Section A -Research paper

Prognostic Nutritional Index with Ovarian Cancer

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Abstract:

Background: Ovarian Cancer is the second most common gynecological malignancy and cancer related death in women. Most of the patient with ovarian cancer presented in advanced stage because screening test have low predictive value. The Prognostic Nutritional Index(PNI) was developed in 1984 and used as risk assessment of post-surgical complication and it has recently attracted attention as an indicator of poor prognosis in patient various solid cancer- its calculated using the following method: 10×serum albumin(gm/dl) + 0.005×total lymphocyte count(per mmɜ in peripheral blood, it can reflect both Nutritional and Immunologic status of patients with cancer. Prognostic Nutritional Index recently it has been reported to be useful an independent prognostic factor for survival in different malignant carcinoma. Its reflecting preoperative malnutrition, is useful for predicting the incidence of post-operative complication. Patient with Low prognostic nutritional index has low prognostic index and high prognostic nutritional index has high prognostic index.

Keywords; prognostic Nutritional Index, Ovarian Cancer

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INTRODUCTION:

Ovarian cancer (OC) is the second most common gynecological malignancy and the fifth leading cause of cancer related death in women in the United States. mainly due to the late-stage diagnosis of this cancer **(Asangba et al.,2023).**

The existing screening tests have a low predictive value contributing further to this misery. Detailed gynecological evaluation along with transvaginal ultrasound and

laboratory marker like cancer antigen-125 (CA-125) assay are the key early detection strategies which have shown no significant beneficial effect in the morbidity or mortality of this cancer **(Arora et al., 2023).**

According to the American Cancer Society's annual estimates, approximately 19 710 new diagnoses and 13 270 deaths due to ovarian cancer are predicted, According to the Egyptian National Population-Based Registry Program 2008–2011, ovarian cancer accounts for 4.12% of the population, with a crude rate of 4.6. The incidence of ovarian cancer is expected to rise steadily from 2288 in 2013 to 5957 in 2050, representing a 260% increase. Upper Egypt (6.1%) had the highest incidence, 6.1%. Lower rates were found in middle and lower Egypt (3.8% and 3.9%, respectively) **(Talaat et al., 2022).**

According to the epidemiological studies, the known risk factors for ovarian cancer include higher age, genetic susceptibility, infertility treatments, and family history. Pregnancy, lactation, and oral contraceptive pills have been mentioned as protective factors. By eliminating risk factors, the incidence of ovarian cancers will be reduced by one-third to two-fifths, Ovarian cancer is a heterogeneous disease categorized as histological subtypes with different epidemiology, treatment strategy, and prognosis ***(Hu et al., 2023).***

Madsen et al refer to the protective role of phytoestrogens in the development of ovarian cancer and believe that a plant-based diet plays an important role in the reduction of hormone-related cancers. The results of a case-control study showed that saturated fat is associated with an increased risk of ovarian mucinous tumors. Madsen et al revealed that an increased concentration of vitamin D in plasma may reduce the risk of ovarian cancer. This risk reduction is also seen in the case of calcium and lactose consumption **(Madsen et al., 2015).**

Ovarian cancer is classified into serous, mucinous, endometrioid, clear cell, and transitional cell carcinomas and malignant Brenner tumor ***(Hayashi et al., 2023).***

Despite initial treatment with cytoreduction surgery and platinum-taxane combination therapy, the majority (80–85%) of patients with advanced ovarian cancer relapse and require additional treatment. Traditionally, the likelihood for recurrence has been predicted by stage of disease at initial presentation, success of surgical cytoreduction, rate of cancer antigen (CA) 125 resolution and sensitivity to platin-based therapy. However, there has been a real paucity of predictive markers for recurrence in ovarian cancer **(Matulonis et al., 2016).**

Nearly 67% of women with advanced ovarian cancer can be related with some degree of malnutrition due to associated cancer cachexia, ascites and less commonly, malignant bowel obstruction. It has been observed that pretreatment nutritional and immunological condition with systemic inflammatory response markers is associated with the postoperative outcomes, chemotoxicity and long-term outcomes of patients with malignant tumors **(Mu et al., 2022).**

Nutritional parameters like albumin, body mass index (BMI) and total skeletal muscle volume have been investigated as possible prognostic and predictive markers in various cancers. Recently, prognostic nutritional index (PNI) has been reported to be an independent prognostic factor for survival in different malignancies, including colorectal cancer, gastric cancer, lung cancer and pancreatic cancer **(Sun et al., 2019).**

It has been found that preoperative nutritional and immunological condition, as well as systemic inflammatory response markers, are associated with the postoperative prognosis and overall survival (OS) of patients with malignant tumors. Immune function can be affected by nutritional condition and inflammation status, which in turn affects the C-reactive protein (CRP) level and concentration of lymphocytes **(Zhang et al., 2017).**

Serum albumin, the synthesis of which is suppressed by malnutrition and inflammation, is generally used to assess nutritional status, severity of disease, disease progression, and prognosis. In addition, albumin concentrations can be influenced by CRP concentrations, and this relationship is similar across various tumor types. Therefore, in recent years, some inflammation- and nutrition-based factors have been investigated as possible prognostic and predictive markers in various cancers **(Soeters et al., 2019).**

Details of these factors are all easily available from peripheral blood samples, including the C-reactive protein/albumin ratio (CAR), lymphocyte/monocyte ratio (LMR), albumin and lymphocyte count combined into the prognostic nutritional index (PNI), and CRP- and albumin-related factors of the modified Glasgow prognostic score (mGPS). As an efficient, simple, and convenient novel prognostic factor, the PNI is calculated according to the following formula: serum albumin value (g/L) + 0.005 × lymphocyte count (per mm^3) in peripheral blood **(Sun et al., 2019).**

Recently, PNI has been reported to be an independent prognostic factor for survival in different malignant carcinomas, including colorectal cancer, gastric cancer, lung cancer, and pancreatic cancer. However, the prognostic importance of PNI for OC still needs to be elucidated, especially according to tumor stage. Although Miao *et al*. reported that PNI was an independent prognostic factor in OC patients, they did not assess the combination of PNI with other established prognostic factors, such as CAR, LMR, and mGPS **(Zhao et al., 2016).**

PNI can be calculated by serum albumin concentration, and peripheral blood lymphocyte count could quantify both the nutritional and immunological status of the body. However, the effect of PNI on the short-term treatment outcomes and long-term prognosis still needs to be explored in advanced ovarian cancer **(Ellez et al., 2023).**

Prognostic nutritional index (PNI) is used for the assessment of the nutritional status among patients who have undergone surgery, predicting surgical risks, and for prognostic judgments. It was first established by Lakananurak and Gramlich, a Japanese

scholar. Originally, PNI was used for the evaluation of the nutrition and immune status of patients undergoing gastrointestinal surgery **(Lakananurak and Gramlich, 2020).**

It is determined according to the lymphocyte count and level of serum albumin in the peripheral blood. In recent years, it has been used as a new indicator for prognostic judgment of patients with gastrointestinal malignant tumors, gynecological tumors, and lung cancer. PNI reflects preoperative malnutrition and is used to predict the incidence of postoperative complications. It is also a prognostic predictor for the long-term progression of various malignant tumors **(Soeters et al., 2019).**

Although thrombocytosis before treatment is used as an independent factor for poor prognoses in patients with epithelial ovarian cancer, it usually reflects lower PNI, and no prognostic information is available when adjusting for the PNI values. Feng et al. used PNI = 46.2 as the critical value and showed that low preoperative PNI was correlated with the FIGO stage progression, elevated CA125 level, extensive presence of ascites, residual tumors, and platinum resistance. In multivariate analysis, PNI as a continuous variable was an independent predictor of OS **(Zhang et al., 2017).**

PNI is a validated prognostic predictive parameter for high-grade serous ovarian cancer (HGSC). Lakananurak and Gramlich. used PNI = 45 as the cut-off value and found that the AUC of PNI-predicted platinum resistance was 0.688; the sensitivity was 62.50%, and the specificity was 83.47%. The median PFS of patients with a lower PNI (<45) was 12 months (95% CI, 10.62–13.38 months), whereas the median PFS of patients with a higher PNI (≥45) was 23 months (95% CI, 18.03–27.97 months). PFS and OS in the low-PNI group were significantly lower than those in the high-PNI group (both $P < 0.001$) **(Lakananurak and Gramlich, 2020).**

Multivariate analysis showed that PNI < 45 was an independent risk factor for PFS and OS outcomes. Soeters et al. retrospectively analyzed the data of 237 patients with epithelial ovarian cancer using PNI = 47.2 as the cut-off value. They found that the PFS in the low PNI group was significantly lower than in the high PNI group. For low and high PNI groups of platinum-sensitive patients, PFS was 49.4 and 28.9 months ($P < 0.001$), respectively, and OS was 55.7 and 82.7 months ($P < 0.001$), respectively **(Soeters et al., 2019).**

The prognostic nutritional index (PNI), which reflects preoperative malnutrition, is useful for predicting the incidence of postoperative complications and has been reported in recent years to predict the long-term prognosis of various malignancies. Malnutrition has been reported to make patients more susceptible to infection, increase the risk of postoperative complications, and promote tumor recurrence through suppression of tumor immunity **(Zhang et al., 2017).**

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