

# Impact of COVID-19 on the mortality of dialysis patients and kidney transplant recipients during the Omicron fifth wave in Hong Kong

**KM Chow**<sup>1</sup>\*, MB, ChB, FRCP, **John YH Chan**<sup>2</sup>, MB, ChB, FRCP, **Sunny SH Wong**<sup>3</sup>, MB, BS, FRCP, **SK Yuen**<sup>4</sup>, MB, ChB, FRCP, **PN Wong**<sup>5</sup>, MB, ChB, FRCP, **YL Cheng**<sup>6</sup>, MB, ChB, FRCP, **CC Szeto**<sup>1</sup>, MB, ChB, MD

<sup>1</sup> Department of Medicine and Therapeutics, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

<sup>2</sup> Department of Medicine, Queen Elizabeth Hospital, Hong Kong

<sup>3</sup> Department of Medicine and Geriatrics, United Christian Hospital, Hong Kong

<sup>4</sup> Department of Medicine and Geriatrics, Caritas Medical Centre, Hong Kong

<sup>5</sup> Department of Medicine and Geriatrics, Kwong Wah Hospital, Hong Kong

<sup>6</sup> Department of Medicine, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

\* Corresponding author: chow\_kai\_ming@alumni.cuhk.net

This article was published on 13 Jan 2023 at [www.hkmj.org](http://www.hkmj.org).

Hong Kong Med J 2023;29:Epub

<https://doi.org/10.12809/hkmj2210309>

This version may differ from the print version.

During the fifth wave of novel coronavirus disease 2019 (COVID-19) caused by the Omicron variant of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in Hong Kong, the reported mortality rate of 37.7 per million population was one of the highest worldwide.<sup>1</sup> This pandemic wave provided a unique opportunity to assess the impact of COVID-19 on the mortality of patients receiving peritoneal dialysis, haemodialysis or kidney transplantation. Among them, peritoneal dialysis patients had been perceived to be less vulnerable to SARS-CoV-2 infection because their treatment was home-based with better protection by self-isolation. On the contrary, in-centre haemodialysis patients were perceived to have a higher likelihood of infection due to practical challenges of maintaining social distancing within a crowded dialysis unit.<sup>2-5</sup>

Estimates of SARS-CoV-2 incidence are heavily influenced by the frequency and intensity of surveillance. As such, the prevalence of COVID-19 infection may have been underestimated for peritoneal dialysis patients compared with that of haemodialysis patients. Furthermore, peritoneal dialysis patients are less likely to be hospitalised after infection so the exact disease burden might not be easily assessed. Collider bias, therefore, is a problem encountered when both the risk factor (haemodialysis) and the factor on the pathway to the outcome of interest (for instance, hospitalisation on the pathway to death) influence the mechanisms behind selection into a study sample population.<sup>6,7</sup> To overcome this bias, we determined the mortality of COVID-19 for all patients separately for each mode of renal replacement therapy (instead of the infected population). We retrospectively analysed six large renal units in Hong Kong and included patients between 1 October 2021 and 30 April 2022. Of the 5514 patients, 1231 (22.3%) were on haemodialysis, 2526 (45.8%) on peritoneal

dialysis, and 1757 (31.9%) were kidney transplant recipients. Mortality of COVID-19, defined as death due to COVID-19 infection in the absence of a clear alternative cause (such as peritonitis),<sup>8</sup> was estimated from death registry and chart review. Data for uncertain causes of death, including those with sudden death with concurrent COVID-19 infection, were also captured. A total of 90 patients from our cohort died of COVID-19. Similar to deaths reported for the whole population during a similar period,<sup>1</sup> over 60% of deaths in dialysis or kidney transplant patients occurred in unvaccinated persons. An imbalance of unvaccinated patients was noted for those on peritoneal dialysis, representing 73% of those on peritoneal dialysis who succumbed to COVID-19. As shown in the Table, the peritoneal dialysis and haemodialysis populations had similarly high mortality attributable to COVID-19, with 19.4 and 21.9 deaths per 1000 dialysis population, respectively.

Our results contrast with the previous observation of strikingly lower COVID-19 cases and deaths per population in Asian countries.<sup>4</sup> Although we cannot exclude confounding factors such as frailty and age, the results of a high mortality burden among peritoneal dialysis patients should caution nephrologists who give advice about vaccination of dialysis patients. It should be emphasised that a perceived lower risk of infection might have caused a more relaxed attitude among peritoneal dialysis patients. Potential explanations for the relatively high mortality in the peritoneal dialysis cohort are lower adherence to hand hygiene, mask wearing, social distancing, and most significantly, vaccine uptake. The observation of lower vaccine coverage among death cases in peritoneal dialysis patients supports the hypothesis although we did not have population-level data of vaccination coverage among all dialysis patients. Our findings are therefore important

TABLE. Mortality of patients on haemodialysis, peritoneal dialysis and with kidney transplantation

|   | Haemodialysis | Peritoneal dialysis | Kidney transplantation |
|---|---------------|---------------------|------------------------|
| Total No. of patients   | 1231          | 2526                | 1757                   |
| No. of patients with COVID-19 mortality   | 27            | 49                  | 14                     |
| Male  | 18            | 37                  | 10                     |
| Female  | 9             | 12                  | 4                      |
| COVID-19 mortality per 1000 patient population  | 21.9          | 19.4                | 8.0                    |
| Mean ( $\pm$ standard deviation) age of patients who died from COVID-19, y              | 70 $\pm$ 13   | 69 $\pm$ 9          | 71 $\pm$ 6             |
| No. of vaccine doses received by patients who died from COVID-19 (% of all death cases) |               |                     |                        |
| 0   | 13 (48.1%)    | 36 (73.5%)          | 6 (42.9%)              |
| 1   | 11 (40.7%)    | 6 (12.2%)           | 5 (35.7%)              |
| $\geq 2$  | 3 (11.1%)     | 7 (14.3%)           | 3 (21.4%)              |
| No. of patients with sudden death and concurrent COVID-19 infection                     | 9             | 11                  | 0                      |

Abbreviation: COVID-19 = coronavirus disease 2019

for patient information and COVID-19 infection preparedness in the nephrology community.

#### Author contributions

Concept or design: All authors.

Acquisition of data: KM Chow, JYH Chan, SSH Wong, SK Yuen, PN Wong.

Analysis or interpretation of data: KM Chow, YL Cheng, CC Szeto.

Drafting of the manuscript: All authors.

Critical revision of the manuscript for important intellectual content: KM Chow, YL Cheng, CC Szeto.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

#### Conflicts of interest

All authors disclosed no conflicts of interest.

#### Funding/support

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

#### Ethics approval

The study adhered to the tenets of the Declaration of Helsinki.

#### References

1. Smith DJ, Hakim AJ, Leung GM, et al. COVID-19 mortality

and vaccine coverage—Hong Kong Special Administrative Region, China, January 6, 2022–March 21, 2022. *MMWR Morb Mortal Wkly Rep* 2022;71:545-8.

2. Corbett RW, Blakey S, Nitsch D, et al. Epidemiology of COVID-19 in an urban dialysis center. *J Am Soc Nephrol* 2020;31:1815-23.

3. Yau K, Muller MP, Lin M, et al. COVID-19 outbreak in an urban hemodialysis unit. *Am J Kidney Dis* 2020;76:690-5. e1.

4. Robinson BM, Guedes M, Alghonaim M, et al. Worldwide early impact of COVID-19 on dialysis patients and staff and lessons learned: a DOPPS roundtable discussion. *Kidney Med* 2021;3:619-34.

5. Hsu CM, Weiner DE, Awesh G, Salenger P, Johnson DS, Lacson E Jr. Epidemiology and outcomes of COVID-19 in home dialysis patients compared with in-center dialysis patients. *J Am Soc Nephrol* 2021;32:1569-73.

6. Griffith GJ, Morris TT, Tudball MJ, et al. Collider bias undermines our understanding of COVID-19 disease risk and severity. *Nat Commun* 2020;11:5749.

7. Mahalingasivam V, Su G, Iwagami M, Davids MR, Wetmore JB, Nitsch D. COVID-19 and kidney disease: insights from epidemiology to inform clinical practice. *Nat Rev Nephrol* 2022;18:485-98.

8. International Statistical Classification of Diseases, World Health Organization. International guidelines for certification and classification (coding) of COVID-19 as a cause of death. Available from: <https://cdn.who.int/media/docs/default-source/classification/icd/covid-19/guidelines-cause-of-death-covid-19-20200420-en.pdf>. Accessed 1 May 2022.