# **A Novel Non-Invasive Approach for Early Breast Cancer Diagnosis Using Menstrual Blood Biomarker Tumor Necrosis Factor-Alpha (TNF-α)**

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**ABSTRACT-------Background:** Breast cancer remains a significant health concern as it stands as the second most common cancer among women in the United States. The existing diagnostic process for breast cancer is often time-consuming and inefficient. Screening methods typically initiate with a self-examination for lumps, or mammograms are not consistently effective. **Importance:** Breast cancer cells undergo proliferation while awaiting diagnosis. Timely detection significantly enhances breast cancer prognosis. This research investigates the viability of utilizing menstrual blood as a non-invasive and easily accessible sample for early breast cancer risk diagnosis. **Purpose:** The primary aim is to establish the feasibility and effectiveness of utilizing TNF-alpha in menstrual blood as a diagnostic tool for distinguishing malignant from benign breast conditions. This tool holds significant potential for women worldwide, particularly in regions lacking established diagnostic procedures or advanced diagnostic tools. It could serve as a seamless and comprehensive means to prompt patients to consult a doctor for further evaluation. **Methods:** Menstrual blood samples are collected, and TNF-alpha levels will be measured using an Enzyme-Linked Immunosorbent Assay. An EMT cell line will be subjected to TNF-alpha exposure to assess the influence in cell morphology, cell viability, and Population Doubling Time (PDT). **Conclusion:** Preliminary findings indicate a promising association between TNF-alpha levels in menstrual blood, demonstrating the potential of this novel approach for early breast cancer diagnosis. The utilization of a non-invasive sample source, coupled with the specificity of TNF-alpha, opens avenues for a seamless diagnostic method. Further research and validation are warranted to refine and establish the clinical utility of this approach. This research contributes to the ongoing efforts in enhancing breast cancer diagnostics, offering a promising avenue for early intervention and improved patient outcomes.