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Kidney Replacement Modality and Outcomes After De Novo Solid Cancer: Stage at Diagnosis, Treatment, and Survival in a Nationwide Cohort

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Objectives : Kidney transplant recipients (KTRs) and end-stage kidney disease (ESKD) patients face elevated cancer risk, but differences in stage at diagnosis and mortality remain unclear. We compared cancer stage at diagnosis and mortality among KTRs, ESKD patients, and the general population (GP) for stomach, colorectal, liver, and breast cancers.
Methods : Using a nationwide Korean cancer registry linked to administrative claims data (2012–2019), we identified de-novo cancers among KTRs, ESKD patients on dialysis, and GP individuals. Cancer stage was classified using SEER summary staging. Logistic regression compared localized versus advanced-stage disease, and Cox models estimated hazard ratios (HRs) for mortality among patients surviving ≥90 days after diagnosis.
Results : We included 507,525 patients: 577 KTRs, 2,890 ESKD patients, and 504,058 GP individuals. KTRs were younger (58.7±9.6 years) than ESKD (66.5±10.8 years) and GP (61.3±12.1 years), and both groups had higher prevalence of hypertension and diabetes than GP. Compared with GP, KTRs with stomach cancer were less likely to present with localized disease (OR 0.66; 95% CI 0.50–0.88), and KTRs with liver cancer had lower odds of localized presentation versus ESKD (OR 0.56; 0.33–0.94). KTRs had higher all-cause mortality than GP for all sites: stomach HR 2.09 (1.63–2.68), colorectal HR 2.77 (2.04–3.75), liver HR 1.78 (1.33–2.38), and breast HR 2.09 (1.15–3.78). In KTR-versus-ESKD comparisons, KTRs had lower mortality for stomach (HR 0.65; 0.49–0.87) and breast cancer (HR 0.36; 0.19–0.70).
Conclusions : Both KTRs and ESKD patients had worse cancer outcomes than the GP, although KTRs showed a survival advantage over ESKD patients for certain cancers. More advanced stage at presentation for stomach and liver cancers in KTRs raises concern about current post-transplant surveillance, and supports development of cancer-site-specific strategies tailored separately for transplant recipients and dialysis patients.

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Localized stage at diagnosis				Unadjusted Model		Adjusted Model	
Cancer site * Study group	Number of patients	Number of events	Event rate (%)	OR (95% CI)	p-value	OR (95% CI)	p-value
Stomach							
GP	167,754	120,523	71.85	1.00 (ref)		1.00 (ref)	
ESKD	796	540	67.84	**0.83 (0.71, 0.96)**	0.012	**0.81 (0.70, 0.94)**	0.006
KT	207	135	65.22	**0.74 (0.55, 0.98)**	0.035	**0.66 (0.50, 0.88)**	0.005
Colorectal							
GP	134,671	55,434	41.16	1.00 (ref)		1.00 (ref)	
ESKD	890	411	46.18	**1.23 (1.08, 1.40)**	0.003	**1.27 (1.11, 1.45)**	<0.001
KT	137	70	51.09	**1.49 (1.07, 2.09)**	0.019	1.34 (0.96, 1.88)	0.088
Liver							
GP	62,506	34,328	54.92	1.00 (ref)		1.00 (ref)	
ESKD	582	362	62.2	**1.35 (1.14, 1.60)**	<0.001	**1.23 (1.03, 1.45)**	0.019
KT	71	36	50.7	0.84 (0.53, 1.35)	0.476	0.75 (0.47, 1.19)	0.224
Breast							
GP	113,717	72,187	63.48	1.00 (ref)		1.00 (ref)	
ESKD	321	203	63.24	0.99 (0.79, 1.24)	0.929	1.06 (0.84, 1.33)	0.645
KT	116	77	66.38	1.13 (0.77, 1.67)	0.525	1.24 (0.84, 1.82)	0.284
Advanced(regional or diatant) stage at diagnosis				Unadjusted Model		Adjusted Model	
Cancer site * Study group	Number of patients	Number of events	Event rate (%)	OR (95% CI)	p-value	OR (95% CI)	p-value
Stomach							
GP	167,754	47,231	28.15	1.00 (ref)		1.00 (ref)	
ESKD	796	256	32.16	**1.21 (1.04, 1.40)**	0.012	**1.24 (1.06, 1.44)**	0.006
KT	207	72	34.78	**1.36 (1.02, 1.81)**	0.035	**1.51 (1.13, 2.01)**	0.005
Colorectal							
GP	134,671	79,237	58.84	1.00 (ref)		1.00 (ref)	
ESKD	890	479	53.82	**0.82 (0.71, 0.93)**	0.003	**0.79 (0.69, 0.90)**	<0.001
KT	137	67	48.91	**0.67 (0.48, 0.94)**	0.019	0.75 (0.53, 1.04)	0.088
Liver							
GP	62,506	28,178	45.08	1.00 (ref)		1.00 (ref)	
ESKD	582	220	37.80	**0.74 (0.63, 0.88)**	<0.001	**0.82 (0.69, 0.97)**	0.019
KT	71	35	49.30	1.18 (0.74, 1.89)	0.476	1.34 (0.84, 2.13)	0.224
Breast							
GP	113,717	41,530	36.52	1.00 (ref)		1.00 (ref)	
ESKD	321	118	36.76	1.01 (0.81, 1.27)	0.929	0.95 (0.75, 1.19)	0.645
KT	116	39	33.62	0.88 (0.60, 1.30)	0.525	0.81 (0.55, 1.19)	0.284

Model was adjusted for age, sex, income, hypertension, diabetes mellitus.

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All-cause mortality							Unadjusted Model		Adjusted Model 1		Adjusted Model 2		Adjusted Model 3	
Cancer site * Study group	Number of patients	Number of events	Event rate (%)	Follow-up duration (years, mean±std)	Person-year	Incidence rate (per 1000 person years)	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Stomach														
GP	163,584	29,772	18.2	4.68±2.55	765968.12	38.87	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
ESKD	708	378	53.39	2.95±2.38	2091.91	180.7	3.92 (3.54, 4.34)	<0.001	3.30 (2.98, 3.66)	<0.001	3.51 (3.17, 3.89)	<0.001	2.99 (2.70, 3.32)	<0.001
KT	202	62	30.69	3.86±2.54	780.32	79.45	1.91 (1.49, 2.45)	<0.001	2.25 (1.76, 2.89)	<0.001	2.14 (1.67, 2.75)	<0.001	2.09 (1.63, 2.68)	<0.001
Colorectal														
GP	131,364	26,700	20.33	4.54±2.50	596763.39	44.74	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
ESKD	787	405	51.46	3.09±2.40	2430.49	166.63	3.34 (3.03, 3.68)	<0.001	2.68 (2.42, 2.96)	<0.001	2.99 (2.71, 3.30)	<0.001	2.64 (2.39, 2.91)	<0.001
KT	128	42	32.81	4.10±2.80	525.2	79.97	1.79 (1.32, 2.42)	<0.001	2.16 (1.60, 2.92)	<0.001	2.80 (2.07, 3.79)	<0.001	2.77 (2.04, 3.75)	<0.001
Liver														
GP	53,905	26,873	49.85	3.03±2.47	163281.71	164.58	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
ESKD	457	304	66.52	2.37±2.24	1081.95	280.97	1.54 (1.38, 1.73)	<0.001	1.55 (1.38, 1.73)	<0.001	1.69 (1.51, 1.90)	<0.001	1.60 (1.42, 1.79)	<0.001
KT	64	45	70.31	2.14±1.85	137.13	328.16	1.63 (1.22, 2.19)	0.001	1.89 (1.41, 2.54)	<0.001	1.78 (1.33, 2.39)	<0.001	1.78 (1.33, 2.38)	<0.001
Breast														
GP	113,506	5,292	4.66	4.84±2.17	549527.23	9.63	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
ESKD	308	101	32.79	4.01±2.31	1235.79	81.73	8.31 (6.83, 10.12)	<0.001	5.46 (4.46, 6.68)	<0.001	5.88 (4.81, 7.20)	<0.001	5.51 (4.50, 6.74)	<0.001
KT	112	11	9.82	4.59±2.18	513.85	21.41	2.20 (1.22, 3.97)	0.009	2.04 (1.13, 3.70)	0.018	2.08 (1.15, 3.77)	0.015	2.09 (1.15, 3.78)	0.015

Model 1 was adjusted for age, sex, income, hypertension, diabetes mellitus.
Model 2 was adjusted for age, sex, income, hypertension, diabetes mellitus, cancer stage (='localized' or 'regional/distant').
Model 3 was adjusted for age, sex, income, hypertension, diabetes mellitus, cancer stage (='localized' or 'regional/distant'), cancer treatment within 90 days(='yes' or 'no').