathology

Introduction

Ovarian neoplasms are heterogeneous group of gynecologic diseases, including functional cysts to extremely malignant tumors. World Health Organization statistics reveal that ovarian cancer ranks as the eighth most prevalent malignancy in women worldwide and ranks first among fatal gynecological cancers, constituting for 3–4% of all female tumors.[1,2] GLOBOCAN 2020 estimates show that there were >313,000 new cases and >207,000 deaths from ovarian cancer worldwide.[3] The burden is particularly high in developing countries such as Bangladesh, where inadequate access to health

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services, financial constraints and sociocultural norms lead to late diagnosis of the disease. In these scenarios knowledge of the relation between symptom, imaging and surgical finding is an utmost important for early management and better prognosis. A difficulty for diagnosis of ovarian neoplasm is that the clinical manifestations for this disease are always not obvious and specific. Women usually have complaints of an abdominal mass, distension, discomfort or loss of appetite symptoms that can only be explained as gastrointestinal or urinary disorders.[4,5] Commonly neoplasms are found incidentally on imaging performed for other indications highlighting the challenges of diagnosis based only upon clinical signs. In addition, postmenopausal women are more likely to have advanced disease, and the late development of definite symptoms reduces the opportunity for early treatment.[6] These diagnostic challenges require a more methodical plan that combines clinical suspicion with imaging and histopathological correlation to increase the sensitivity of the diagnosis. Ultrasound imaging (USG) has become the mainstay modality in assessing ovarian neoplasms on account of being relatively cheap, widely available and non-invasive.[7] It helps to distinguish cystic, solid and complex adnexal masses and in some situations to predict malignant potential by features such as multilocularity, papillary projections or increased vascularity on Doppler studies.[8,9] Nevertheless, ultrasound findings can be operator dependent and sometimes indeterminate especially in the case of differentiation between borderline tumors and malignant tumors.[10] Although more advanced imaging (CT and MRI) may offer greater diagnostic certainty, these modalities are costly and less readily available in resource limited settings.[11] Therefore, USG will continue to be the backbone of first line assessment in resource

poor low- and middle-income countries, hence it being pertinent to correlate it with operative and histological findings. Surgical exploration and anatomical pathology are still the standard for the diagnosis, therapy of ovarian neoplasm. Surgical exploration assesses tumor laterality, size, consistency and extent, whereas the histopathology provides for a definitive separation into benign, borderline or malignant types.[12] Determining the diagnostic performance of ultrasound compared to surgical and histopathological correlation has a high clinical impact. A proven link can prevent unnecessary interventions in benign cases but may also ensure expeditious treatment of malignant disease. Additionally, it could aid in patient's counseling, help better the referral pattern and can help design public health programs among women of Bangladesh where plight of ovarian neoplasm still is a matter of concern.[13,14] Hence, we proposed to evaluate consistency between symptom, ultrasound and operative findings with aspect to ovarian neoplasms in patients diagnosed at Community Based Medical College, Bangladesh (CBMC,B) Hospital, a tertiary level institution in Mymensingh, Bangladesh.

Methods

This prospective, observational study was conducted in the Department of Obstetrics & Gynaecology, Community Based Medical College, Bangladesh (CBMC,B) Hospital, Mymensingh, Bangladesh, between June and December 2024. A total of 60 patients presenting with ovarian neoplasms and undergoing surgical intervention were included in the study. The study population comprised both premenopausal and postmenopausal women across diverse socioeconomic backgrounds. Each patient underwent detailed clinical evaluation,

ultrasonography, surgical exploration, and subsequent histopathological examination to establish a comprehensive diagnostic pathway. The multidisciplinary team approach included gynecologists, radiologists, anesthesiologists, and pathologists to ensure accurate data collection and patient safety throughout the study period.

The inclusion criteria: (1) female patients aged 12 years and above presenting with clinically or radiologically diagnosed ovarian mass, (2) patients who underwent laparotomy for ovarian neoplasm, and (3) those willing to participate in the study and provide written informed consent.

The exclusion criteria: (1) patients with non-neoplastic ovarian cysts such as functional, follicular, or corpus luteum cysts, (2) patients with para-ovarian or tubo-ovarian masses not of ovarian origin, (3) incomplete clinical or operative records, and (4) patients unwilling or unfit to undergo surgical management. These criteria were employed to ensure homogeneity of the study population and to avoid confounding results from non-neoplastic ovarian lesions or unrelated pelvic masses.

Patients presenting with acute symptoms (e.g., cyst rupture, ovarian torsion, hemodynamic instability) were operated on immediately. In such an emergency, preoperative CT scan or MRI was not possible. The decision to operate was, therefore, based on clinical and ultrasound findings.

Data was collected using a pre-structured proforma that captured socio-demographic details, reproductive and menstrual history, contraceptive practices, and presenting complaints. Clinical evaluation included a detailed history of abdominal pain, distension, loss of appetite, weight loss, and palpable abdominal lump, supplemented with general and systemic examinations. Baseline laboratory investigations such as hemoglobin level and hematological profiles were recorded. Ultrasonography was performed for all patients to classify ovarian masses as cystic, solid, or mixed in nature, along with documentation of size, laterality, mobility, and presence of ascites or peritoneal fluid. Laparotomy findings were meticulously recorded, including tumor size, consistency, laterality, and gross cut-section features. Intraoperative findings were then correlated with preoperative ultrasonographic impressions. Resected specimens were sent for histopathological examination, which was considered the gold standard for definitive diagnosis. All histological subtypes were documented, including benign and malignant variants, as well as borderline lesions where applicable.

Data was compiled, coded and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0 for Windows. Descriptive statistics such as mean, standard deviation, frequency, and percentage distribution were calculated for sociodemographic and clinical variables. Associations between categorical variables, such as age and histological type or symptoms and ultrasonographic mass characteristics, were analyzed using Chi-square (χ^2) test. The level of statistical significance was set at $p < 0.05$. Agreement between ultrasound and laparotomy findings was evaluated using Cohen's kappa coefficient, with values interpreted as poor (<0.20), fair (0.21–0.40), moderate (0.41–0.60), good (0.61–0.80), or very good (>0.81). Diagnostic performance of ultrasound in differentiating benign from malignant ovarian neoplasms was assessed by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy.

The study was approved by the Ethical Review Committee of Community Based Medical College, Bangladesh (CBMC,B), Mymensingh, Bangladesh.

Results

A total of 60 patients with ovarian neoplasms were included in this study. The age distribution revealed that the largest group was between 31-40 years (30%), followed by 41-50 years (20%). The youngest patients were in the ≤20 years group (13.3%), while only 6.7% were in the 61-70 years category. Regarding socioeconomic background, half of the patients (50%) belonged to the middle-class group, while 41.7% were from lower-class families, and only 8.3% from upper-class backgrounds (Table-I). Among clinical presentations, the most common complaint was a lump in the lower abdomen (75%), followed by loss of appetite, weight loss, and anemia (each 50%). Abdominal distension was reported by 26.7%, vague abdominal discomfort by 20%, and acute severe abdominal pain with nausea and vomiting in 8.3%. On physical examination, most masses were cystic (43.3%), measuring 8–10 cm in diameter (58.3%) (Table-II). During laparotomy, 70% of neoplasms were unilateral, with almost equal i.e., right-sided (33.3%) and left-sided (36.7%). Cystic tumors predominated (58.3%), while 25% were solid and 16.7% mixed. Peritoneal fluid was present in 15%, and peritoneal seeding in 5% (Table-III). In this study, 10(16.66%) patients had an emergency laparotomy. The most frequent emergency event was a chocolate cyst (5 patients, 8.33%). This was followed by adnexal torsion (2 patients, 3.33%) and by torsion and rupture of ovarian tumours (2 patients, 3.33%) (Table-IV). Histopathological examination showed that serous cystadenoma was the most frequent tumor (41.7%), followed by mucinous cystadenoma (25%) and mature teratoma (13.3%). Among malignant tumors, serous cystadenocarcinoma was the most common (10%), while mucinous cystadenocarcinoma and dysgerminoma were less frequent (3.3% each). 78.3% of tumors were benign, while 21.7% were malignant in nature (Table-V). Correlation analysis revealed that symptoms alone had no significant association with USG findings (p>0.05), although cystic lesions commonly presented with abdominal lump (Table-VI). Agreement between ultrasound and laparotomy findings was strong (kappa=0.82, p<0.001), indicating high reliability of USG in characterizing ovarian masses (Table-VII). The diagnostic performance of ultrasound in differentiating benign from malignant tumors demonstrated 76.9% sensitivity, 95.7% specificity, PPV of 83.3%, and NPV of 93.8%, with overall diagnostic accuracy of 91.7% (Table-VIII). A significant association was found between patients' age and malignancy, as 80% of malignant tumors occurring in women >40 years (p=0.01) (Table-IX).

Table-I: Sociodemographic Characteristics of patients (N=60)

Characteristics	Frequency	Percentage
Age group (in years)		
≤20	8	13.33
21–30	10	16.67
31–40	18	30.00
41–50	12	20.00
51–60	8	13.33
61–70	4	6.67
Socioeconomic status		
Upper class	5	8.33
Middle class	30	50.00
Lower class	25	41.67

Table-II: Clinical presentation of the patients (N=60)

Clinical presentation	Frequency	Percentage
Symptoms		
Lump in the lower abdomen	45	75.0
Feeling of abdominal distension	16	26.7
Vague abdominal discomfort with pain	12	20.0
Sudden severe lower abdominal pain with nausea, vomiting	5	8.3
Loss of appetite, dyspepsia	30	50.0
Loss of body weight	30	50.0
Incidental diagnosis	30	50.0
Signs – Anaemia		
Mild	30	50.0
Moderate	25	41.7
Severe	5	8.3
Mass in the abdomen – Consistency		
Cystic	26	43.3
Solid	10	16.7
Mixed	7	11.7
Size of the mass		
8–10 cm	35	58.3
>10 cm	10	16.7
Mobility		
Mobile	30	50.0
Restricted	15	25.0
Surface		
Regular	35	58.3
Irregular	10	16.7
Other findings		
Tenderness	8	13.3
Ascites	5	8.3

Table-III: Laparotomy findings (N=60)

Laparotomy features	Frequency	Percentage
Laterality		
Unilateral	42	70.0
Rt sided	20	33.3
Lt sided	22	36.7
Bilateral neoplasm	9	15.0
Haemorrhagic peritoneal fluid	3	5.0
Consistency		
Solid neoplasm	15	25.0
Cystic	35	58.3
Partly solid partly cystic	10	16.7
Free peritoneal fluid	9	15.0
Peritoneal seedling	3	5.0
Size		
<8 cm in diameter	15	25.0
8–10 cm in diameter	35	58.3
>10 cm in diameter	10	16.7
Cut section		
Unilocular cystic	22	36.7
Multilocular cystic	9	15.0
Solid/Other	29	48.3
Fluid		
Serous	25	41.7
Mucoid	12	20.0
Haemorrhagic	4	6.7
Sebum + hair	5	8.3

Table-IV: Emergency surgical findings in patients with ovarian neoplasms (n=10)

Emergency Condition	Frequency	Percentage
Chocolate Cyst	5	8.33
Adnexal Torsion	2	3.33
Ovarian Tumor Torsion/Rupture	2	3.33
Appendiceal Involvement	1	1.67

Table-V: Histopathological findings (N=60)

Histopathological types	Frequency	Percentage
Serous cyst adenoma	25	41.67
Mucinous cyst adenoma	15	25.00
Mature teratoma	8	13.33
Ovarian fibroma	2	3.33
Serous cyst adenocarcinoma	4	6.67
Mucinous cyst adenocarcinoma	2	3.33
Papillary serous cyst adenoma	2	3.33
Dysgerminoma	2	3.33

Table-VI: Association between symptoms and USG mass type (N=60)

Symptoms	Cystic (n=35)	Solid (n=15)	Mixed (n=10)	X^2 value	p-value
Lump in abdomen	30	10	5		
Distension	8	5	3	4.25	0.119[NS]
Pain/ Discomfort	7	3	2		
Others	15	4	0		

Chi-square test was applied to reach p-value; NS=not significant.

Table-VII: Agreement between USG and laparotomy findings (N=60)

USG Findings	Laparotomy – Cystic	Laparotomy –Solid	Laparotomy –Mixed	Total
Cystic (n=35)	32	2	1	35
Solid (n=15)	1	13	1	15
Mixed (n=10)	2	0	8	10

Kappa value=0.82 → strong agreement; p<0.001.

Table-VIII: Diagnostic accuracy of USG in differentiating benign vs. malignant lesions (N=60)

Variable	Histopathology Benign	Histopathology Malignant	Total
USG Benign (Cystic/Simple)	45	3	48
USG Malignant (Solid/Complex)	2	10	12
Total	47	13	60

Sensitivity = 10/13 = 76.9%; Specificity = 45/47 = 95.7%; PPV = 10/12 = 83.3%; NPV = 45/48 = 93.8%; Diagnostic accuracy = 55/60 = 91.7%.

Table-IX: Association between age and histopathological types of tumors (N=60)

Age group (in years)	Benign (n=45)	Malignant (n=15)	X^2 value	p-value
≤40	25	3		
>40	20	12	6.72	0.01[S]

Chi-square test was applied to reach p-value; S=significant.

Discussion

In the present study, most of the patients were in 31-40 years age group, which is similar to recent studies from this region showing higher prevalence of ovarian tumors being in women of reproductive age, whereas they tend be more malignant premenopausal.[1,2] In the group which was performed for suspected malignant tumors, and 80% were women over age 40 and there was a significant association of malignancy in patients with higher mean age. This is consistent with the results of Parveen et al.,[3] and van Nagell et al.[4]

should be considered, which showed that the likelihood of malignant ovarian tumors in postmenopausal women is greater than other populations. In addition, we found socioeconomic gap among the cohort; 91.7% of our patients belonged to middle- or low-income families which is a key to existing disparity in health system that directly points its fingers towards easily reachable diagnosis for poor women. Clinical presentation was predominantly as abdominal lump (75%), weight loss and anorexia (50% each). Nonetheless, the lack of specificity in our symptoms led to them having no statistically significant value as diagnostic tools because the tumour type and situation were not associated by us on ultrasonography. This compares to relevant literature studies, where ovarian cancer has been termed the "silent killer" because of its nonspecific symptoms and late diagnosis.[5,6] Similar reports were addressed by Ahmed et al.[7] a study based in Dhaka, as most patients had abdominal distension, although it did not predict malignancy well. These findings emphasize that, although clinical examination remains central for the primary suspicion of SFN, symptomatic complaints alone are not enough to make the diagnosis. Rather, the early imaging continues to be crucial for subsequent treatment. Our findings validate the importance of ultrasonography, with close correlation to laparotomy results (kappa=0.82, p<0.001). This degree of agreement is comparable to those reported by Gupta et al.[8] and Shakya et al.,[9] who also showed the reliability of ultrasound in describing adnexal masses, specifically for distinguishing between cystic and solid lesions. The ability of ultrasound to differentiate between benign and malignant tumors was excellent in this study: the overall accuracy was 91.7%, the specificity was 95.7% and the sensitivity (76.9%). These figures are similar to what have been reported from other

studies, where the sensitivity found varied between 85% and 95%.[10-12] Our study demonstrated a high negative predictive value (93.8%) which means that ultrasound studies can particularly exclude malignancy potentially avoiding unnecessary radical interventions in benign cases. The pattern of benign lesion with the highest prevalence of serous cystadenoma and malignant with serous cystadenocarcinoma was similar to some other studies from South Asia.[13-15] The predominance of cystic lesions especially serous tumours is in agreement with the observations of Mondal et al.[16] highlighting regional convergences in tumor biology. Clinically, these findings underscore the critical need of ultrasound as a first-line imaging tool in resource constrained settings such as Bangladesh, where CT and MRI are often not available due to cost and lack of infrastructure. In addition, cocktailing presentation, ultrasonography, surgical findings and histopathology for optimal diagnostic pathway provides comprehensive management of patient care and economics.

There are several methodologic limitations in this study that need to be considered. Firstly, this was performed in a single-center hospital population and only 60 subjects were included over six months. Hence, it might be difficult to generalize the findings to many more people throughout Bangladesh as well as other areas. Secondly, the study was fundamentally based on ultrasound imaging for radiological evaluation, instead of advanced examinations (e.g., CT/MRI); hence, it might have been able to achieve more diagnostic accuracy, especially for complicated or borderline tumors. Thirdly, the follow-up was of such a brief duration that analysis of long-term outcomes including recurrence rate, survival and postoperative complications could not be performed. In addition, potential confounders

such as genetic susceptibility to disease, parity and lifestyle factors that may have an effect on ovarian tumor biology were not taken into consideration in the analysis. Finally, there may have been bias due to inter-observer variability in ultrasound interpretation and surgical reporting. These limitations underscore the importance of larger, multicenter and longitudinal studies to confirm and elaborate on our findings. However, validation of these prognostic findings and investigation on the recurrence or survival outcomes, demonstrated by larger and multicenter studies with long-term follow-up, are needed. In short, symptom assessment, imaging, surgery and pathology together represent a comprehensive approach toward ovarian neoplasia and enhancement of women's reproductive health.

Conclusion

This study illustrated that evaluation of clinical presentation, US findings, and operative exploration is essential in diagnosing and managing ovarian masses. In resource limited healthcare settings, the reinforcement of US and support (surgical skills and histopathological services) can add substantially to early detection, avoid undue surgical procedures and lead to stagerated management in malignant cases. These results also have public health relevance as ovarian neoplasms preferentially occur in women of middle– and low–socioeconomic status, highlighting the need for cost effective diagnostic programmes.

References

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018;68(6):394-424.

2. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71(3):209-49.

3. Parveen S, Begum R, Sultana H. Clinicopathological study of ovarian tumors in a tertiary care hospital of Bangladesh. Bangladesh J Obstet Gynaecol, 2016;31(1):29-34.

4. van Nagell JR Jr, DePriest PD, Reedy MB, Gallion HH, Ueland FR, Pavlik EJ, et al. The efficacy of transvaginal sonographic screening in asymptomatic women at risk for ovarian cancer. Gynecol Oncol. 2000;77(3):350-6.

5. Bankhead CR, Kehoe ST, Austoker J. Symptoms associated with diagnosis of ovarian cancer: a systematic review. BJOG. 2005;112(7):857-65.

6. Goff BA, Mandel L, Muntz HG, Melancon CH. Ovarian carcinoma diagnosis. Cancer. 2000;89(10):2068-75.

7. Ahmed T, Rahman MM, Akhter N. Clinical presentation and histopathological patterns of ovarian tumors in a tertiary hospital in Bangladesh. Bangladesh J Pathol. 2018;33(2):25-30.

8. Gupta N, Bisht D, Agarwal AK, Sharma VK. Retrospective and prospective study of ovarian tumours and tumour-like lesions. Indian J Pathol Microbiol. 2007;50(3):525-7.

9. Shakya G, Malla S, Shakya KN, Shrestha R. Ovarian tumors in childhood and adolescents – a clinicopathological study of 53 cases. J Pathol Nepal. 2010;1(2):100-3.

10. Valentin L. Pattern recognition of pelvic masses by gray-scale ultrasound imaging: the contribution of Doppler ultrasound. Ultrasound Obstet Gynecol. 1999;14(5):338-47.

11. Timmerman D, Bourne TH, Tailor A, Collins WP, Verrelst H, Vandenberghe K, et al. A comparison of methods for preoperative discrimination between malignant and benign adnexal masses: the development of a new logistic regression model. Am J Obstet Gynecol. 1999;181(1):57-65.

12. Kinkel K, Hricak H, Lu Y, Tsuda K, Filly RA. US characterization of ovarian masses: a meta-analysis. Radiology. 2000;217(3):803-11.

13. Pilli GS, Suneeta KP, Dhaded AV, Yenni VV. Ovarian tumours: a study of 282 cases. J Indian Med Assoc. 2002;100(7):420,423-4,447.

14. Gupta N, Yadav M, Gupta V, Chaudhary D, Patne SCU. Distribution of various histopathological types of ovarian tumors: a study of 212 cases from a tertiary care center of Eastern Uttar Pradesh. J Lab Physicians. 2019;11(1):75-81.

15. Shrestha A, Shrestha S, Shrestha R. Clinicopathological profile of ovarian tumors in Nepal. Nepal J Obstetrics Gynaecol. 2012;7(2):35-40.

16. Mondal SK, Banyopadhyay R, Nag DR, RoyChowdhury S, Mondal PK, Sinha SK. Histologic pattern, bilaterality and clinical evaluation of 957 ovarian neoplasms: a 10-year study in a tertiary hospital of eastern India. J Cancer Res Ther. 2011;7(4):433-7.