

The effect of blood selenium level on the chemotherapy relative dose intensity (RDI) in breast cancer patient receiving neoadjuvant treatment.

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Purpose: We previously found that a high selenium level is predictive of pCR in women diagnosed with HER2-positive or triple-negative breast cancer treated with neoadjuvant chemotherapy (NAC). The pCR rate was 59.0% for women in the highest tertile of blood selenium (≥ 107.19 $\mu\text{g/L}$) compared to 39.0% for women in the lowest tertile (≤ 94.29 $\mu\text{g/L}$) ($p = 0.003$). Relative dose intensity (RDI) of chemotherapy is an important marker of treatment tolerability. An RDI less than 85% is associated with a suboptimal response to chemotherapy. We hypothesized that patients with high blood selenium level (≥ 107.19 $\mu\text{g/L}$) are more likely to achieve a RDI of 85% and above compared to women with low selenium levels (≤ 94.29 $\mu\text{g/L}$) which partly explains the relationship between high selenium levels and the achieved pCR.

Methods: We studied 329 women diagnosed with primary invasive breast cancer who were treated with neoadjuvant chemotherapy (NAC). We included patients with HER2-positive ($n = 183$) or triple-negative breast cancer ($n = 146$). Blood was collected before the initiation of treatment. Blood levels of selenium were quantified by mass spectroscopy. Each patient was assigned to one of three tertiles based on the distribution of blood selenium levels in the entire cohort. Patients with triple-negative breast cancer (TNBC) were treated with a range of combination chemotherapies. Patients with HER2-positive breast cancer received anti-HER2 treatment based on trastuzumab alone or trastuzumab and pertuzamab. The dose intensity for each drug was calculated as (actual dose intensity/projected dose intensity). The RDI for each drug in the treatment regimen was calculated separately, and a total RDI was calculated by taking the average of all drugs.

Results: In the entire cohort, the RDI of 85% and above was 82.7% (91/110) for women in the highest tertile of blood selenium (≥ 107.19 $\mu\text{g/L}$) compared to 67.3% (74/110) for women in the lowest tertile (≤ 94.29 $\mu\text{g/L}$) ($p = 0.01$). Additionally, we observed a lower infection rate in the high selenium levels group (9/110) compared to the lowest selenium levels group (28/110) ($p = 0.001$).

Conclusions: A high selenium level is predictive to obtain RDI above 85% in women treated with neoadjuvant chemotherapy for HER2-positive or triple-negative breast cancer. This result may explain the association between high selenium levels and a higher rate of pCR after preoperative treatment in this subgroup of patients.