UNIVERSITEIT STELLENBOSCH UNIVERSITY

Morning Brief : Scientific Review

(17 April 2020)

The purpose of the Morning Brief is to **summarise** and present key information, research articles and other relevant publications pertaining to critical care and COVID-19. We aim to prioritise information, articles and publications released in the preceding 24-48 hours

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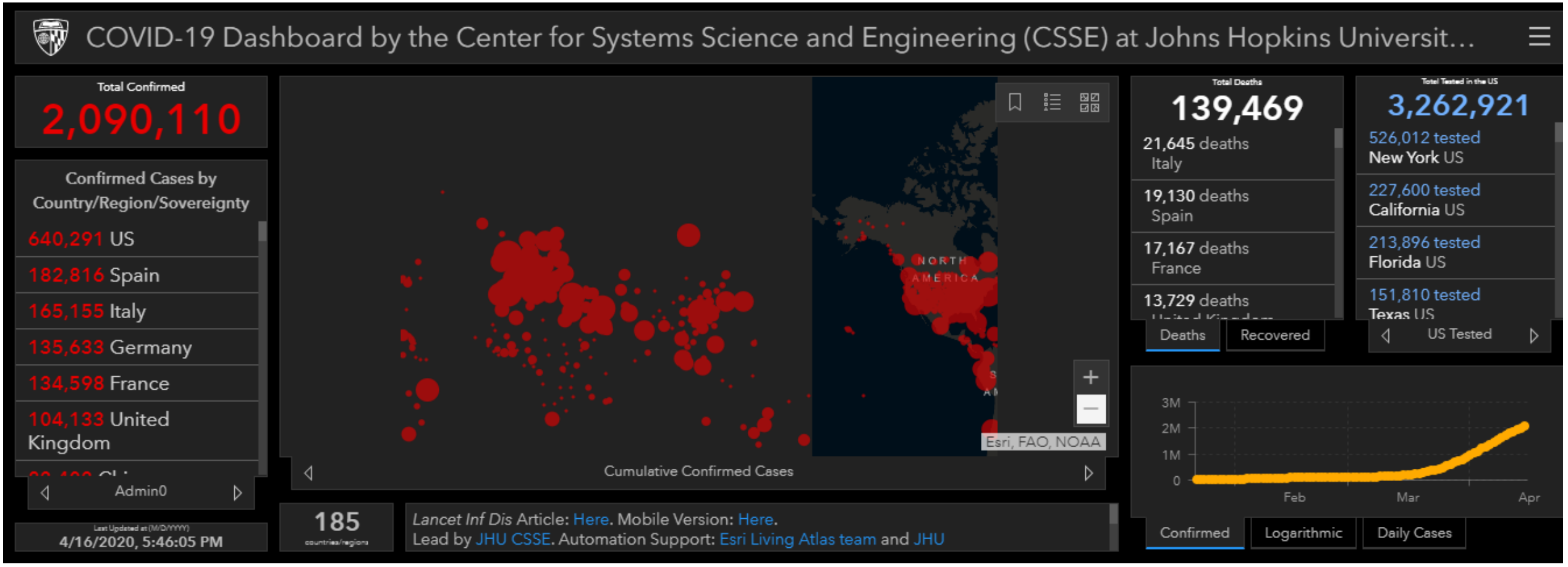
Content

- Daily Statistics (Global update)
- Daily Statistics (South African update)
- Articles of interest:
  - **The Novel Coronavirus 2019 epidemic and kidneys**
  - **Kidney disease is associated with in-hospital death of patients with COVID-19**

Global Update

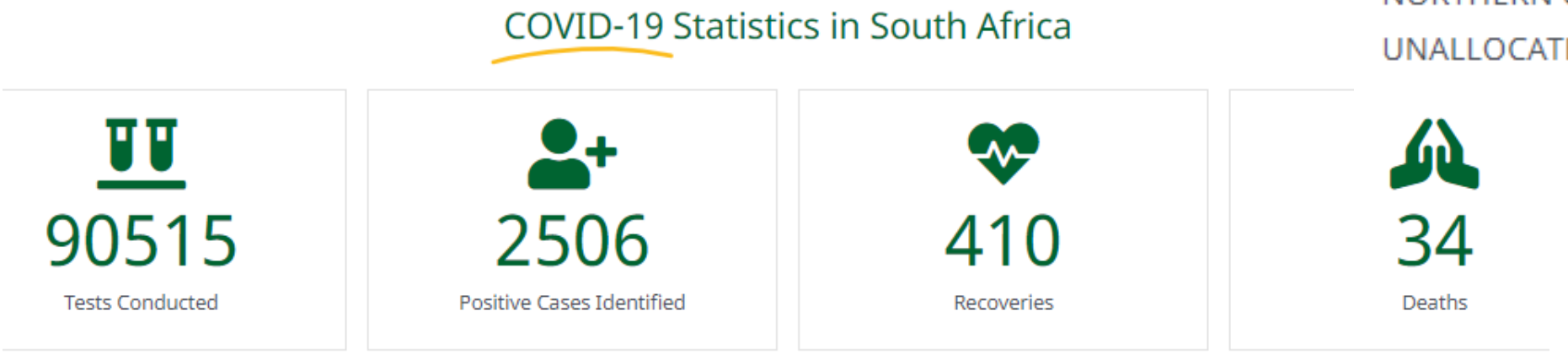


Accessed on 16 April 2020 at 19:05
Source: https://coronavirus.jhu.edu/map.html

South African Update

The provincial breakdown is as follows:

GAUTENG	930
WESTERN CAPE	657
KWAZULU – NATAL	519
EASTERN CAPE	199
FREE STATE	97
LIMPOPO	25
NORTH WEST	23
MPUMALANGA	22
NORTHERN CAPE	16
UNALLOCATED	18



Accessed on 16 April 2020 at 19:13
Source:https://sacoronavirus.co.za/2020/04/15/update-on-covid-19-15th-april-2020/

Articles of Interest

Theme: COVID-19 and the Kidney

- 2 Papers

www.kidney-international.org editorial

The Novel Coronavirus 2019 epidemic and kidneys

OPEN

Kidney International (2020) ■, ■–■; https://doi.org/10.1016/j.kint.2020.03.001

KEYWORDS: acute kidney injury; hemodialysis

www.kidney-international.org editorial: special report

Kidney disease is associated with in-hospital death of patients with COVID-19

OPEN

Yichun Cheng[1,2], Ran Luo[1,2], Kun Wang[1,2], Meng Zhang[1], Zhixiang Wang[1], Lei Dong[1], Junhua Li[1], Ying Yao[1], Shuwang Ge[1] and Gang Xu[1]

www.kidney-international.org editorial

The Novel Coronavirus 2019 epidemic and kidneys

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Kidney International (2020) ■, ■–■; https://doi.org/10.1016/j.kint.2020.03.001

KEYWORDS: acute kidney injury; hemodialysis

07th March 2020

Naicker, S et al.; The Novel Coronavirus 2019 epidemic and kidneys; Kidney International; doi: 10.1016/j.kint.2020.03.001

Kidney involvement in COVID-19 infection

- In previous reports of SARS and MERS-CoV infections, acute kidney injury (AKI) developed in 5% to 15% of cases and carried a high (60%–90%) mortality rate
- Early reports suggested a lower incidence (3%–9%) of AKI in those with COVID-19 infection.(1-4)
- Recent reports, however, have shown a higher frequency of renal abnormalities.
- A study of 59 patients with COVID-19 found that 34% of patients developed massive albuminuria on the first day of admission, and 63% developed proteinuria during their stay in hospital (5)
  - Blood urea nitrogen was elevated in 27% overall and in two-thirds of patients who died.
- Computed tomography scan of the kidneys showed reduced density, suggestive of inflammation and oedema. (4)
- AKI was an independent risk factor for in-hospital mortality.

1. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study
2. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395:507–513.
3. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of 2019 novel coronavirus infection in China [e-pub ahead of print]. N Engl J Med.
4. Cheng Y, Luo R, Wang K, et al. Kidney impairment is associated with in-hospital death of COVID-19 patients
5. Li Z, Wu M, Guo J, et al. Caution on kidney dysfunctions of 2019-nCoV patients. medRxiv 2020.02. 08.20021212. Accessed March 2, 2020.

Pathogenesis

- The exact mechanism of kidney disease in patients with COVID-19 is unclear, however it is likely to be multifactorial.
- The authors propose 3 mechanisms of kidney:
  - **First mechanism suggests that** the novel coronavirus may exert direct cytopathic effects on kidney tissue
  - **The Second mechanism involves the** deposition of immune complexes of viral antigen or virus-induced specific immunological effector mechanisms may damage the kidney
  - **The Third mechanism suggests that** virus-induced cytokines or mediators might exert indirect effects on renal tissue, such as hypoxia, shock, and rhabdomyolysis.

COVID-19 in patients with Chronic kidney disease

- The impact of COVID-19 on chronic kidney disease has not been reported
- However, COVID-19 infection presents a special threat to patients on dialysis.
  - Patients with uremia are particularly vulnerable to infection and may exhibit greater variations in clinical symptoms and infectivity.
- A small study that reported on the cause of death in patients with CKD found that they are likely to die from cardiovascular complications
- Patients on HD with COVID-19 had less lymphopenia and lower serum levels of inflammatory cytokines(1)

1. Ma Y, Diao B, Lv X, et al. 2019 novel coronavirus disease in hemodialysis (HD) patients: report from one HD center in Wuhan, China.

Treatment

- The current treatment of COVID-19 with AKI includes general and supportive management and kidney replacement therapy.

www.kidney-international.org editorial: special report

Kidney disease is associated with in-hospital death of patients with COVID-19

Yichun Cheng[1,2], Ran Luo[1,2], Kun Wang[1,2], Meng Zhang[1], Zhixiang Wang[1], Lei Dong[1], Junhua Li[1], Ying Yao[1], Shuwang Ge[1] and Gang Xu[1]

OPEN

15th March 2020

Cheng, Y, et al.; Kidney disease is associated with in-hospital death of patients with COVID-19; Kidney International; doi: 10.1016/j.kint.2020.03.005

Aims

- To determine the prevalence of acute kidney injury (AKI) in patients with COVID-19
- To evaluate the association between markers of abnormal kidney function and death in patients with COVID-19.

Methods

- Prospective cohort study of 701 patients with COVID-19 admitted in a tertiary teaching hospital in Wuhan of whom 113 (16.1%) died in hospital.
- Consecutive patients with COVID-19 admitted to Tongji Hospital, from January 28 to February 11, 2020, were enrolled.

- All patients who were enrolled in this study were diagnosed COVID-19 according to the guidance provided by the Chinese National Health Commission
- Patients with a history of maintenance dialysis or renal transplantation were excluded from the study.
- Clinical outcomes were monitored up to February 29, 2020, the final date of follow-up.

Table 1 | Characteristics and outcomes of patients with COVID-2019

Variables	All patients	Normal baseline serum creatinine	Elevated baseline serum creatinine	*P* value
Number	701	600	101	
Age, yr	63 (50–71)	61 (49–69)	73 (62–79)	<0.001
Male patients	367 of 701 (52.4)	294 of 600 (49.0)	73 of 101 (72.3)	<0.001
Days from illness onset to admission, d	10 (7–13)	10 (7–13)	9 (7–12)	0.381
Fever on admission	213 of 655 (32.5)	187 of 560 (33.4)	26 of 95 (27.4)	0.246
Systolic blood pressure, mm Hg	128 (117–143)	128 (118–142)	128 (114–144)	0.942
Diastolic blood pressure, mm Hg	79 (72–87)	79 (73–87)	77 (70–86)	0.282
Severe disease	297 of 701 (42.4)	244 of 600 (40.7)	53 of 101 (52.5)	0.026
Any comorbidity	297 of 698 (42.6)	237 of 598 (39.6)	60 of 100 (60.0)	<0.001
Chronic kidney disease	14 of 698 (2.0)	5 of 598 (0.8)	9 of 100 (9.0)	<0.001
Chronic obstructive pulmonary disease	13 of 698 (1.9)	9 of 598 (1.5)	4 of 100 (4.0)	0.191
Hypertension	233 of 698 (33.4)	185 of 598 (30.9)	48 of 100 (48.0)	0.001
Diabetes	100 of 698 (14.3)	84 of 598 (14.0)	16 of 100 (16.0)	0.606
Tumor	32 of 698 (4.6)	28 of 598 (4.7)	4 of 100 (4.0)	0.965
Admission to intensive care unit	73 of 701 (10.4)	60 of 600 (10.0)	13 of 101 (12.8)	0.382
Administration of mechanical ventilation	97 of 701 (13.4)	75 of 600 (12.5)	22 of 101 (21.8)	0.012
Acute kidney injury	36 of 701 (5.1)	24 of 600 (4.0)	12 of 101 (11.9)	0.001
Stage 1	13 of 701 (1.9)	10 of 600 (1.7)	3 of 101 (3.0)	0.356
Stage 2	9 of 701 (1.3)	4 of 600 (0.7)	5 of 101 (5.0)	
Stage 3	14 of 701 (2)	10 of 600 (1.7)	4 of 101 (4.0)	
In-hospital death	113 of 701 (16.1)	79 of 600 (13.2)	34 of 101 (33.7)	<0.001

COVID-19, coronavirus disease 2019.

Data are presented as number/total (percentage) or median (interquartile range). The severity was staged based on the guidelines for diagnosis and treatment of COVID-19 (trial fifth edition) published by the Chinese National Health Commission on February 4, 2020.

Incidence of AKI and in-hospital death.

- During the study period, AKI occurred in 5.1% patients
- The incidence of AKI was significantly higher in patients with elevated baseline serum creatinine (11.9%) than in patients with normal baseline values (4.0%)

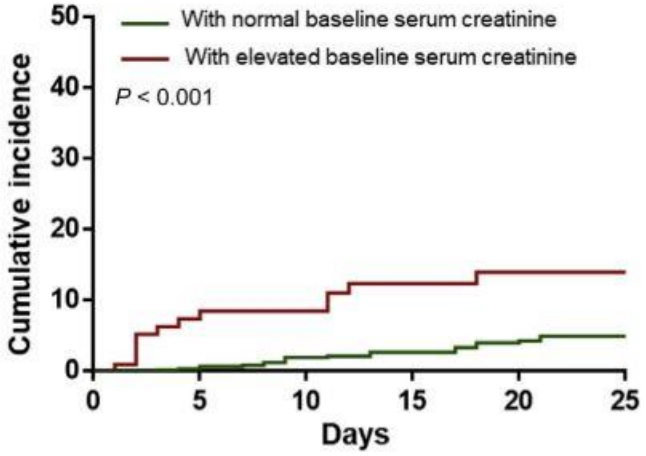

Figure 1 | Cumulative incidence of acute kidney injury of patients with coronavirus disease 2019 subgrouped by baseline serum creatinine.

Incidence of AKI and in-hospital death.

- The incidence of in-hospital death in the patients with elevated baseline serum creatinine was 33.7%, which was significantly higher than in those with normal baseline serum creatinine (13.2%)

- Kaplan- Meier analysis demonstrated that patients with kidney disease had a significantly higher risk for in-hospital death

- After adjusting for age, sex, disease severity, comorbidities, and lymphocyte count, the following were all associated with in-hospital death:
  - proteinuria of any degree,
  - hematuria of any degree,
  - elevated baseline BUN,
  - serum creatinine,
  - peak serum creatinine > 133 mmol/l, and
  - AKI over stage 2

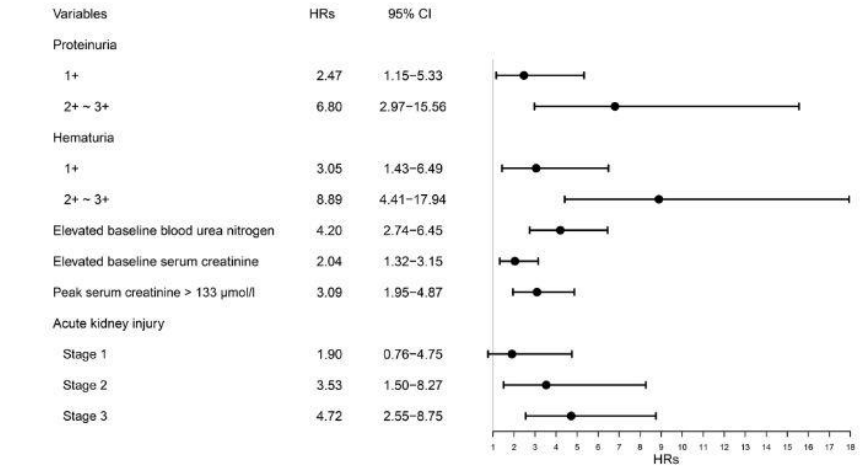

Figure 3 | Association of kidney disease with in-hospital death in patients with coronavirus disease 2019 (COVID-19). Hazard ratios (HRs) of each variable were obtained using separate proportional hazard Cox models after adjustment for age, sex, disease severity, any comorbidity, and lymphocyte count. The severity was staged based on the guidelines for diagnosis and treatment of COVID-19 (trial fifth edition) published by the Chinese National Health Commission on February 4, 2020. Comorbidities include chronic kidney disease, chronic obstructive pulmonary disease, hypertension, diabetes, and tumor. 95% CI, 95% confidence interval.

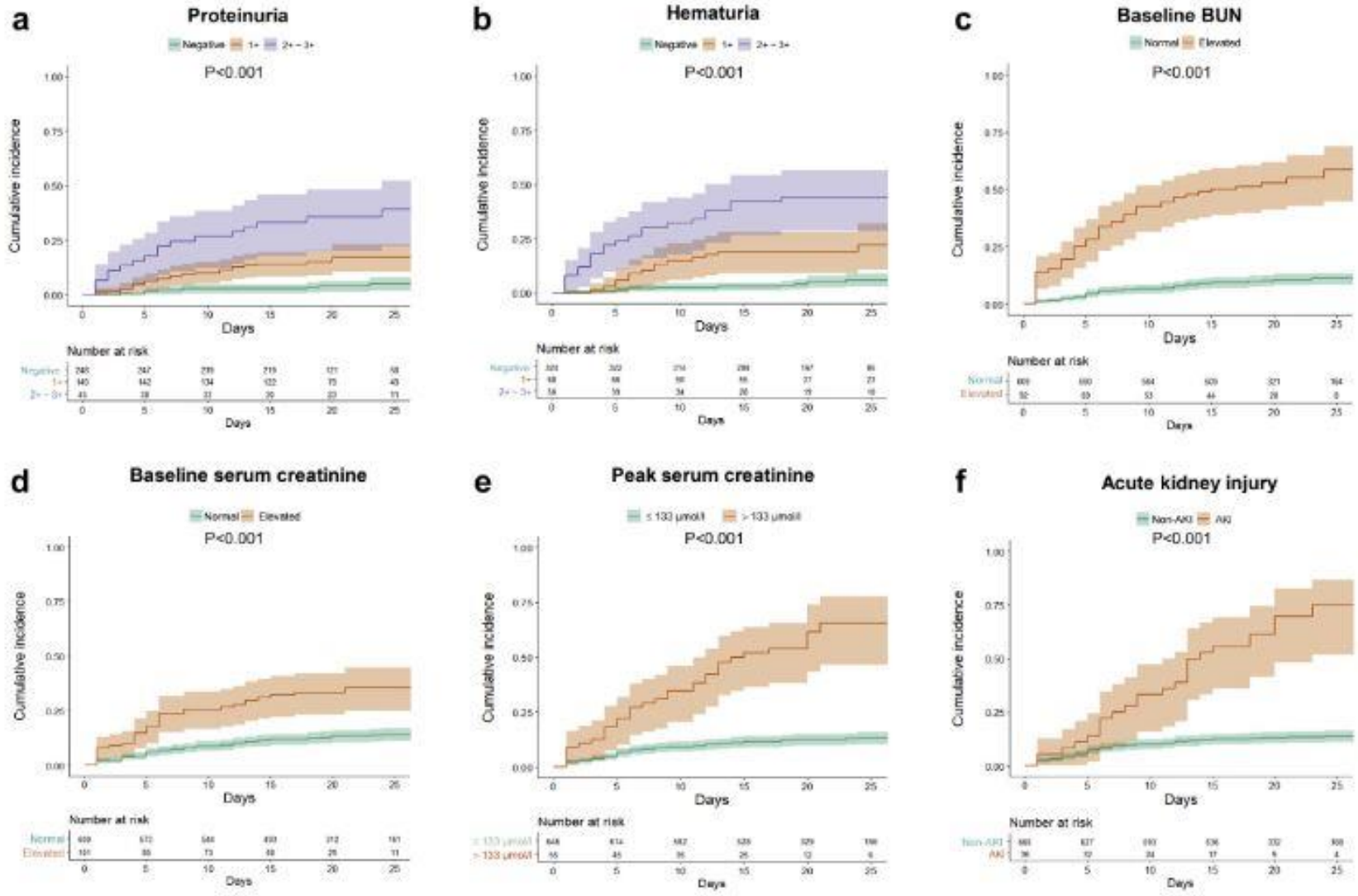

Figure 2| Cumulative incidence for in-hospital death of patients with coronavirus disease 2019 subgrouped by kidney disease indicators. Shadows indicate the 95% confidence intervals of the corresponding estimates: (**a**) proteinuria, (**b**) hematuria, (**c**) baseline blood urea nitrogen (BUN), (**d**) baseline serum creatinine, (**e**) peak serum creatinine, and (**f**) acute kidney injury.

Conclusion

- The prevalence of kidney disease in patients with COVID-19 hospitalized in Wuhan, China, was high
- Kidney disease on admission and AKI during hospitalization were associated with an increased risk of in hospital death
- Early detection and effective intervention of kidney involvement may help to reduce deaths of patients with COVID-19.

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Limitations

- An accurate baseline serum creatinine was not available, which may have led to an underestimation of AKI or erroneous association
- Although they attempted to adjust for many confounders, other unmeasured or unknown confounders might have played a role.
- Third, clinical data of patients after discharge were lacking, so we could not assess COVID-19 effects on long-term outcomes.