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The relationship between chronic kidney disease and cancer

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Implication for health policy/practice/research/medical education:
Chronic kidney disease (CKD) is a common complication of cancer and it is well-established that cancer and or its treatment can lead to the development of CKD and finally end-stage renal disease (ESRD). Therefore it appears that the relationship between CKD and cancer is reciprocal since CKD and end stage renal disease are common complications of cancer and its treatment. On the other hand, both CKD and ESRD are risk factors for the development of a variety type of malignancies.

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Cancer is the second or third leading cause of death in the most of developed countries and it is associated with significant morbidity. It is estimated that until 2026, more than 20 million cancer survivors will be alive in the United States (1,2).

Although the overall incidence and prevalence of cancer in developing countries is still uncertain, there is growing evidence to suggest that the risk of cancer among these countries is also high and still increasing like developed countries (3).

The life expectancy of patients with cancer have improved during the past two decades, and as survival rates of these patients have improved, an increasing number of cancer survivors will develop renal complications including acute kidney injury (AKI), glomerular disease and nephrotic syndrome, electrolyte disorders and chronic kidney disease (CKD) (1,2).

This study will provide an overview of the association between CKD and cancer which are connected in several ways.

CKD is a common complication of cancer and it is well-established that cancer and or its treatment can lead to the development of CKD and finally end-stage renal disease (ESRD) (4,5).

It may be related in part to the high prevalence of preexisting renal disease among cancer patients (1,2,6). For example, in a large observational study, Launay-Vacher et al evaluated the prevalence of renal insufficiency among 4684 patients from the 15 oncology centers in France. According to the use of Cockcroft-Gault formula in this study, 57.4% of these patients had an estimated glomerular filtration rate (eGFR) of less than 90 mL/min and the prevalence of stage 3 and 4 CKD was 12% and less than 1%, respectively which demonstrated the high prevalence of renal impairment among patients with cancer (6).

On the other hand, it appears that both CKD and ESRD are risk factors for the development of a number of malignancies because some evidence suggests that the overall incidence of a various type of cancer is higher in patients with CKD and ESRD than in the general population (7-9).

Lowrance et al evaluated the impact of CKD on the risk of cancer in a large retrospective cohort study (2). They examined the association between level of eGFR and the risk of incident cancer among 1190538 adults who were

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receiving care within a health care delivery system and had no prior cancer.

A recent study showed a significant association between lower eGFR and an increased risk of renal and urothelial cancer was detected. However lower eGFR was not associated with an increased risk of lung, colorectal, prostate, breast, and or any cancer overall (2).

According to the results of other studies, it seems that ESRD is also a risk factor for the development of a number of malignancies (7-9). For example, in an international collaborative study, Maisonneuve et al evaluated the risk of cancer among 831 804 ESRD patients treated by dialysis in the United States, Europe, Australia, or New Zealand from 1980 to 1994 and compared the observed frequency of cancer among these patients with the frequency of cancer in the respective background populations. During an average follow-up of 2–5 years, cancer occurred in 25 044 of 831 804 dialysis patients compared with an expected number of 21 185 which showed the overall risk of cancer is increased in patients with ESRD (7).

Accordingly in the study by Inamoto et al (8), the risk of malignancy among 23 209 Japanese dialysis patients in 589 institutions together with a retrospective study at Keio University hospital was investigated. According to the results of this study, the incidence of malignancy was 1.4-fold higher in dialysis patients than the expected rates in the general population and therefore the results of this study support the results of Maisonneuve and colleagues' study (7).

Similar results have also been reported in the more recent retrospective cohort study of Butler et al which evaluated adult patients enrolled in Medicare's ESRD program who received in-center hemodialysis between 1996 and 2009. The 5-year cumulative incidence of any cancer was 9.48% which suggests a high burden of cancer in the hemodialysis population compared to the general population (9).

Therefore it appears that the relationship between CKD and cancer is reciprocal since CKD and ESRD are common complications of cancer and its treatment. On the other hand, both CKD and ESRD are risk factors for the development of a variety type of malignancies.

Author's contribution

SMMM, FH, SS, SAH, ZK and LS prepared the draft. SSBM edited and finalized the manuscript. All authors read and signed the final paper.

Conflicts of interest

The authors declare no conflict of interest.

Ethical considerations

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

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