



## **NUS Medicine researchers discover glaucoma and chronic kidney disease have more in common than what meets the eye**

**Singapore, 21 June 2022** – A team from the Yong Loo Lin School of Medicine at the National University of Singapore (NUS Medicine) has found that there is a bidirectional association between chronic kidney disease (CKD) and glaucoma. This is possibly due to underlying common risk factors such as diabetes and hypertension. CKD involves the gradual loss of kidney function in filtering blood, with evidence of kidney damage for more than 3 months.<sup>1</sup> Glaucoma is a condition where there is a build-up of pressure in the eye, resulting in damage to the optic nerve. It affects around 3% of people over 40 in Singapore and its incidence increases with age.<sup>2</sup> Poorly controlled glaucoma can eventually lead to permanent loss of vision.

As our population ages, more are at risk of developing chronic diseases such as CKD and glaucoma. The number of Singaporeans diagnosed with CKD has increased significantly from about 4.3 daily new cases in 2011, to about 5.7 daily new cases in 2019, with no sign of abating. There are currently more than 8,500 dialysis patients in Singapore.<sup>3</sup>

The kidney and the eye are two organs located in separate parts of the body that are not intuitively thought to be associated. They are involved in different systems and perform different functions. The team, however, found that patients with baseline CKD have a 18% higher risk of incident glaucoma. The risk of incident glaucoma increased to 42% in patients with CKD due to diabetes. This association was more prevalent among patients of East Asian ethnicity, including Singaporeans. Reversely, patients with glaucoma have more than 3.6 times higher risk of incident CKD after 10-15 years of follow-up.

Possible explanations for the association include the two diseases sharing common risk factors, such as diabetes, hypertension and cardiovascular disease, as well as common disease processes such as renin-angiotensin system (RAS) dysfunction – in which, a hormonal system is unable to regulate blood pressure, fluid and electrolyte balance, and other functions in the body, other disease processes also include oxidative stress, and inflammation. Causal mechanisms may also play a role in the presence of both diseases, as CKD results in fluid overload and accumulation of toxic metabolites, disturbing the osmotic pressure in the eye, and at the same time accelerating arteriosclerosis, which is the hardening of the walls of the blood vessels, causing microvascular compromise.

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<sup>1</sup> [https://www.kidney-international.org/article/S0085-2538\(15\)50698-4/fulltext](https://www.kidney-international.org/article/S0085-2538(15)50698-4/fulltext)

<sup>2</sup> <https://www.straitstimes.com/singapore/health/local-studies-find-link-between-myopia-and-glaucoma>

<sup>3</sup> <https://www.straitstimes.com/opinion/forum/forum-vital-to-do-more-upstream-to-prevent-or-delay-kidney-failure>

Though these findings are still insufficient to conclude a cause-and-effect relationship between CKD and glaucoma, they draw attention to the complex interplay of factors between disease states. They also emphasise the importance of reducing risk factors such as diabetes and hypertension that are implicated in multiple health problems.

The study was published in *eClinicalMedicine* in June 2022, a part of the Lancet's series of Discovery Science journals and a leading open-access journal in the world. The team comprises NUS Medicine fifth-year student Faye Ng, third-year student Harris Song, and newly-minted doctors, Dr Benjamin Tan and Dr Teo Chong Boon, along with Professor Cheng Ching-Yu from the Department of Ophthalmology at NUS Medicine and Clinical Associate Professor Boey Pui Yi from the Glaucoma Department, Singapore National Eye Centre, Singapore, and Dr Emmett Wong from the Division of Nephrology, Department of Medicine at the National University Hospital, Singapore.

Faye Ng, first author of this study, shared, "We are grateful for the opportunity to work with brilliant mentors who provided their clinical knowledge and expertise to this research. They encouraged us to reflect on how we can leverage our research findings to impact population health, translating science into actionable perspectives and insights. Our research has shown the importance of paying attention to the complex interplay between disease states such as CKD and glaucoma, and the need to advocate for preventive health to improve overall health and well-being, countering the rise in chronic diseases."

Prof Cheng, supervisor of the research team, applauds the efforts of the team on discovering this significant finding. "The team has been hard at work trying to discover the associations between seemingly different organs. Eventually, we hope that this research will add on to the narrative in educating the public that they need to pay closer attention to their chronic health risks, because it is crucial for the entire physiology of the body to work in tandem to ensure good health."

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Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 30 university level research institutes, research centres of excellence and corporate labs focus on themes that

include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

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The NUS Yong Loo Lin School of Medicine is Singapore's first and largest medical school. Our enduring mission centres on nurturing highly competent, values-driven and inspired healthcare professionals to transform the practice of medicine and improve health around the world.

Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus on innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University of Singapore and a founding institutional member of the National University Health System. It is one of Asia's leading medical schools and ranks among the best in the world (Times Higher Education World University Rankings 2022 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2021).

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