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EPH40

Evolving Impact of the COVID-19 Pandemic in Chronic Dialysis Recipients According to Wave Sub-Periods.

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Context & objectives

- During the early period of the COVID-19 pandemic, studies reported a strong association between end-stage kidney disease (ESKD) and higher risks of hospitalization and mortality from COVID-19[1,2]

- After vaccine rollout, it became evident that among patients on maintenance dialysis:
  - the magnitude of antibody and T-cell immune responses after 2 doses of mRNA COVID-19 vaccination is lower[3,4];
  - immunity wanes faster than in general population[3,4];
  - booster campaigns are required for sustaining vaccine effectiveness[5];
  - adherence to such booster campaigns remains inadequately documented in the literature;
  - reports on vaccine effectiveness after January 2022 among persons undergoing dialysis are lacking[4].

Study objectives

1. Characterize the evolving risk of mortality among dialysis patients along the pandemic period, considering the different wave and inter-wave sub-periods
2. Investigate the adherence of persons with ESKD to booster doses
3. Estimate the impact of COVID-19 vaccinations among dialysis patients
4. Compare the results obtained in the ESKD targeted population with those in a control population having similar characteristics excepted ESKD

Methods

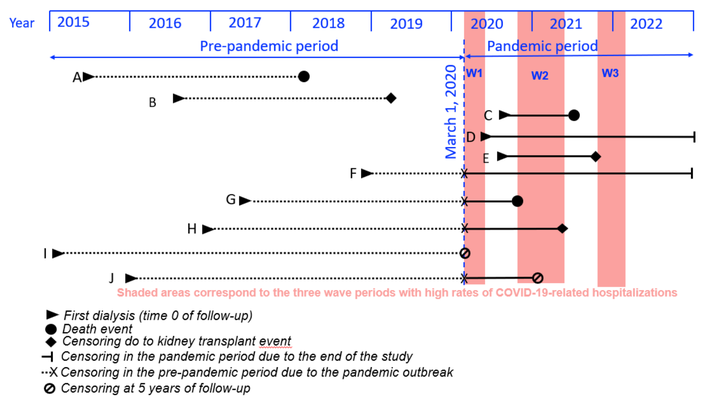

Fig1. Graphic examples of some individual follow-up in the pre-pandemic and pandemic periods according to the timing of event or censoring features

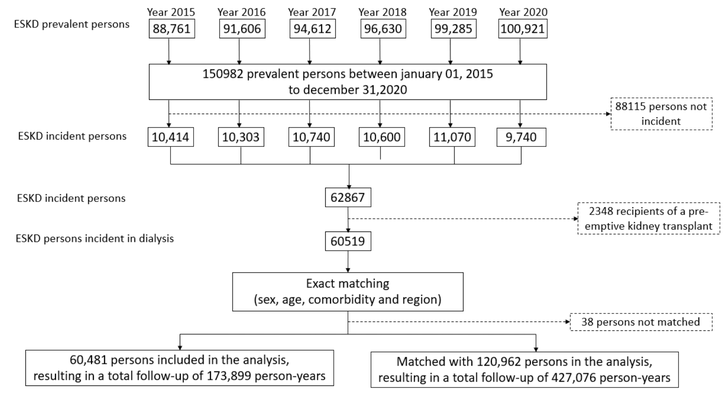

Fig2. Study flow chart

Model : $\lambda_0(t|L_0,L_t) = \lambda_0(t)\exp(\mu_1 pand_t + \mu_2 L_0 + \mu_3 L_t)$

$\lambda_0(t)$: Baseline hazard function

μ_1: Log-HR of the time-dependent pandemic period status

μ_2: Vectors of log-HRs for the baseline covariates L_0 (sex, comorbidities…)

μ_3: Vectors of log-HRs for time-dependent covariates L_t (COVID-19-related hospitalization, vaccination)

Results

Variable	All dialysis patients (n=60,481)	Pre-pandemic period (n=53,183)	Pandemic period (n=7,298)	P. value
Age-group				
18-44	4,893 (8%)	4,314 (8%)	579 (8%)	<0.01
45-54	5,213 (9%)	4,576 (9%)	637 (9%)	
55-64	9,428 (16%)	8,302 (16%)	1,126 (15%)	
65-74	16,610 (28%)	14,393 (27%)	2,217 (30%)	
75-84	16,892 (28%)	14,986 (28%)	1,906 (26%)	
85+	7,445 (12%)	6,612 (12%)	833 (11%)	
Sex				
Male	39,153 (65%)	34,411 (65%)	4,742 (65%)	0.66
Female	21,328 (35%)	18,772 (35%)	2.556 (35%)	
Diabetes				
No	32,631 (54%)	28,819 (54%)	3,812 (52%)	<0.01
Yes	27,850 (46%)	24,364 (46%)	3,486 (48%)	
Chronic cardiovascular disease				
No	30,910 (51%)	27,110 (51%)	30,910 (51%)	0.08
Yes	29,571 (49%)	26,073 (49%)	3,498 (49%)	

Table 1. Characteristics of dialysis patients included in the study

Model	Variable	Dialysis patients Deaths observed / person-years	HR [95% CI]	P	Control group Deaths observed / person-years	HR [95%CI]	P
	Period						
	Pre-pandemic	13,906/99,795	1 (reference)		10,350/233,086	1 (reference)	
M1	1st wave	1,193/7,058	1.18 [1.13-1.24]	<0.01	1,008/34,533	1.22[1.14-1.30]	<0.01
	1st inter-wave	1,326/10,186	0.88 [0.84-0.91]	<0.01	1,060/25,613	0.88[0.82-0.94]	<0.01
	2nd wave	3,603/21,131	1.10 [1.05-1.13]	<0.01	3,005/36,951	1.12[1.07-1.17]	<0.01
	2nd inter-wave	1,905/14,009	0.87 [0.84-0.90]	<0.01	1,704/53,684	0.87[0.87-0.92]	<0.01
	3rd wave	1,477/9,424	0.97 [0.93-1.02]	<0.01	1,387/25,519	1.00[1.00-1.18]	<0.01
	3rd inter-wave	1,678/12,296	0.81 [0.78-0.84]	<0.01	1,666/17,690	0.83[0.79-0.88]	<0.01
	COVID-19 hospitalization	1,793/3,939	3.45 [3.28-3.64]	<0.01	1,147/2,675	6.75[6.33-7.19]	<0.01

Table 2. Multivariable analysis of evolving mortality among dialysis patients and control group along the pandemic sub-periods as compared to the pre-pandemic period

Model	Variable	Deaths observed (n) / person-years(n)	HR [95% CI]	P
	Periods			
	pre-pandemic	24,256/332,881	1 (reference)	
M2	pandemic	21,012/268,094	1.10 [1.07-1.13]	<0.01
	Population			
	control population	25,088/427,076	1 (reference)	
	dialysis population	20,180/173,899	3.29 [3.20-3.37]	<0.01
	Interaction	-		
	population : periods		0.99 [0.95-1.03]	0.53

Table 3. Multivariable analysis of association between pandemic period and death in dialysis and control populations

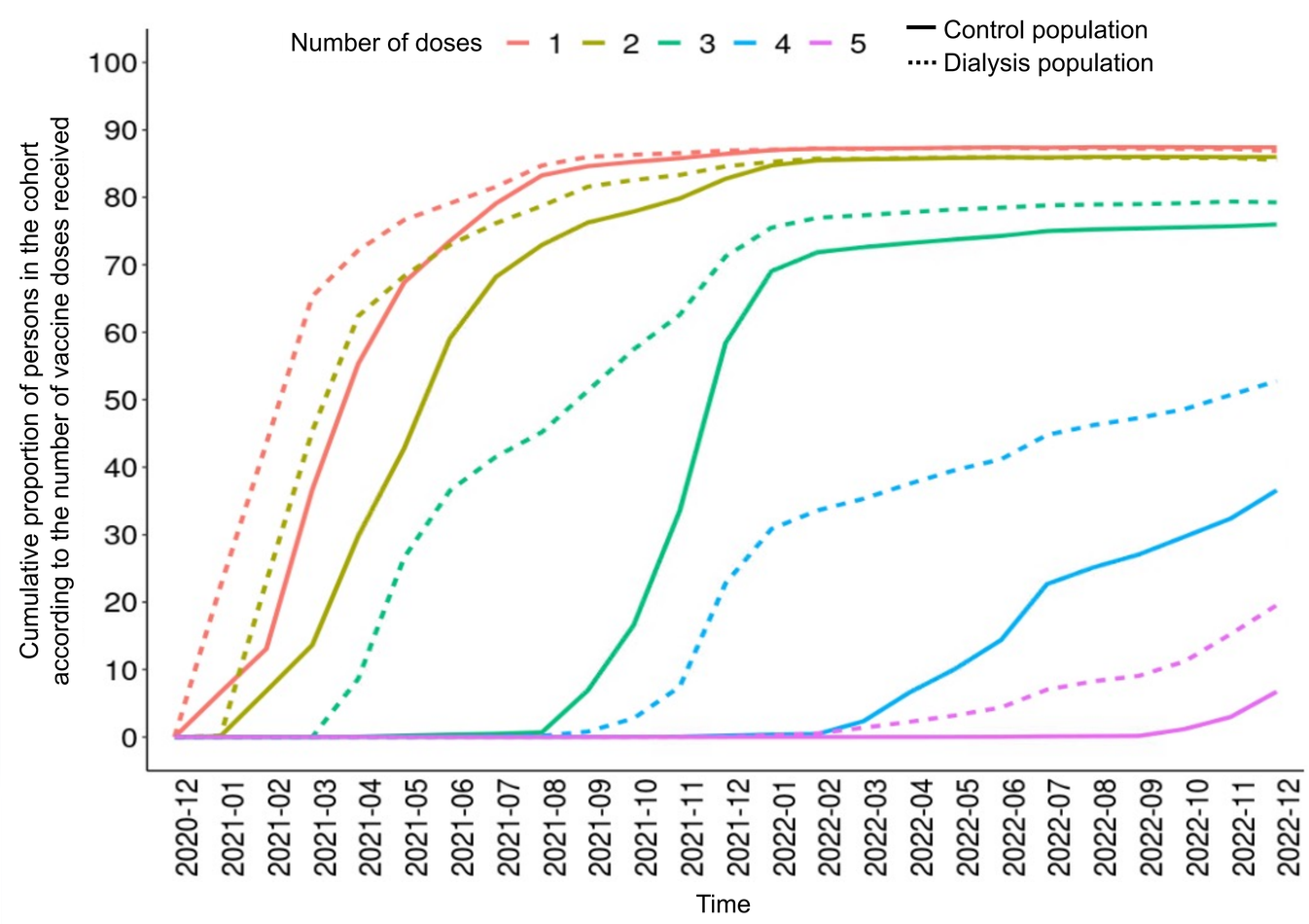

Fig 3. Dynamics of COVID-19 vaccination in the dialysis and control populations of the study

Model	Vaccine doses (n)	Dialysis population Deaths observed (n) / person-years(n)	HR [95% CI]	P	Control population Deaths observed (n) / person-years (n)	HR [95%CI]	P
M3	0 or 1dose	6,609/41,689	1 (reference)	-	6,384/118,184	1 (reference)	-
	2 doses	1,675/10,128	1.00 [0.93–1.07]	<0.01	1,637/36,068	0.71 [0.67–0.76]	<0.01
	3 doses (1st booster)	1,850/15,076	0.68 [0.63–0.73]	<0.01	1,799/38,588	0.58 [0.54–0.63]	<0.01
	4 doses (2nd booster)	1,210/7,938	0.74 [0.68–0.80]	<0.01	479/8,615	0.53 [0.48–0.60]	<0.01
	5 doses (3rd booster)	160/1157	0.64 [0.54–0.76]	<0.01	17/335	0.39 [0.24–0.64]	<0.01

Table 4. Multivariable analysis of mortality according to the number of vaccine doses received

Discussion & Conclusion

- While previous studies reported nearly a 30% higher risk of mortality in patients on maintenance dialysis in the USA and the UK[6,7] during the first pandemic wave as compared to the trend observed in the 5 previous pre-pandemic years, our national study in France estimates a comparable lower increased risk of mortality, 18% (HR = 1.18 [1.13-1.24], see Table 2).
- Our assessment of the evolving risk of mortality in this vulnerable population was extended to further wave and inter-wave sub-periods of the pandemic: a worsened outcome was also observed during the second wave.
- Pandemic period did not alter the well-known death risk of persons undergoing to dialysis as compared to matched-controls.
- This study shows a positive association between COVID-19 vaccination and a decreased risk of death inf France in the vulnerable population of persons on maintenance dialysis.
- Unfortunately, the good level of adherence to the vaccination campaigns for the first two doses was not reached, when considering further booster campaigns.

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