Research Article

Comparison of Preoperative Risk of Malignancy Index with Histopathological Findings in Patients with Ovarian Tumors

Dr. Bidisha Chakma[1], Prof. Dr. Tripti Rani Das[2], Dr. Shah Noor Sharmin[3], Dr. Jinat Fatema[4], Farah Noor[5], Dr. Sabiha Islam[6]*, Dr. Dipika Majumder[7], Dr. Tanzina Iveen Chowdhury[8]

Abstract

Background: Ovarian tumors are a significant health concern for women in Bangladesh, often presenting diagnostic challenges due to late-stage identification and limited access to specialized care. Implementing preoperative tools like the Risk of Malignancy Index (RMI) is critical in improving early detection and guiding clinical decision-making in resource-constrained settings.

Aim: The aim of this study was to evaluate the correlation between the preoperative RMI and histopathological findings in patients with ovarian tumors.

Materials and Methods: This hospital-based cross-sectional study, conducted from September 2022 to August 2023 at Bangladesh Medical University (BMU), included 102 female patients with ovarian tumors scheduled for surgery. Preoperative assessments involved ultrasound scoring, menopausal status determination, and serum CA-125 measurement, used to calculate the RMI. Histopathological examination served as the gold standard for diagnosis. Data were analyzed using SPSS-26, with Fisher's Exact Test and RMI calculations performed. Ethical approval and informed consent were obtained. A p-value of <0.002 was considered statistically significant. A purposive sampling technique was used to recruit participants based on predefined inclusion and exclusion criteria.

Results: A substantial proportion, specifically 40.2%, of these patients were classified as high-risk preoperatively based on their RMI scores, with 45.1% demonstrating elevated CA-125 levels exceeding 100 IU/ml. Notably, the analysis revealed a statistically significant association (p=0.002) between the type of ovarian tumor and a documented family history of ovarian or breast cancer.

Conclusion: The findings highlight that a significant proportion of patients, often within a younger age group, presented with advanced disease, emphasizing the importance of early detection strategies. The statistically significant association between tumor type and family history underscores the need for thorough familial risk assessment. While RMI can serve as a valuable tool.

Affiliation:

[1]Associate Professor, Department of Obstetrics & Gynecology, Bangladesh Medical University (BMU), Dhaka, Bangladesh.

[2]Professor, Department of Obstetrics & Gynecology, BMU. Dhaka, Bangladesh.

[3]Medical officer, Department of Obstetrics & Gynecology, BMU, Dhaka, Bangladesh.

[4]Assistant Professor, Department of Obstetrics & Gynecology, BMU, Dhaka, Bangladesh.

[5]Assistant Professor, Department of Obstetrics & Gynecology, BMU, Dhaka, Bangladesh.

[6]Associate Professor, Department of Obstetrics & Gynecology, BMU, Dhaka, Bangladesh.

[7]Medical Officer, Department of Obstetrics & Gynecology, Madaripur, Bangladesh.

[8]Assistant Professor, Department of Obstetrics & Gynecology, BMU, Dhaka, Bangladesh.

*Corresponding author:

Dr. Sabiha Islam, Associate Professor, Department of Obstetrics & Gynecology, BMU, Dhaka, Bangladesh.
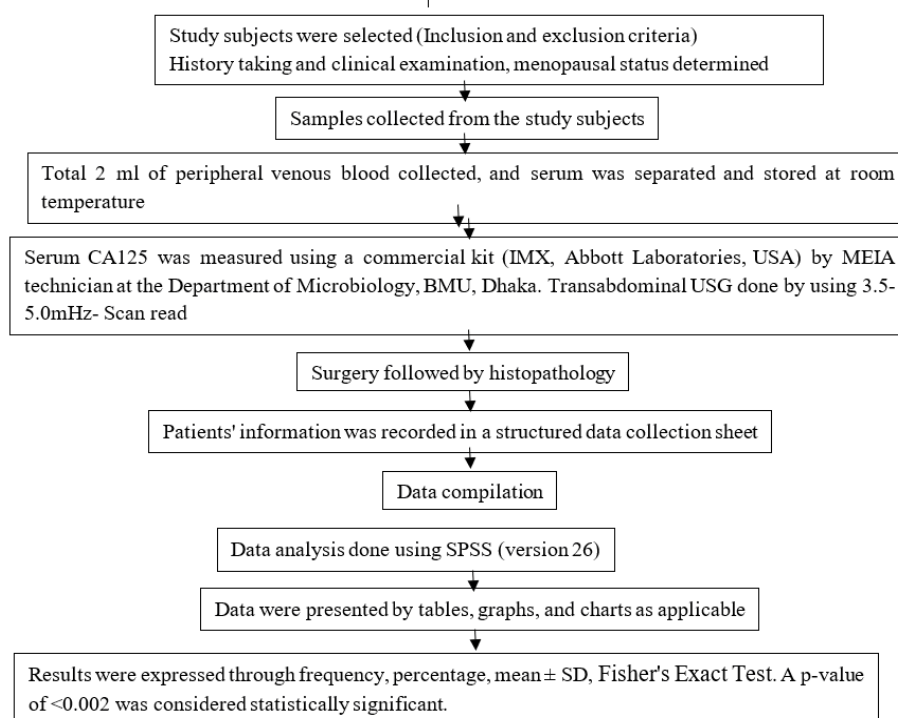
Introduction

Ovarian tumors, a heterogeneous group of neoplasms with varying malignancy potential, present a significant diagnostic and therapeutic challenge globally, particularly in resource-constrained settings like Bangladesh [1]. Accurate preoperative risk stratification is essential for optimal patient management, guiding surgical decisions and minimizing unnecessary interventions. The RMI, which integrates serum CA-125 levels, menopausal status, and ultrasound findings, has been widely employed to predict malignancy in ovarian masses [2, 3]. However, the predictive accuracy of RMI can vary across different populations and healthcare contexts, necessitating local validation studies [4, 5]. Recent advancements emphasize the integration of clinico-pathological features with molecular markers to enhance diagnostic precision, highlighting the need for context-specific risk assessment tools [6]. Furthermore, familial risk factors, especially the history of ovarian or breast cancer, significantly influence malignancy risk, underscoring the importance of detailed family history evaluation [7]. In Bangladesh, where access to advanced diagnostic modalities may be limited, and healthcare seeking behavior may be delayed, the RMI remains a potentially valuable tool for triaging patients and guiding surgical decisions. The prevalence of ovarian tumors in this region, coupled with the potential for delayed diagnoses due to socioeconomic factors, cultural beliefs, and healthcare access disparities, further emphasizes the need for efficient and cost-effective diagnostic strategies [8, 9]. Given the prevalence of ovarian tumors and the imperative for efficient diagnostic strategies within the Bangladeshi healthcare landscape, this study aims to evaluate the correlation between preoperative RMI and histopathological findings in a cohort of Bangladeshi patients, thereby contributing to improved clinical decision-making within the local healthcare context.

Metairies and Methods

A hospital-based cross-sectional study was conducted at the Department of Gynecology & Obstetrics, BMU, Dhaka, between September 2022 and August 2023. The study included 102 female patients diagnosed with ovarian tumors who were scheduled for surgical exploration. Patients with histopathological confirmed non-adnexal masses were excluded. A purposive sampling technique was employed to select participants based on predefined inclusion and exclusion criteria. Preoperative evaluation involved a structured clinical assessment, transabdominal ultrasound, and serum CA125 measurement. The ultrasound score (U) was assigned based on the presence of multiloculated cysts, solid areas, bilaterality, ascites, or intra-abdominal metastases, with a total score of 0 for no abnormality, 1 for the presence of one feature, and 3 for the presence of two or more features. Menopausal status (M) was assigned a score of 1 for premenopausal and 3 for postmenopausal patients. Serum CA125 levels were measured using the IMX (Abbott Laboratories, USA) commercial kit, following standard laboratory protocols. RMI was calculated using the established formula RMI = U × M × CA125, with a cut-off value of 200 considered indicative of malignancy.

Data processing plan:

Study subjects were selected (Inclusion and exclusion criteria)
History taking and clinical examination, menopausal status determined

↓

Samples collected from the study subjects

↓

Total 2 ml of peripheral venous blood collected, and serum was separated and stored at room temperature

↓

Serum CA125 was measured using a commercial kit (IMX, Abbott Laboratories, USA) by MEIA technician at the Department of Microbiology, BMU, Dhaka. Transabdominal USG done by using 3.5-5.0mHz- Scan read

↓

Surgery followed by histopathology

↓

Patients' information was recorded in a structured data collection sheet

↓

Data compilation

↓

Data analysis done using SPSS (version 26)

↓

Data were presented by tables, graphs, and charts as applicable

↓

Results were expressed through frequency, percentage, mean ± SD, Fisher's Exact Test. A p-value of <0.002 was considered statistically significant.

Citation: Dr. Bidisha Chakma, Prof. Dr. Tripti Rani Das, Dr. Shah Noor Sharmin, Dr. Jinat Fatema, Farah Noor, Dr. Sabiha Islam, Dr. Dipika Majumder, Dr. Tanzina Iveen Chowdhury. Comparison of Preoperative Risk of Malignancy Index with Histopathological Findings in Patients with Ovarian Tumors. Journal of Surgery and Research. 8 (2025): 292-297.

Following surgical resection, specimens were preserved in formalin and sent for histopathological examination, which served as the diagnostic gold standard. Data collection was conducted using a structured questionnaire, which recorded demographic, clinical, and laboratory parameters. Ethical approval was obtained from the Institutional Review Board of BMU, and permission was secured from the relevant hospital departments. Written informed consent was obtained from all participants, ensuring voluntary participation without coercion. The purpose, procedures, and potential risks of the study were explained in detail, and participants were assured of confidentiality. A unique identification number was assigned to each patient for sample collection, transport, and reporting to maintain anonymity. Safety protocols were strictly followed during blood collection, and privacy was ensured during physical examinations and interviews. No experimental drugs or placebos were used.

Data analysis was performed using SPSS-26. Categorical variables were expressed as frequencies and percentages, while continuous variables were analyzed using Fisher's Exact Test. RMI were calculated to assess its diagnostic performance. A p-value of <0.002 was considered statistically significant.

Results

The socio-demographic distribution of the study population revealed a predominantly young cohort, with most patients 55.9% aged between 15 and 30 years, and a mean age of 29.77 ± 8.106 years. Symptom presentation indicated that a significant portion of patients 66.7% experienced symptoms for 1–3 months prior to diagnosis, with abdominal pain being the most frequently reported symptom. Tumor characteristics showed serous carcinoma as the most common histological finding 28.4%, and intraoperative findings revealed that unilateral tumor presentation was more prevalent. Ultrasound findings commonly included bilateral lesions and solid areas. Biochemical analysis demonstrated that 45.1% of patients had elevated serum CA-125 levels above 100 IU/ml and based on the RMI, a substantial proportion 40.2% were classified as high risk, indicating that nearly two-thirds of the patients fell into moderate to high-risk categories preoperatively. Postoperative complications were primarily wound infections 63.7% and hemorrhage 36.3%. Among patients who underwent total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH-BSO), 69% had the procedure once, while 31% underwent it twice. A statistically significant association was observed between the type of tumor on histopathology and a family history of ovarian or breast cancer (p = 0.002). Surgical interventions predominantly involved cystectomy 68.6%, with oophorectomy performed in 31.4% of cases.

Table 1: Distribution of respondents by socio-demographic factors

Age category	Frequency	Percent
15-30	57	55.9
31 & above	45	44.1
Mean±SD	29.77±8.106	
Menopausal status		
Premenopausal	52	51
Postmenopausal	50	49
Total	**102**	**100**

Table 1 shows the age distribution revealed that most patients 55.9% were within the 15–30-year age group, while the remaining 44.1% were aged 31 years or older. The overall mean age was 29.77 years with a standard deviation of ±8.106 years, indicating a relatively young study population with a moderate spread in age.

Table 2: Distribution of the respondents by symptoms related factors

Duration of symptoms	Frequency	Percent
<1 month	19	18.6
1–3 months	68	66.7
>3 months	15	14.7
Presenting symptoms		
Abdominal pain	28	27.5
Abdominal distension	17	16.7
Menstrual irregularities	18	17.6
Weight loss	9	8.8
Other	30	29.4
Total	**102**	**100**

Table 2 demonstrate most of patients 66.7% reported experiencing symptoms for 1–3 months prior to diagnosis, while 18.6% had symptoms for less than one month and 14.7% for more than three months. Abdominal pain was the most frequently reported symptom 27.5%, followed by other non-specific symptoms 29.4%, menstrual irregularities 17.6%, abdominal distension 16.7%, and weight loss 8.8%.

Table 3 revealed that serous carcinoma was the most common tumor type 28.4%, followed by mucinous cystadenoma 20.6% and endometriotic cysts 16.7%. Benign tumors such as serous cystadenoma accounted for 12.7%, while granulosa cell tumors and mucinous carcinoma were less frequent. Intraoperative findings showed that most tumors were unilateral 57.8%, with 30.4% presenting bilaterally and 11.8% associated with ascites. Ultrasound features commonly included bilateral lesions 26.5%, solid areas 22.5%, and multiloculated cysts 18.6%, while ascites were noted in 2.9% of cases.

Table 4 explained that 45.1% of patients had elevated

serum CA-125 levels above 100 IU/ml, while 32.4% had levels between 35–100 IU/ml, and 22.5% had levels below 35 IU/ml. Based on the calculated RMI, 40.2% of patients were classified as high risk >250, 23.5% as intermediate risk 200–250, and 36.3% as low risk <200, indicating that nearly two-thirds of the patients fell into moderate to high-risk categories preoperatively.

Table 3: Distribution of the respondents by tumor related factors

| Type of tumor on histopathology	Frequency	Percent
Serous Cystadenoma	13	12.7
Mucinous Cystadenoma	21	20.6
Endonetriotic Cyst	17	16.7
Granulosa cell Tumor	2	2
Serous Cardinoma	29	28.4
Mucinous carcinoma	8	7.8
Other	12	11.8
Tumor characteristics on surgery		
Unilateral	59	57.8
Bilateral	31	30.4
Presence of ascitis	12	11.8
Ultrasound findings		
Multiloculated cyst	19	18.6
Solid areas	23	22.5
Bilateral lesions	27	26.5
Ascitis	3	2.9
Total	**102**	**100**

Table 4: Distribution of the respondents by biochemical test related factors.

Serum CA-125 level (IU/ml)	Frequency	Percent
<35	23	22.5
35–100	33	32.4
>100	46	45.1
Calculated RMI score		
<200 (Low risk)	37	36.3
200–250 (Intermediate risk)	24	23.5
>250 (High risk)	41	40.2
Total	**102**	**100**

Figure 1 confirms among the postoperative complications, wound infection was the most common 63.7%, followed by hemorrhage, which occurred in 36.3% of cases.
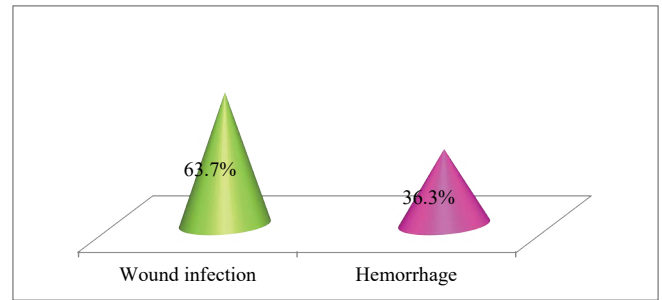
Figure 1: Postoperative complications
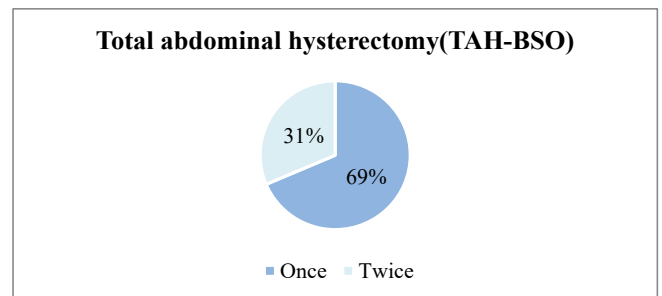
Figure 2: Total abdominal hysterectomy

Figure 2 indicates among patients who underwent total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH-BSO), 69% had the procedure once, while 31% underwent it twice.

Table 5 shows that there is a significant association between type of tumor on histopathology and family history of ovarian or breast cancer (p=.002).

Table 5: Association between type of tumor on histopathology and family history of ovarian or breast cancer.

Type of tumor on histopathology	Family history of ovarian or breast cancer		p-Value
	Yes	No	
Serous Cystadenoma	4	9	
Mucinous Cystadenoma	0	21	
Endonetriotic Cyst	0	17	
Granulosa cell Tumor	0	2	.002f
Serous Cardinoma	0	29	
Mucinous carcinoma	0	8	
Other	0	12	
Total	**4**	**98**	**102**

Figure 3 shows most patients 68.6% underwent cystectomy, while 31.4% required oophorectomy as part of their surgical management.
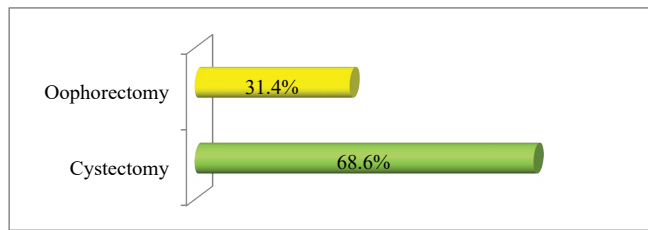
Figure 3: Surgical intervention.

Discussion

The findings of this study highlight the utility of the Risk of Malignancy Index (RMI) in differentiating between benign and malignant ovarian tumors in a resource-constrained setting such as Bangladesh. The high proportion of young patients in the study (mean age: 29.77 years) reflects the socio-demographic characteristics of the study population and aligns with findings from Ahmed et al. (2021) [1], who reported that gynecological cancers in Bangladesh predominantly affect younger women compared to global statistics. The statistically significant association between tumor type and family history of ovarian or breast cancer highlights the importance of incorporating familial risk into the preoperative evaluation. This finding reinforces the need for detailed family history taking in clinical practice, particularly in populations where genetic predisposition may play a significant role. Studies have consistently demonstrated the association between familial history and ovarian cancer risk [16]. The prevalence of symptoms such as abdominal pain and nonspecific complaints observed in this study is consistent with previous studies emphasizing the nonspecific nature of ovarian tumor presentations, which can lead to delays in diagnosis [9].

Histopathological findings in this study identified serous carcinoma as the most common tumor type, followed by mucinous cystadenoma, mirroring global data on ovarian cancer types [3]. Furthermore, the observation that benign tumors such as serous cystadenoma constituted a substantial proportion aligns with studies highlighting the predominance of benign ovarian neoplasms in younger populations [4]. Furthermore, the observation that benign tumors such as serous cystadenoma constituted a substantial proportion aligns with studies highlighting the predominance of benign ovarian neoplasms in younger populations [4]. Additionally, the study underscores the significant role of imaging features such as solid areas and multiloculated cysts in characterizing tumor malignancy risk, corroborating findings on the diagnostic importance of transvaginal ultrasonography [10]. The biochemical analysis in this study revealed that a significant number of patients exhibited elevated CA-125 levels, with 45.1% surpassing 100 IU/ml. These results agree with Bristow et al. (2004) [2]. who demonstrated the sensitivity of CA-125

in detecting ovarian malignancies, especially when combined with imaging modalities. However, it is important to note that CA-125 levels can be elevated in benign conditions, which highlights the necessity of using multimodal scoring systems like the RMI for accurate diagnosis [11]. The proportion of patients categorized as high-risk (40.2%) using the RMI further supports its robustness as a diagnostic tool in preoperative settings.

A statistically significant association (p = 0.002) between family history of ovarian or breast cancer and histopathological tumor types was identified in this study [6, 7], which emphasizes the importance of genetic predisposition, particularly BRCA1 and BRCA2 mutations, in the development of ovarian cancer. These findings reinforce the need for genetic counseling and risk assessment in patients with a family history of gynecological malignancies. Postoperative complications such as wound infections 63.7% and hemorrhage 36.3% observed in this study align with the findings of Islam et al. (2020) [8], who reported similar challenges in gynecological surgeries in Bangladesh. These findings highlight the importance of perioperative care to minimize complications. The predominance of surgical interventions such as cystectomy 68.6% and oophorectomy 31.4% further aligns with established surgical management protocols for ovarian tumors [12]. The findings of this study are consistent with previous research globally and regionally, reaffirming the utility of the RMI as a reliable, cost-effective tool for risk stratification in preoperative settings. However, variations in imaging interpretation and access to advanced diagnostic tools remain a challenge [13,14]. The application of newer indices such as RMI3 and RMI4, which incorporate tumor size and additional ultrasound features, could potentially enhance diagnostic accuracy [15]. The potential impact of socioeconomic factors on access to care and disease presentation in this population should also be considered [17]. Future studies focusing on integrating genetic testing and advanced imaging modalities could further refine the risk assessment process.

Conclusion

The study highlights the Risk of Malignancy Index as a reliable tool for preoperative evaluation of ovarian tumors, effectively distinguishing between benign and malignant masses in a resource-limited context like Bangladesh. The significant correlation between RMI scores and histopathological findings validates its role in guiding timely surgical interventions and optimizing patient care. Incorporating advanced diagnostic methods and genetic screening with the RMI could further enhance its precision, ultimately improving early detection, treatment outcomes, and reducing mortality associated with ovarian malignancies.

Declaration of Interest

The authors declare no competing financial interests.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

References

1. Ahmed S, Mahmud G, Rahman M. Burden of gynecological cancers in Bangladesh: a hospital-based study. Asian Pacific Journal of Cancer Prevention 22 (2021): 229-234. Available from: https://apjcp.com/ojs/index.php/APJCP/article/view/3201

2. Bristow RE, Tomacruz RS, Armstrong DK, et al. Serum CA 125 and surgical evaluation in the management of adnexal masses. Obstetrics & Gynecology 103 (2004): 484-490.

3. Jacobs I, Oram D. Serum CA 125 in the management of ovarian cancer. British Journal of Obstetrics and Gynaecology 96 (1989): 1263-1268.

4. Moore RG, Miller MC, Steinhoff M, Lambert-Messerlian G, et al. Comparison of the risk of malignancy index (RMI) with the risk of ovarian malignancy algorithm (ROMA) in patients referred for an adnexal mass. Gynecologic Oncology 119 (2010): 242-246.

5. Van Gorp T, Veldman J, Van Calster B, et al. Comparison of the risk of malignancy index, risk of ovarian malignancy algorithm and the ADNEX model to predict malignancy in adnexal masses. BJOG: An International Journal of Obstetrics & Gynaecology 118 (2011): 831-841.

6. Bowtell DD, Bohm S, Ahmed AA, et al. Rethinking ovarian cancer II: recommendations for improving outcomes. Nature Reviews Cancer 15 (2015): 256-266.

7. National Comprehensive Cancer Network (NCCN). Ovarian Cancer (including fallopian tube cancer and primary peritoneal cancer).1 NCCN Clinical Practice Guidelines in Oncology. 2 (2023). Available from: https://www.nccn.org/guidelines/guidelines-detail?category=1&id=6

8. Islam, M. T., Rahman, M. M., Akter, S., & Jahan, I. Gynecological malignancies in a tertiary care hospital of Bangladesh: A retrospective study. Bangladesh Journal of Medical Science 19 (2020): 447-452.

9. Akhter, S., Sultana, S., & Rahman, M. S. Socio-demographic factors and health seeking behavior among women with gynecological problems in a rural area of Bangladesh. Journal of Health, Population and Nutrition 37 (2018): 1-10.

10. Clarke-Pearson DL. Screening for ovarian cancer. New England Journal of Medicine 361 (2009): 170-177.

11. Van Gorp T, Veldman J, Van Calster B, et al. Comparison of the risk of malignancy index, risk of ovarian malignancy algorithm and the ADNEX model to predict malignancy in adnexal masses. BJOG: An International Journal of Obstetrics & Gynaecology 118 (2011): 831-841.

12. Engelen MJ, Vergote I, Heyns W, et al. Role of cytoreductive surgery in ovarian cancer: survival improvement through maximal cytoreduction. Gynecologic Oncology 103 (2006): 1162-1170.

13. Mel J, Crayford T, et al. Variation in ultrasound interpretation for ovarian masses: Impact on diagnostic accuracy. Ultrasound Obstet Gynecol 18 (2001): 1-8.

14. Hebbar S, Mosdoen P. Advanced imaging techniques in ovarian cancer staging. J Obstet Gynecol India 65 (2015): 87-93.

15. Yamamoto Y, Yamada R, et al. Development of RMI4 for the diagnosis of ovarian malignancy. Gynecologic Oncology 112 (2009): 533-539.

16. Permuth-Wey, J., & Sellers, T. A. Epidemiology of ovarian cancer. Methods in molecular biology (Clifton, N.J.), 472 (2009): 413-437.

17. Kamal, S. M. M., & Hoque, M. Z. Socioeconomic inequalities in gynecological cancer care seeking in Bangladesh: a cross-sectional study. BMC women's health 18 (2018): 1-10.