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Comparison of Platelet Distribution Width (PDW) between Benign and Malignant Endometrial Disease

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Abstract

Background: *Endometrial carcinoma (EC) is the sixth most common cancer in women, primarily affecting postmenopausal women. Differentiating benign from malignant endometrial lesions remains challenging, and the purpose of this study was to compare Platelet Distribution Width (PDW) levels between patients with benign and malignant endometrial diseases.*

Aim of the Study: *The aim of this study was to compare Platelet Distribution Width (PDW) between patients with benign and malignant endometrial disease*

Methods: *This cross-sectional analytic study was conducted at the Department of Gynecological Oncology, BSMMU, Dhaka, from July 2022 to July 2023. It included 183 women: 61 with endometrial carcinoma and 122 with benign endometrial disease. Blood samples were collected and analyzed, and comprehensive clinical histories were documented. Data were analyzed using SPSS and MedCalc software.*

Result: *The study found a significantly lower PDW in endometrial cancer cases (11.33 ± 1.78) compared to controls (14.39 ± 4.62) ($p < 0.001$). PDW showed a strong negative correlation with age and histological grade and was a significant predictor of endometrial cancer (OR = 1.68, $p = 0.001$). The ROC analysis for PDW had an AUC of 0.789 ($p < 0.001$), and a PDW cutoff value of 13.50 provided the highest specificity (97%) and accuracy (61%), with 96.7% of cancer cases having PDW <13.50 compared to 55.7% of controls ($p < 0.001$).*

Conclusion: *PDW is a valuable biomarker for distinguishing between benign and malignant endometrial diseases, showing significant correlations with age, histological grade, and strong predictive capability in endometrial cancer.*

Keywords: *Platelet Distribution Width (PDW), Benign Endometrial Disease, Malignant Endometrial Disease, Inflammatory Biomarkers, Endometrial Carcinoma.*

1. INTRODUCTION

Endometrial carcinoma (EC) is the sixth most prevalent cancer among females worldwide, ranking as the fourth most common gynecological malignancy in developed countries and the seventh in developing nations[1,2] It is the leading gynecological malignancy in developed regions, predominantly affecting postmenopausal women.[3] Endometrial polyps, a common

benign condition, are more frequently observed in postmenopausal women (11.8%) compared to premenopausal women (5.8%).[4] Although the risk of malignant transformation in polyps is relatively low, it increases substantially after menopause, with malignancy confined to polyps reported in 0.8%–8% of cases. Importantly, 10%–34% of endometrial carcinomas in postmenopausal women are associated with endometrial polyps, emphasizing the critical need for timely diagnosis and appropriate management.[5,6]

Differentiating between benign and malignant endometrial lesions remains a challenging aspect of clinical practice. Conventional diagnostic methods, such as endometrial biopsy, are prone to false-negative results due to the limitations of tissue sampling.[7,8] Imaging techniques like sonography, though commonly used, often produce nonspecific findings such as endometrial thickening and heterogeneity, with considerable diagnostic overlap between benign and malignant conditions.[9,10] While MRI offers higher diagnostic accuracy owing to its superior soft tissue contrast, its high cost, lengthy procedure time, and limited patient acceptance restrict its routine use.[11] These challenges highlight the need for non-invasive, affordable, and reliable diagnostic tools, such as hematological biomarkers, to improve the differentiation of benign and malignant endometrial lesions.

Platelet indices (PIs), including platelet count, mean platelet volume (MPV), and platelet distribution width (PDW), provide insight into platelet function and production dynamics. PDW, which reflects the variability in platelet size (anisocytosis), has been linked to various inflammatory and malignant conditions.[12] Changes in platelet parameters like MPV and PDW are often observed in response to infections, malignancies, cardiovascular diseases, and autoimmune disorders, underscoring their potential utility as biomarkers.[13] While the relationship between inflammation and endometrial cancer (EC) has been explored in several studies, limited research has specifically focused on the diagnostic value of systemic inflammatory markers, including PDW, in endometrial and other cancers.

Despite increasing interest in the diagnostic potential of inflammatory markers, there is limited evidence on the role of platelet distribution width (PDW) in differentiating benign from malignant endometrial conditions. Recent research has indicated that certain serum markers may help distinguish endometrial carcinoma (EC) from benign endometrial disorders, though the results remain inconclusive.[15,16] Additionally, age-related changes in the hematopoietic system have been recognized as a potential confounding factor, highlighting the need for further investigation.[17]The purpose of this study was to compare Platelet Distribution Width (PDW) between patients with benign and malignant endometrial disease.

2. Objective

The aim of this study was to compare Platelet Distribution Width (PDW) between patients with benign and malignant endometrial disease.

3. Methodology and Materials

This cross-sectional analytic study was conducted at the Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from July 2022 to July 2023. A total of 183 women, including 61 with histopathologically confirmed endometrial carcinoma (FIGO stage I to IV) and 122 with histopathologically confirmed benign endometrial disease, who met the inclusion and exclusion criteria, were purposively selected for this study.

Inclusion Criteria:

Group 1:

Histopathologically confirmed endometrial cancer

FIGO stage I-IV disease

Patients who consented to the procedure

Group 2:

Histopathologically confirmed benign endometrial disease

Exclusion Criteria:

- Patients with other primary cancers with or without metastasis
- Any known hematological or inflammatory diseases
- Patients with a history of recombinant granulocyte colony-stimulating factor use
- Patients with prior radiotherapy or

chemotherapy

- Patients with local or systemic infections
- Patients taking corticosteroids
- Patients who refused participation
- Serious concomitant medical illnesses
- Patients with double primaries

Informed consent was obtained from all participants, ensuring confidentiality, voluntary participation, and the right to withdraw at any time. Participants were divided into two groups based on histopathological reports: Group 1 (endometrial carcinoma) and Group 2 (benign endometrial disease), with all presenting with abnormal uterine bleeding. Venous blood samples (2 ml) were collected 24 to 72 hours before laparotomy and analyzed at the Hematology Department using an automated analyzer (Model no XN-2000). Detailed histories, clinical examinations, and laboratory tests, including CBC, PDW, MPV, RDW, and histopathology reports, were collected. Data from BSMMU inpatient and outpatient departments were cleaned, coded, and analyzed using SPSS version 22.0 for descriptive and inferential statistics, while MedCalc software was used for ROC curve analysis. Ethical approval was obtained from the IRB of BSMMU, with strict confidentiality maintained through special ID numbers and proper privacy during data collection and examinations.

4. RESULT

Table1. *Distribution of the participants according to PDW*

PDW	Cases (61)	Control (122)	P value
Mean±SD	11.33±1.78	14.39±4.62	[c]0.001[s]
Mean±SD	13.37±4.16		
Median (min-max)	12 (2-53)		

The Platelet Distribution Width (PDW) showed a statistically significant difference between cases and controls ($p < 0.001$). The mean ± SD of PDW in cases (endometrial cancer) was 11.33 ± 1.78, with a median (min-max) of 12 (2–53), whereas in controls, it was 14.39 ± 4.62. These findings highlight that patients with endometrial cancer tend to have lower PDW values compared to controls, suggesting a potential association between altered platelet distribution and malignancy

Table2. *Correlation of PDW with Clinicopathological Characteristics*

Variables	PDW	P value
Age	-0.357	[d]0.001*[s]
FIGO stage	-0.202	[d]0.122[ns]
Histological grade	-0.284	[d]0.028*[s]

PDW exhibited a strong negative correlation with age ($r = -0.357$, $p = 0.001$), histological grade ($r = -0.284$, $p = 0.028$), and FIGO stage ($r = -0.202$, $p = 0.122$). While the correlation with FIGO stage was not statistically significant ($p = 0.122$), both age and histological grade showed significant negative correlations with PDW. These results suggest that as the histological grade and FIGO stage of endometrial cancer increase, PDW tends to decrease significantly, indicating its potential role as a biomarker for disease progression

Table3. *Logistic Regression of FIGO Staging in Case Group*

Variables	Univariate regression (OR)	P value	Variables
PDW	1.68 (1.37-2.07)	[e]0.001[s]	PDW
Histological grade	1.0	[e]0.001[s]	Histological grade
Age	1.5 (1.15-2.08)	[e]0.004[s]	Age

In the univariate regression analysis, PDW was found to be a significant predictor of endometrial cancer, with an odds ratio (OR) of 1.68 (95% CI: 1.37–2.07, $p = 0.001$). Both histological grade (OR = 1.0, $p < 0.001$) and age (OR = 1.5, 95% CI: 1.15–2.08, $p = 0.004$) were also significant predictors. These findings suggest that PDW, along with histological grade and age, may serve as

important factors in assessing the risk of endometrial cancer.

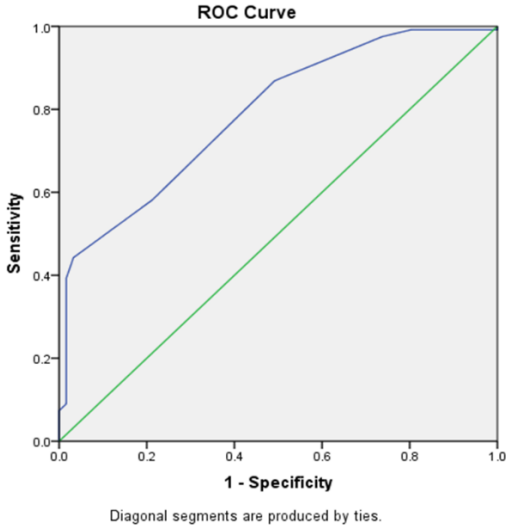

Figure1. *ROC for PDW*

The ROC analysis of PDW for predicting endometrial carcinoma revealed an area under the curve (AUC) of 0.789 (95% CI: 0.722–0.856), which was statistically significant ($p < 0.001$).

Table4. *Determination of Cut-off Value Using Youden Index*

Cutoff value	Sensitivity	Specificity	PPV	NPV	Accuracy	Youden index (j=sen+spe-1)
12.5	0.582	0.787				0.369
13.5	0.443	0.967	0.46	0.96	0.61	0.41
14.5	0.393	0.984				0.377

The analysis of PDW cutoff values revealed that a cutoff of 13.50 demonstrated the highest Youden index (0.410), with sensitivity of 44%, specificity of 97%, positive predictive value (PPV) of 46%, negative predictive value (NPV) of 96%, and an accuracy of 61%. This suggests that a PDW threshold of 13.50 is the most effective for distinguishing between endometrial carcinoma and controls, with a high specificity and NPV

Table5. *Distribution of Participants According to Derived Cut-off Value*

PDW	Cases (61)	Control (122)	P value
<13.50	59 (96.7%)	68 (55.7%)	[a]0.001[s]
≥13.50	2 (3.3%)	54 (44.3%)	

This table shows the distribution of the total sample according to the derived PDW cutoff value of 13.50. A significant difference between the case and control groups is observed for PDW ($p = 0.001$), with a higher percentage of cases (96.7%) having PDW <13.50 compared to the controls (55.7%).

5.DISCUSSION

Endometrial carcinoma (EC) is a significant gynecological malignancy with a rising incidence, particularly in postmenopausal women, underlining the importance of early detection and effective management. Despite advancements in diagnostic techniques, differentiating between benign and malignant endometrial conditions remains challenging. Platelet Distribution Width (PDW), a marker reflecting platelet size variability, has shown potential as an indicator of malignancy in various cancers, including EC. This cross-sectional study aimed to compare PDW levels between patients with benign and malignant endometrial disease at Bangabandhu Sheikh Mujib Medical University, Dhaka. The findings suggest a significant association between lower PDW values and endometrial carcinoma, highlighting its potential as a diagnostic biomarker for distinguishing benign from malignant endometrial conditions.

In this study, the mean MPV of our patients was significantly higher (10.46 ± 1.26) than in the control group (9.96 ± 1.25). However, the mean PDW was significantly lower in our case group (11.33 ± 1.78) compared to the control group (14.39 ± 4.62). Another study that analyzed PDW supports our findings. The highest PDW ($p = 0.002$) was found in the endometrial cancer

group, while the lowest levels were observed in the control group[18].

Our study showed a unique correlation. PDW had a strong negative correlation with age, FIGO staging, and histological grade, indicating that as histological grade and FIGO stage increase, PDW tends to decrease significantly. In contrast, another study found a positive correlation between FIGO staging and PDW.[19]

Our study revealed that PDW, histological type, and age are strong influencers of endometrial carcinoma. Dobrzycka et al.[20] observed a negative correlation between ADC values and both FIGO staging and tumor grade, further support the idea that specific hematological and clinical parameters, such as PDW and age, play crucial roles in predicting and understanding endometrial carcinoma progression and prognosis. These similarities underscore the importance of PDW, histological type, and age as significant factors in the diagnosis and prognosis of endometrial carcinoma.

ROC analysis of PDW to predict endometrial carcinoma revealed an AUC value of 0.789 (95% CI 0.722–0.856), which was statistically significant ($P < 0.001$). A cut-off value of 13.50 showed the highest Youden index (0.410) with sensitivity of 44%, specificity of 97%, PPV of 46%, NPV of 96%, and an accuracy of 61%.

7. Limitations of the Study

This study had some limitations:

- The study was conducted at a single center, which may limit the diversity and variation within the study population, affecting the external validity of the results.
- The sample size was small.
- The study period was short.
- There were disparities among the literatures reviewed.

6. Conclusion

The aim of this study was to compare Platelet Distribution Width (PDW) between patients with benign endometrial disease and those with malignant endometrial disease. The results indicated that PDW was significantly lower in endometrial cancer cases compared to controls. PDW showed strong negative correlations with age and histological grade. Univariate regression analysis confirmed PDW as a significant predictor of endometrial cancer. The ROC analysis highlighted PDW's potential as a predictive marker, with a specific cutoff value demonstrating high specificity and accuracy. These findings suggest that PDW may serve as a valuable biomarker for distinguishing between benign and malignant endometrial diseases.

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