



ERACODA

- The ERA-EDTA COVID-19 Database for Patients on Kidney Replacement Therapy -

THE NETHERLANDS

Preliminary

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According to type of kidney replacement therapy

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Patient and COVID-19 characteristics at presentation
 According to type of kidney replacement therapy

Table 1

	Kidney transplant patients	Dialysis patients	Missing data (n)
Number of patients, N	66	52	
Male sex, %	67	54	
Age, y	60 ± 13	68 ± 15	
BMI, kg/m ²	26.1 ± 4.5	27.1 ± 7.3	19/1
Race			
Asian, %	0	8	
Black or African descent, %	2	6	
White or Caucasian, %	62	81	
Other, %	0	6	
Unknown, %	36		
Tobacco use			
Current, %	2	2	
Prior, %	26	31	
Never, %	38	31	
Unknown, %	35	37	
Clinical frailty scale			23/7
Very fit, %	10	4	
Well, %	19	8	
Managing well, %	21	19	
Vulnerable, %	6	13	
Mildly frail, %	3	12	
Moderately frail, %	2	6	
Severely frail, %	2	21	
Very severely frail, %	0	4	
Terminally ill, %	0	0	
<i>Primary kidney disease</i>			36/0
Primary glomerulonephritis, %	8	6	
Pyelonephritis, %	12	4	
Interstitial nephritis, %	0	0	
Familial/hereditary renal diseases, %	27	2	
Congenital diseases, %	4	2	
Vascular diseases, %	8	35	
Secondary glomerular/systemic disease, %	12	6	
Diabetic kidney disease, %	15	29	
Other, %	8	8	

Unknown, %	8	10	
Hemodialysis, %	NA	92	
Peritoneal dialysis, %	NA	8	
Residual diuresis > +/- 200 ml/day	NA	46	
<i>Comorbidities</i>			
Obesity, %	8	29	
Hypertension, %	69	90	
Diabetes Mellitus, %	27	42	
Coronary artery disease, %	31	37	
Heart failure, %	5	25	
Chronic lung disease, %	6	10	
Active malignancy, %	5	10	
Auto-immune disease, %	2	2	
<i>Use of RAASi use at presentation</i>			
ACE-inhibitors, %	21	12	1/0
ARB, %	18	8	1/0
<i>Use of immunosuppressive medication at presentation</i>			
Prednisone, %	77	6	3/0
Tacrolimus, %	73	2	2/0
Cyclosporine, %	10	0	8/0
Mycophenolate, %	56	0	4/0
mTOR inhibitor, %	11	2	8/0
Azathioprine, %	6	0	8/0
Belatacept, %	0	0	9/0
Anti TNF A, %	0	0	8/0
Rituximab, %	0	0	8/0
Cyclophosphamide, %	0	0	8/0
Other, %	0	2	9/0
<i>COVID-19 symptoms</i>			
Sore throat, %	10	12	11/0
Cough, %	78	50	4/0
Shortness of breath, %	47	29	5/0
Fever, %	75	69	10/0
Headache, %	18	8	11/0
Nausea or vomiting, %	25	17	9/0
Diarrhea, %	32	15	9/0
Myalgia or arthralgia, %	20	20	11/1

Temperature, Celcius	38.1 ± 1.0	37.8 ± 1.1	4/2
Respiration rate, /minute	20.8 ± 6.6	18.6 ± 6.4	13/7
Oxygen saturation with room air, %	94.8 ± 4.3	94.5 ± 4.4	10/7
Systolic blood pressure, mm Hg	134 ± 22	143 ± 28	10/0
Diastolic blood pressure, mm Hg	81 ± 18	72 ± 19	10/0
Pulse rate, BPM	85 ± 18	79 ± 14	11/2
COVID-19 test result positive, %	95	94	1/0
Abnormalities chest X-ray suggestive for COVID-19, %	55	40	2/0
Abnormalities CT-scan suggestive for COVID-19, %	83	29	3/0
<i>Laboratory results</i>			
Lymphocyte count, x1000/microL	1.0 (0.6-1.5)	1.0 (0.6-1.4)	24/16
eGFR, mL/min	36 (25-54)	NA	18/NA
CRP, mg/L	61 (28-97)	65 (17-122)	18/7

Continuous variables are reported as mean ± SD or median (IQR). eGFR is calculated with the creatinine-based CKD-EPI formula. Obesity is defined as BMI > 30 kg/m². Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; COVID-19, corona virus disease 2019; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

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Patient and COVID-19 characteristics at presentation
For patients with a kidney transplant, according to hospital status

Table 2

	Control group*	Patients with a kidney transplant			
		Not admitted	Admitted to		Deceased **
			Hospital, no ICU	ICU	
Number of patients, N		16	37	9	9
Number of patients, %		26	60	14	16
Male sex, %		69	68	44	67
Age, y		58 ± 9	63 ± 15	54 ± 16	73 ± 12
BMI, kg/m ²		25.3 ± 2.7	26.4 ± 5.1	26.3 ± 4.1	24.6 ± 3.3
Race					
Asian, %		0	0	0	0
Black or African descent, %		0	3	0	0
White or Caucasian, %		75	62	33	56
Other, %		0	0	0	0
Unknown, %		25	35	67	44
Tobacco use					
Current, %		0	0	11	11
Prior, %		32	27	22	33
Never, %		32	43	22	44
Unknown, %		38	30	44	11
Clinical frailty scale					
Very fit, %		20	2	13	0
Well, %		7	11	13	0
Managing well, %		20	15	13	0
Vulnerable, %		7	5	0	0
Mildly frail, %		0	3	0	0
Moderately frail, %		0	2	0	11
Severely frail, %		0	2	0	0
Very severely frail, %		0	0	0	0
Terminally ill, %		0	0	0	0
Primary kidney disease					
Primary glomerulonephritis, %		17	6	0	0
Pyelonephritis, %		0	18	0	0
Interstitial nephritis, %		0	0	0	0
Familial/hereditary renal diseases, %		33	29	0	0

Congenital diseases, %		17	0	0	0
Vascular diseases, %		0	12	0	11
Secondary glomerular/systemic disease, %		17	12	0	0
Diabetic kidney disease, %		17	18	0	11
Other, %		0	6	0	11
Unknown, %		0	0	100	0
<i>Comorbidities</i>					
Obesity, %		0	11	0	0
Hypertension, %		69	68	75	67
Diabetes Mellitus, %		25	32	38	44
Coronary artery disease, %		31	43	13	56
Heart failure, %		0	8	0	22
Chronic lung disease, %		6	8	13	11
Active malignancy, %		0	8	0	22
Auto-immune disease, %		0	3	0	0
<i>Use of RAASi use at presentation</i>					
ACE-inhibitors, %		20	19	38	22
ARB, %		0	24	25	33
<i>Use of immunosuppressives at presentation</i>					
Prednisone, %		93	79	88	78
Tacrolimus, %		86	68	75	78
Cyclosporine, %		0	16	14	22
Mycophenolate, %		69	55	75	67
mTOR inhibitor, %		15	13	14	11
Azathioprine, %		8	10	0	0
Belatacept, %		0	0	0	0
Anti TNF A, %		0	0	0	0
Rituximab, %		0	0	0	0
Cyclophosphamide, %		0	0	0	0
Other, %		0	0	0	0
<i>COVID-19 symptoms</i>					
Sore throat, %	NA	8	10	17	13
Cough, %	NA	93	69	100	78
Shortness of breath, %	NA	14	53	63	89
Fever, %	NA	75	74	67	75
Headache, %	NA	25	20	0	25
Nausea or vomiting, %	NA	8	30	43	50
Diarrhea, %	NA	8	37	71	38
Myalgia or arthralgia, %	NA	17	10	67	13

Temperature, Celcius	NA	37.9 ± 1.0	38.1 ± 1.0	37.9 ± 1.1	37.8 ± 0.7
Respiration rate, /minute	NA	16.8 ± 4.8	21.3 ± 5.8	21.1 ± 8.2	23.7 ± 8.0
Oxygen saturation with room air, %	NA	97.0 ± 1.7	94.1 ± 4.9	94.6 ± 2.9	93.7 ± 4.7
Systolic blood pressure, mm Hg	NA	135 ± 14	136 ± 26	122 ± 16	144 ± 38
Diastolic blood pressure, mm Hg	NA	83 ± 11	83 ± 19	71 ± 18	80 ± 25
Pulse rate, BPM	NA	76 ± 12	89 ± 18	80 ± 16	82 ± 10
COVID-19 test result positive, %	NA	100	91	100	100
Suggestive abnormalities X-ray, %	NA	33	50	83	80
Suggestive abnormalities CT-scan, %	NA	50	86	80	75
<i>Laboratory results</i>					
Lymphocyte count, x1000/microL	NA	3.5 (2.1-7.0)	0.8 (0.6-1.1)	0.6 (0.6-0.8)	0.8 (0.6-1.1)
eGFR, mL/min	NA	55 (21-63)	30 (25-46)	40 (34-75)	28 (17-40)
CRP, mg/L	NA	12 (6-21)	(36-101) 64	94 (84-159)	76 (43-139)

Continuous variables are reported as mean ± SD or median (IQR).

* Control group: formed by the average of all patients with a kidney transplant in the ERA-EDTA registry

** Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

eGFR is calculated with the creatinine-based CKD-EPI formula. Obesity is defined as BMI > 30 kg/m². Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; COVID-19, corona virus disease 2019; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

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Patient and COVID-19 characteristics at presentation
For patients on dialysis, according to hospital status

Table 3

	Control group*	Patients on dialysis			
		Not admitted	Admitted to		Deceased **
			Hospital, no ICU	ICU	
Number of patients, N		17	32	1	10
Number of patients, %		34	64	2	20
Male sex, %		35	66	0	50
Age, y		66 ± 18	69 ± 13	59	71 ± 6
BMI, kg/m ²		25.6 ± 8.3	27.8 ± 7.0	23.3	31.8 ± 6.3
Race					
Asian, %		12	6	0	20
Black or African descent, %		6	6	0	0
White or Caucasian, %		82	81	100	80
Other, %		0	6	0	0
Unknown, %		0	0	0	0
Tobacco use					
Current, %		0	3	0	0
Prior, %		29	34	0	50
Never, %		29	28	0	40
Unknown, %		41	34	100	10
Clinical frailty scale					
Very fit, %		0	7	0	10
Well, %		20	3	0	0
Managing well, %		20	21	100	0
Vulnerable, %		0	24	0	40
Mildly frail, %		8	17	0	30
Moderately frail, %		8	7	0	0
Severely frail, %		30	21	0	20
Very severely frail, %		14	0	0	0
Terminally ill, %		0	0	0	0
Primary kidney disease					
Primary glomerulonephritis, %		6	6	0	10
Pyelonephritis, %		0	3	100	0
Interstitial nephritis, %		0	0	0	0
Familial/hereditary renal diseases, %		0	3	0	0
Congenital diseases, %		6	0	0	0

Vascular diseases, %		35	38	0	50
Secondary systemic disease, %		0	9	0	0
Diabetic kidney disease, %		18	31	0	40
Other, %		18	3	0	0
Unknown, %		18	6	0	0
Hemodialysis, %		94	94	0	90
Peritoneal dialysis, %		6	6	100	10
Residual diuresis > +/- 200 ml/day		35	50	0	50
<i>Comorbidities</i>					
Obesity, %		18	34	0	50
Hypertension, %		88	94	100	100
Diabetes Mellitus, %		29	47	0	50
Coronary artery disease, %		24	47	0	60
Heart failure, %		12	34	0	50
Chronic lung disease, %		0	16	0	20
Active malignancy, %		6	13	0	0
Auto-immune disease, %		6	0	0	0
<i>Use of RAASi use at presentation</i>					
ACE-inhibitors, %		18	9	0	0
ARB, %		12	3	0	0
<i>Use of immunosuppressives at presentation</i>					
Prednisone, %		13	3	0	0
Tacrolimus, %		7	0	0	0
Cyclosporine, %		0	0	0	0
Mycophenolate, %		0	0	0	0
mTOR inhibitor (sirolimus, everolimus), %		7	0	0	0
Azathioprine, %		0	0	0	0
Belatacept, %		0	0	0	0
Anti TNF A, %		0	0	0	0
Rituximab, %		0	0	0	0
Cyclophosphamide, %		0	0	0	0
Other, %		0	3	0	10
<i>COVID-19 symptoms</i>					
Sore throat, %	NA	18	6	100	0
Cough, %	NA	59	44	100	40
Shortness of breath, %	NA	12	41	0	40
Fever, %	NA	71	72	100	100
Headache, %	NA	0	9	0	10

Nausea or vomiting, %	NA	6	19	100	40
Diarrhea, %	NA	12	19	0	40
Myalgia or arthralgia, %	NA	19	19	0	10
Temperature, Celcius	NA	37.7 ± 0.9	37.9 ± 1.2	38.8	38.1 ± 1.2
Respiration rate, /minute	NA	15.0 ± 2.5	20.3 ± 7.0	18.0	20.5 ± 7.2
Oxygen saturation with room air, %	NA	96.7 ± 2.3	93.7 ± 4.6	88.0	90.9 ± 6.5
Systolic blood pressure, mm Hg	NA	147 ± 17	137 ± 30	220	123 ± 23
Diastolic blood pressure, mm Hg	NA	71 ± 17	71 ± 19	116	62 ± 13
Pulse rate, BPM	NA	75 ± 12	81 ± 19	72	80 ± 13
COVID-19 test result positive, %	NA	100	91	100	100
Suggestive abnormalities X-ray, %	NA	0	71	100	71
Suggestive abnormalities CT-scan, %	NA	100	100	100	100
<i>Laboratory results</i>					
Lymphocyte count, x1000/microL	NA	1.3 (1.1-4.1)	0.7 (0.6-0.9)	1.0	0.7 (0.6-0.8)
eGFR, mL/min	NA	NA	NA	NA	NA
CRP, mg/L	NA	12 (6-73)	80 (45-143)	264	101 (46-158)

Continuous variables are reported as mean ± SD or median (IQR).

* Control group: formed by the average of all patients on dialysis in the ERA-EDTA registry

** Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

eGFR is calculated with the creatinine-based CKD-EPI formula. Obesity is defined as BMI > 30 kg/m². Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; COVID-19, corona virus disease 2019; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

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Follow-up data of KRT patients with COVID-19
 According to type of kidney replacement therapy

Table 4.

	Kidney transplant Patients (n= 66)	Dialysis Patients (n= 52)	Missing data (n)
Hospitalisation, %	75	65	2/2
Reason for no hospital admission			3/1
No indication, %	100	94	
Logistical reasons related to COVID-19, %	0	0	
Patient/family preferred no admission, %	0	6	
ICU admission, %	20	3	2/0
Reason for no ICU admission			11/1
No indication, %	83	73	
Logistical reasons related to COVID-19, %	0	0	
Patient/family preferred no admission, %	4	3	
Prognosis was too bad, %	13	23	
Intubation, %	18	3	3/0
Reason for no intubation			10/2
No indication, %	83	72	
Logistical reasons related to COVID-19, %	0	0	
Patient/family preferred no admission, %	4	3	
Prognosis was too bad, %	13	24	
Start of CVVH/hemodialysis, %	6	-	9/31
Reasons not to start CVVH/hemodialysis			18/31
No indication, %	96	NA	
Logistical reasons related to COVID-19, %	0	-	
Patient/family preferred no admission, %	0	-	
Prognosis was too bad, %	4	-	
Continuing kidney replacement therapy during admission, %	NA	100	
Increase in intensity kidney replacement therapy, %	NA	6	
Reason for discontinuation of kidney replacement therapy			
No indication, %	NA	-	-/31
Logistical reasons related to COVID-19, %	NA	-	
Patient/family preferred no admission, %	NA	-	
Prognosis was too bad, %	NA	-	

Continuous variables are reported as mean \pm SD or median (IQR). Abbreviations: CVVH, continuous veno-venous hemofiltration; COVID-19, corona virus disease 2019; ICU, intensive care unit; NA, not applicable.

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Follow-up data for patients with a kidney transplant with COVID-19
 According to hospital status

Table 5.

	Not admitted to hospital (n= 16)	Admitted to hospital, no ICU (n= 37)	Admitted to ICU (n= 9)	Deceased* (n= 9)
Organ dysfunction				
Liver (transaminases > 2 times ULN), %	0	3	13	0
Heart (heart failure/new ECG abn), %	0	0	0	33
Kidney (>25% increase in creatinine), %	7	24	13	63
Antiviral therapy, %	0	41	88	63
(Hydroxy)chloroquine, %	-	91	100	75
Lopinavir/ritonavir, %	-	0	40	0
Remdesevir, %	-	0	0	0
Interferon, %	-	0	20	0
Other, %	-	8	0	0
Anti-inflammatory therapy, %	0	0	0	0
Tocilizumab, %	-	-	-	-
Anakinra, %	-	-	-	-
High dose steroids, %	-	-	-	-
Other, %	-	-	-	-
ACE-inhibitor use				
Continued, %	100	50	0	0
Discontinued, %	0	50	100	100
Replaced by ARB, %	0	0	0	0
ARB use				
Continued, %	-	57	50	50
Discontinued, %	-	43	50	50
Change in dose immunosuppressive drugs < 48h after presentation				
Tacrolimus				
No change, %	91	63	50	33
Reduction, %	9	23	0	0
Withdrawal, %	0	14	50	67
Cyclosporine				
No change, %	-	100	100	100

Reduction, %	-	0	0	0
Withdrawal, %	-	0	0	0
Mycophenolate				
No change, %	13	26	17	17
Reduction, %	0	5	0	0
Withdrawal, %	87	68	83	83
Azathioprine				
No change, %	0	33	-	-
Reduction, %	0	0	-	-
Withdrawal, %	100	67	-	-
mTor inhibitor				
No change, %	50	33	0	0
Reduction, %	0	0	0	0
Withdrawal, %	50	67	100	100
Belatacept				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-
Prednisone				
No change, %	67	54	43	43
Reduction, %	0	0	0	0
Increase, %	33	46	57	57
Anti TNF A				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-
Rituximab				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-
Cyclophosphamide				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-

Continuous variables are reported as mean \pm SD or median (IQR). Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; COVID-19, corona virus disease 2019; ICU, intensive care unit; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

* Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

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Follow-up data for patients on dialysis with COVID-19
 According to hospital status

Table 6.

	Not admitted to hospital (n=16)	Admitted to hospital, no ICU (n=32)	Admitted to ICU (n=1)	Deceased* (n=10)
Continuing KRT during admission, %	NA	100	100	100
Increase in intensity KRT, %	NA	3	100	10
Reason for discontinuation KRT				
No indication, %	NA	-	-	-
Logistical reasons related to COVID-19, %	NA	-	-	-
Patient/family preferred no admission, %	NA	-	-	-
Prognosis was too bad, %	NA	-	-	-
Organ dysfunction				
Liver (transaminases > 2 times ULN), %	NA	19	100	10
Heart (heart failure/new ECG abn), %	NA	16	0	40
Antiviral therapy, %	12	34	100	40
(Hydroxy)chloroquine, %	100	91	100	100
Lopinavir/ritonavir, %	0	0	0	0
Remdesivir, %	0	0	0	0
Interferon, %	0	0	0	0
Other, %	0	0	0	0
Anti-inflammatory therapy, %	NA	6	0	20
Tocilizumab, %	NA	0	-	0
Anakinra, %	NA	0	-	0
High dose steroids, %	NA	50	-	50
Other, %	NA	50	-	50
ACE-inhibitor use				
Continued, %	100	100	-	-
Discontinued, %	0	0	-	-
Replaced by ARB, %	0	0	-	-
ARB use				
Continued, %	100	100	-	-
Discontinued, %	0	0	-	-

Continuous variables are reported as mean \pm SD or median (IQR). Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; COVID-19, corona virus disease 2019; ICU, intensive care unit; NA, not applicable.

* Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

THE NETHERLANDS
Preliminary outcome of hospital admitted KRT patients with COVID-19*
 According to type of kidney replacement therapy

Table 7.

	Kidney transplant patients (n= 46)	Dialysis patients (n= 33)	Missing data (n)
Status			
Alive, %	80	70	
Deceased, %	20	30	
Lost to follow-up, %	0	0	
Specification alive			
Still admitted, %	41	22	
Transferred to another hospital, %	0	0	
Transferred to a nursing home, %	5	17	
Discharged to home, %	54	61	
Cause of death related to COVID-19, %	100	100	1/0

Abbreviations: COVID-19, corona virus disease 2019.

* These data relate to patients admitted to hospital only, and are preliminary. Some patients are still admitted, and their vital status can therefore yet change during the admission.