



# Breast cancer following renal transplantation; an update to recent findings

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## Abstract

The risk factors for developing breast cancer after a renal transplant are multifaceted, including the impact of immunosuppressive treatment, the unique challenges of managing cancer in transplant patients, and the increased overall cancer risk associated with renal transplantation. Understanding these risk factors is crucial for tailored management strategies and improving outcomes for breast tumor in renal transplant recipients.

**Keywords:** Breast cancer, Immunosuppressive medications, Renal transplantation, Epstein-Barr virus, Malignancy

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## Introduction

Breast cancer is a concern for patients who have undergone a kidney transplant, as they may be at a heightened risk compared to the general populace. This increased risk is thought to be due to a combination of factors, including long-term immunosuppressive therapy, chronic kidney disease, and other comorbidities (1). Immunosuppressive medications, which are necessary to prevent rejection of the transplanted kidney, can weaken the immune system and potentially contribute to the development of cancer, including breast cancer (2). Additionally, cases with chronic renal failure may have a higher risk of developing certain types of cancer, including breast cancer (3). If breast cancer is diagnosed after a renal transplant, treatment options may be more complex due to the need to balance the management of cancer with the need to prevent rejection of the transplanted kidney (4). In a previous study, Kwak et al reported that 11 out of 2139 kidney transplant recipients developed post-transplant breast cancer, indicating a potential risk factor associated with renal transplantation. According to this study, the frequency of post-transplant breast cancer was estimated at 0.5% following kidney transplantation. Kwak et al also detected the five-year global survival for grade III was 66.7%, since no considerable statistical difference was detected compared to that of the overall populace (5). Reports have emphasized a 3-fold strengthen in malignancy incidence following kidney transplant (6).

## Search strategy

For this review, we searched EBSCO, Scopus, Google

Scholar, PubMed, Web of Science, Directory of Open Access Journals (DOAJ) and Embase, using different keywords including; breast cancer, immunosuppressive medications, renal transplantation, Epstein-Barr virus and malignancy.

## Common cancers in kidney transplant patients

The most common types of cancer in renal transplant cases include non-melanoma skin cancers, post-transplant lymphoproliferative disorder, renal cell carcinoma, Kaposi sarcoma, hematological tumors, urinary tract tumors, skin cancer, and particularly non-melanoma skin cancers, are the most prevalent type of cancer in renal transplant cases, occurring at a significantly higher rate than in the general populace (7,8). Post-transplant lymphoproliferative disorder is also a popular cancer type in kidney transplant cases, especially in the long term after transplantation. This malignancy is a type of lymphoma that occurs after a kidney transplant. It is often related to the Epstein-Barr virus (EBV), which is common among transplant recipients (9).

Previous studies showed kidney transplant recipients have an increased risk of developing skin cancers, such as basal cell carcinoma and squamous cell carcinoma. This is often attributed to long-term immunosuppressive medications and increased sun exposure (10). While kidney transplant recipients have a lower risk of developing kidney cancer (renal cell carcinoma) compared to individuals with end-stage renal disease, it is still a potential concern, particularly in cases with a history of polycystic kidney disease (11). Transplant recipients may have an elevated

### ■ Implication for health policy/practice/research/medical education

Breast cancer after renal transplant is a serious concern for individuals who have undergone a kidney transplant. The administration of immunosuppressive medications to prevent organ rejection after the transplant may strengthen the risk of developing particular types of malignancy, counting breast cancer.

risk of developing lung cancer, particularly if they have a history of smoking (12). The risk of colorectal cancer may slightly increase in kidney transplant recipients, although the overall incidence remains relatively low (13). Additionally, kidney transplant individuals have a higher risk of emerging renal cell carcinoma, Kaposi sarcoma, hematological tumors, and urinary tract tumors compared to the general population (6,7). The increased risk of these specific cancer types is attributed to factors such as immunosuppressive treatment, impaired immune responses to oncogenic viruses, and the overall impact of kidney transplantation on cancer risk (6,8).

### Breast cancer in general population

Invasive ductal carcinoma is the most popular type of breast cancer, accounting for about 70%-80% of all cases. Additionally, invasive lobular carcinoma is the second most common type of breast cancer. Moreover, ductal carcinoma in situ is a non-invasive cancer where abnormal cells are found in the lining of a breast duct but have not spread outside the duct (14-16). Accordingly, inflammatory breast cancer is a rare and invasive type of breast malignancy characterized by the breast appearing swollen and red (inflamed) (17). Likewise, metastatic breast cancer is a malignancy that has spread from the breast to other parts of the body (18). There are also other less common types of breast cancer, including triple-negative breast malignancy, Paget's disease of the breast, angiosarcoma of the breast, medullary, metaplastic, and mucinous breast cancers (19). Therefore, the risk factors for developing breast cancer in the general population are multifaceted, including genetic, hormonal, and lifestyle factors, as well as personal and family history. Understanding these risk factors is crucial for tailored management strategies and improving outcomes for breast cancer patients (19).

### Survival rate of breast cancer in renal transplantation

The survival rate for breast cancer in kidney transplant cases vary based on the stage of cancer and the impact of immunosuppressive treatment. Prior investigations showed that females with breast cancer following kidney transplantation had a 5-year overall survival according to the following findings: stage 0, 94%; stage I, 90%; stage II, 82% ; stage III, 56.9%; and stage IV, 19% (5,20). These studies also showed, the median survival for women diagnosed with breast malignancy after renal transplant

was 193 months (about 16.1 years) compared to 299 months (around 24.9 years) from transplantation for females not diagnosed with breast cancer (5). The recent study by Ietto et al showed that transplanted women who developed breast cancer had an excess mortality of at least 40% compared to women with breast cancer in the general population. These findings show that the survival rates for breast cancer in kidney transplant cases vary based on the stage of cancer, with lower survival rates observed for advanced stages. Additionally, the impact of immunosuppressive treatment and the unique challenges of managing cancer in transplant patients may influence overall survival (7).

### Risk factors for developing breast cancer after renal transplant

Several risk factors are associated with the development of breast cancer after renal transplant. Individuals undergoing renal transplantation have a greater risk of developing malignancy due to immunosuppressive treatment. Kidney transplantation is also known to be connected with an enhanced risk of tumors, including breast cancer (7). Moreover, managing breast malignancy in kidney transplant patients presents a unique dilemma, and the simultaneous presence of malignant diseases and transplantation may contribute to the risk (4). While the incidence of breast malignancy in post-transplant patients is comparable to that in the general populace, the prognosis and survival rates may differ, suggesting the need for further investigation into the risk factors and outcomes. It seems that the risk factors for developing breast cancer after renal transplant are multifaceted, including the impact of immunosuppressive treatment, the unique challenges of managing cancer in transplant patients, and the increased overall cancer risk associated with renal transplantation. Further research and tailored management strategies are essential to address the specific risk factors and outcomes associated with breast tumor in kidney transplant individuals (21,22).

### Effect of immunosuppressive treatment

Immunosuppressive treatment is a significant risk factor for emerging breast cancer in renal transplant patients. Immunosuppressive drugs appear to be directly involved in the process of carcinogenesis, and the mechanism of action of immunosuppressive agents can contribute to the development of breast cancer (23). The simultaneous presence of malignant diseases and transplantation may also contribute to the risk (24).

### Conclusion

Transplanted women who developed breast cancer had an excess mortality of at least 40% compared to women with breast cancer in the general population, indicating the significant impact of immunosuppressive treatment on the risk and outcomes of breast malignancy in

renal transplant cases. Therefore, immunosuppressive treatment significantly affects the risk of breast cancer in renal transplant patients, contributing to an increased incidence and influencing the prognosis and mortality rates

#### Conflicts of interest

The author declare that he has no competing interests.

#### Ethical issues

Ethical issues (including plagiarism, data fabrication, and double publication) have been completely observed by the author.

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