COVID-19 situation in RRT patients and LAAB in Dialysis patients

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COVID-19 in dialysis patients

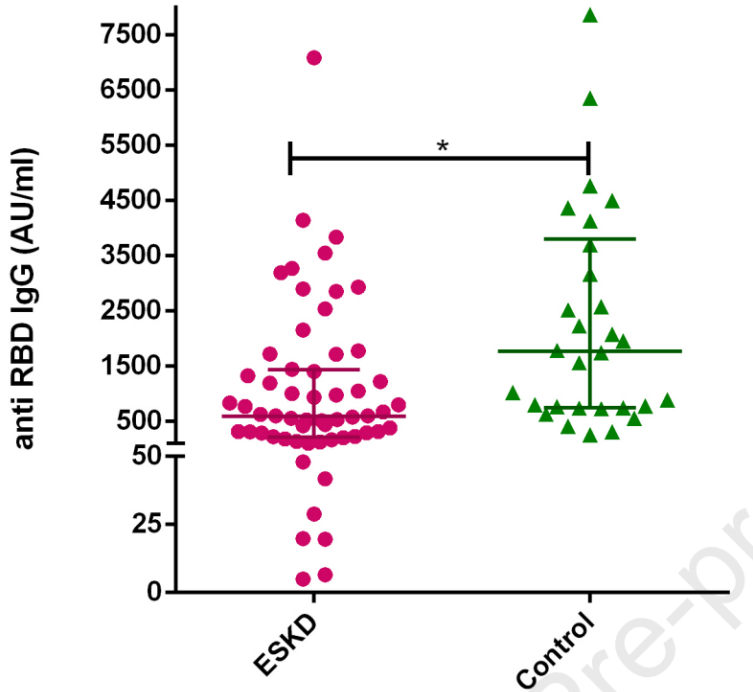
- Global prevalence : 5 – 25%

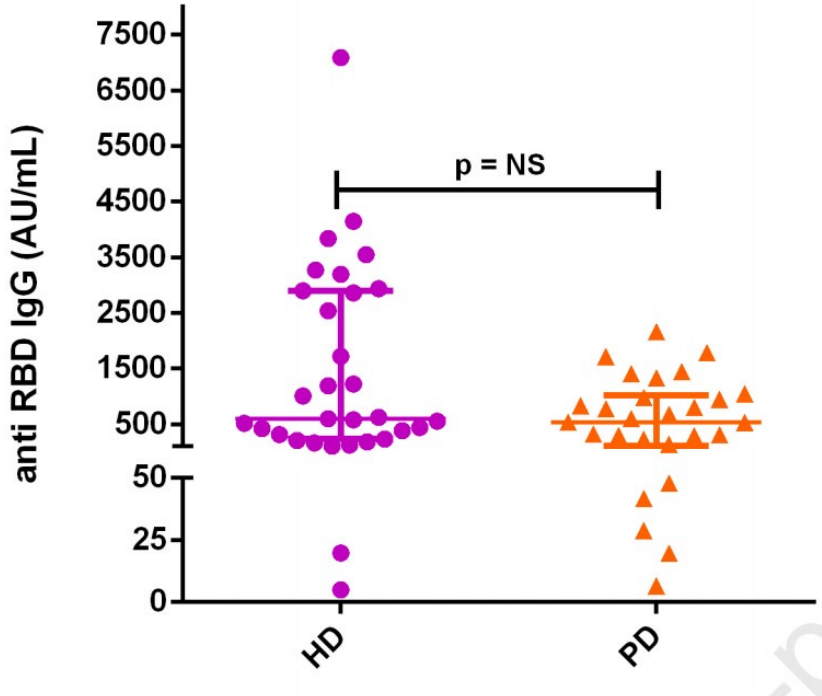
  mortality : 20 – 30% or 4 times of nondialysis patients
- CKD → immunological disorder → rapidly dead (inadequate infection control in the early phase of the disease
- 10 – 50% of dialysis patients → asymptomatic infection
- Dialysis patients delay viral clearance : median time from admission to –ve RTPCR = 18 days or 20 days after symptoms → more longer quarantine times until viral < 100,000 copies/ml or Ct > 28 – 31
- Lower antibody level after vaccination

Kidney Med (2021). 3(4): 619-634.
Kidney International (2022) 101, 883–894

Anti-SARS-CoV-2 Spike Protein S1 Receptor-Binding Domain Antibody to An Inactivated Whole-virus SARS-CoV-2 Vaccination in End-stage Kidney Disease Patients: An Initial Report

Sarinya Boongird, MD, Piyatida Chuengsaman, MD, Salinnart Phanprasert, MD, Rungthiwa Kitpermkiat, MD, Montira Assanatham, MD, Arkom Nongnuch, MD, Sasisopin Kiertiburanakul, MD, MHS, Kumthorn Malathum, MD, Angsana Phuphuakrat, MD, PhD, Chavachol Sethaudom, MSc, Jackrapong Bruminhent, MD





COVID-19 in chronic HD & PD patients
(Thailand 2020, 1st pandemic)

- Chronic hemodialysis patients infected with SARS-CoV-2

  Total **5** cases survive **5** cases Total HD **70,000** cases

- Chronic peritoneal dialysis patients infected with SARS-CoV-2

  Total **1** case survive **1** case Total PD **30,000** cases

- Kidney transplantation infected with SARS-CoV-2

  Total **3** cases survive **3** cases Total KT **6,000** cases

Prevalence and incidence of COVID-19 in Dialysis patients (Thailand 2021, 2nd pandemic)

	Total	COVID-19	Dead
• Thailand			
GP	66,000,000	1,391,477 (2%)	14,671 (1%)
BKK	8,000,000	335,639 (4%)	5,682 (1.7%)
PD	27,556	517 (2%)	167 (>32%)
BKK	1,728	237 (13%)	86 (>36%)
HD	130,000	>3,000 (>2%)	>500 (>10%)
BKK	12,139	>1,000 (>8%)	137/647 (20%)

Prevalence and incidence of COVID-19 in Dialysis patients (Thailand 2022, 3rd pandemic)

	Total	COVID-19	Dead
• Thailand			
PD	27,000	1,152 (5%)	78 (>7%)
BKK	1,700	178 (10%)	7 (>5%)
HD	170,000	>5,000 (>3%)	>100 (>2%)
BKK	15,000	1,000 (>7%)	3/500 (1%)

Prevalence of Dialysis patients

1. ความชุกผู้ป่วยที่ได้รับการบำบัดทดแทนไต (Prevalence of RRT)

ข้อมูลสมาคมโรคไตแห่งประเทศไทยพบว่าความชุกของจำนวนผู้ป่วยที่ได้รับการบำบัดทดแทนไตด้วยวิธีฟอกเลือด ล้างไตทางช่องท้อง และปลูกถ่ายไตแสดงในตารางที่ 1

Years	Hemodialysis	Peritoneal dialysis	Kidney transplantation*	Total	จำนวนประชากร**	ความชุก (คน) ต่อ 1 ล้านประชากร
2016	72,622	20,216	8,132	100,970	65,931,550	1,531
2017	84,910	24,001	5,360	114,271	66,188,503	1,726
2018	97,265	26,070	5,652	128,987	66,413,979	1,942
2019	114,262	30,869	6,212	151,343	66,558,935	2,274
2020	129,724	34,467	6,583	170,774	66,186,727	2,580

/2022 200,000+

Causes of ESRD

THAILAND RENAL REPLACEMENT THERAPY:
YEAR 2020

Causes of ESRD

3. **สาเหตุของภาวะไตเรื้อรังที่ได้รับการบำบัดทดแทนไตของผู้ป่วยในปี พ.ศ. 2563**

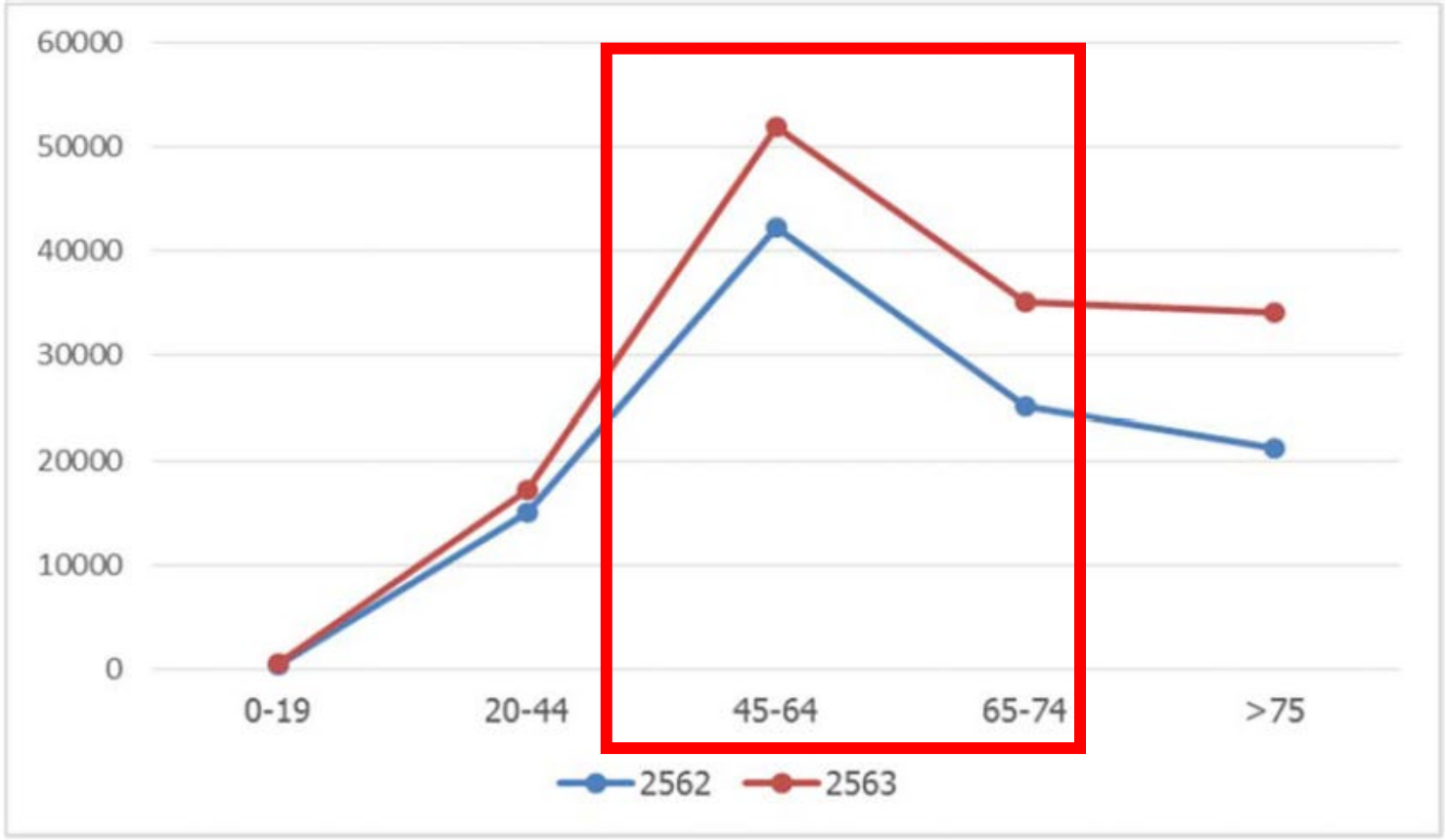
พบว่าสาเหตุหลักของผู้เข้ารับการบำบัดทดแทนไตในปี พ.ศ. 2563 ได้แก่ ความดันโลหิตสูง และเบาหวาน ดังแสดงเป็นร้อยละในตารางที่ 3

Disease	%
Hypertension	42.30
Diabetic nephropathy	41.50
Unknown	8.49
Presumed GN(No biopsy)	1.73
Obstructive nephropathy	1.25
Lupus nephritis	1.20
Polycystic kidney disease	1.19
Glomerulonephritis : Biopsy-proven(มีผล Kidney biopsy)	0.77

5. การกระจายของผู้ป่วยที่ได้รับการบำบัดทดแทนไตในแต่ละช่วงอายุในปี พ.ศ. 2562-2563

ผู้ป่วยที่ได้รับการบำบัดทดแทนไตส่วนใหญ่อยู่ในอายุช่วง 45-64 ปี และผู้มีอายุ 65-74 ปี เป็นลำดับถัดมาดังแสดงใ

รูปที่ 1



Comorbidity score

6. การประเมินโรคร่วมด้วย Charlson Comorbidity Index (CCI) Score

ดัชนีโรคร่วมชาร์ลสัน (Charlson comorbidity index: cci) ซึ่งประเมินระดับความรุนแรงของโรคร่วม โดยเป็นการให้น้ำหนักคะแนน (weighted score) ต่อโรคร่วมบางกลุ่มโรคที่มีในผู้ป่วยแต่ละราย โดยพบว่าในผู้ป่วยรายใหม่ในปี พ.ศ. 2563 ส่วนใหญ่มีค่า score อยู่ในช่วง 4 - 7

60%

Score	ร้อยละของผู้ป่วย (%)
17	<0.01
16	<0.01
15	0.01
14	0.02
13	0.04
12	0.07
11	0.17
10	0.65
9	2.71
8	7.11
7	13.55
6	16.96
5	18.73
4	16.80
3	11.51
2	11.68
1	-
0	-

ตารางที่ 6 แสดงผลการประเมินของโรคร่วมด้วย Charlson Comorbidity Index

Performance Scale

7. การประเมินสภาวะของผู้ป่วยด้วย Karnofsky Performance Status (KPS) Score

จากการประเมินสภาพผู้ป่วยในปี พ.ศ. 2563 ที่ได้รับการบำบัดทดแทนไตพบว่าส่วนใหญ่ร้อยละ 43.6 มีค่า KPS Score เท่ากับ 90

90%

Score	ร้อยละของผู้ป่วย (%)
100	-
90	43.6
80	9.0
70	6.7
60	11.4
50	5.3
40	3.6
30	0.3
20	0.4
10	0.5

Table 1. Karnofsky Performance Scale Index (KPS)

Score (category)	Karnofsky
100	Normal; no complaints; no evidence of disease.
90	Able to carry on normal activity; minor signs or symptoms.
80	Normal activity with effort; some signs or symptoms of disease.
70	Care for self; unable to carry on normal activity or to do active work.
60	Requires occasional assistance but is able to care for most of his needs.
50	Requires considerable assistance and frequent medical care.
40	Disabled; requires special care and assistance.
30	Severely disabled; hospitalization necessary; active supportive treatment is necessary.
20	Very sick; hospitalization necessary; active supportive treatment is necessary.
10	Moribund; fatal processes progressing rapidly.
0	Dead

10. สิทธิการรักษาพยาบาลในผู้ป่วยที่ได้รับการบำบัดทดแทนไต

สิทธิการรักษาพยาบาล	2018	2019	2020	2022
ประกันสุขภาพทั่วหน้า	32.32%	37.39%	39.50%	55%
ราชการ	23.75%	20.62%	22.81%	25%
ประกันสังคม	19.74%	18.21%	19.31%	20%
ชำระเอง	14.90%	13.63%	15.53%	
รัฐวิสาหกิจ	2.15%	2.22%	2.12%	
ประกันชีวิต	0.20%	0.50%	0.60%	
องค์กรการกุศลออกให้	0.23%	0.13%	0.13%	

ตารางที่ 10 แสดงสิทธิการรักษาพยาบาลในผู้ป่วยที่ได้รับการบำบัดทดแทนไต

14. การกระจายตัวของหน่วยไตเทียม Hemodialysis แบ่งตามภูมิภาค

ภูมิภาค	2016	2017	2018	2019	2020
กรุงเทพมหานครและปริมณฑล	223(32.4%)	236(32.6%)	256(32.7%)	270(33.5%)	288 (33.7%)
ภาคกลาง	78(11.3%)	82(11.3%)	88(11.3%)	83(10.3%)	86 (10.1%)
ภาคตะวันตก	33(4.8%)	35(4.8%)	35(4.5%)	37(4.6%)	36 (4.2%)
ภาคตะวันออก	52(7.6%)	56(7.7%)	62(7.9%)	64(7.9%)	70 (8.2%)
ภาคตะวันออกเฉียงเหนือ	176(25.6%)	184(25.4%)	199(25.4%)	199(24.7%)	214 (25.0%)
ภาคเหนือ	60(8.7%)	60(8.3%)	67(8.6%)	80(9.9%)	81 (9.4%)
ภาคใต้	66(9.6%)	70(9.7%)	75(9.6%)	73(9.1%)	80 (9.5%)
รวม	688(100%)	723(100%)	782(100%)	806(100%)	855(100%)

ตารางที่ 13 แสดงการกระจายตัวของหน่วยไตเทียม Hemodialysis แบ่งตามภูมิภาค

17. การกระจายตัวของหน่วยล้างไตทางช่องท้อง (Peritoneal dialysis) แบ่งตามภูมิภาค

ภูมิภาค	2016	2017	2018	2019	2020
กรุงเทพมหานครและปริมณฑล	27(19.4%)	28(19.3%)	39(20.2%)	39(19.6%)	38(18.9%)
ภาคกลาง	23(16.5%)	25(17.2%)	29(15.0%)	29(14.6%)	29(14.4%)
ภาคตะวันตก	7(5.0%)	7(4.8%)	9(4.7%)	10(5.0%)	10(5.0%)
ภาคตะวันออก	6(4.3%)	8(5.5%)	13(6.7%)	16(8.0%)	17(8.5%)
ภาคตะวันออกเฉียงเหนือ	44(31.7%)	45(31.0%)	58(30.1%)	59(29.6%)	60(29.9%)
ภาคเหนือ	14(10.1%)	14(9.7%)	20(10.4%)	22(11.1%)	22(10.9%)
ภาคใต้	18(12.9%)	18(12.4%)	25(13.0%)	24(12.1%)	25(12.4%)
รวม	**139(100%)**	**145(100%)**	**193(100%)**	**199(100%)**	**201(100%)**

ตารางที่ 15 แสดงการกระจายตัวของหน่วยล้างไตทางช่องท้อง (Peritoneal dialysis) แบ่งตามภูมิภาค

Death rate

30. ผลการรักษา (Outcome) ในปี 2563

ผลการรักษา (Outcome)	ร้อยละของผู้ป่วยที่สิ้นสุดหรือเปลี่ยนแปลงการรักษา
HD	
• HD-HD (ไม่เปลี่ยนแปลงการรักษา)	96.2
• HD → PD (เปลี่ยนจาก HD เป็น PD)	2.1
• HD → KT (ได้รับการปลูกถ่ายไต)	1.7
PD	
• PD-PD (ไม่เปลี่ยนแปลงการรักษา)	98.9
• PD → HD (เปลี่ยนจาก PD เป็น HD)	1.0
• PD → KT (ได้รับการปลูกถ่ายไต)	0.1
Change center	12.8
Loss FU	5.7
• Financial	3.16
• Voluntary	19.8
• Other	77.0
Dead	22.7

ตารางที่ 27 แสดงร้อยละของผู้ป่วยที่สิ้นสุดหรือเปลี่ยนแปลงการรักษา ในปี 2563

Summary of COVID-19 in Thai RRT patients 2022

- Total RRT patients 200,000 cases (HD 170,000, PD 23,000, KT 7,000)

  >50% of cases in Bangkok, Northeastern part

  had many comorbidities, but high performance

- Prevalence of COVID-19 in Thai dialysis patients 5 – 10%,

  dead 5 - 10%

  > 80% have got 3 doses of vaccines (> 1 mRNA vaccines)

Anti–SARS-CoV-2 Antibodies

- Convalescent plasma (CP)
  - early in the disease course with potent, high-titer Abs
  - no benefit in outpatients (C3PO study)
- Hyperimmune globulin (HIG)
  - highly purified anti–SARS-CoV-2 Abs from multiple donors who have recovered from COVID-19
  - modest but statistically nonsignificant outcomes
- Monoclonal antibody (mAbs)
  - targeting the spike protein
  - bamlanivimab, BRII-196 plus BRII-198 showed unfavorable outcomes
  - sotrovimab modest but statistically nonsignificant outcomes

CP, mAbs and HIG administered after multiple days of illness may not be useful
New variant of SARS-CoV-2???

Anti–SARS-CoV-2 antibodies : outpatient

- Sotrovimab (4/5/2022), REGEN-COV, bamlanivimab and etesevimab, casirivimab-imdevimab : not effective for treatment of mild to moderate COVID-19 and postexposure prevention in omicron variant
- Bebletovimab : treatment of mild to moderate COVID-19 (active against omicron sub lineages)
- Tixagevimab-cilgavimab (Evusheld) : preexposure prophylaxis (active against omicron sub lineages)

Monoclonal antibodies protect against COVID-19

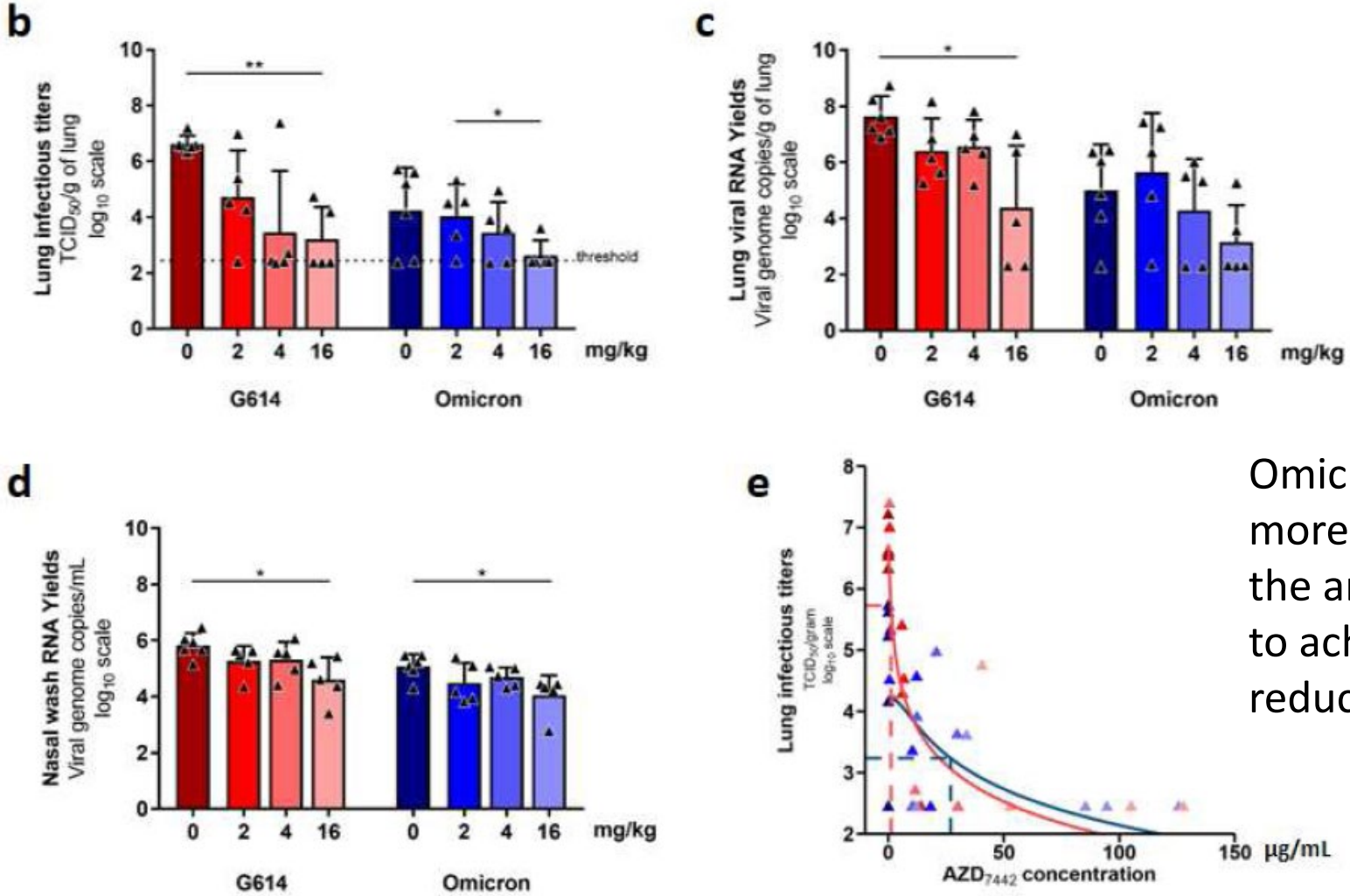
- irrespective of immune system status and provide rapid protection are potential options for Covid-19 immunoprophylaxis
- Some combinations of monoclonal antibodies are already in use against Covid-19 through emergency or temporary authorization for

  preexposure prophylaxis

  postexposure prophylaxis or

  treatment of mild-to moderate disease

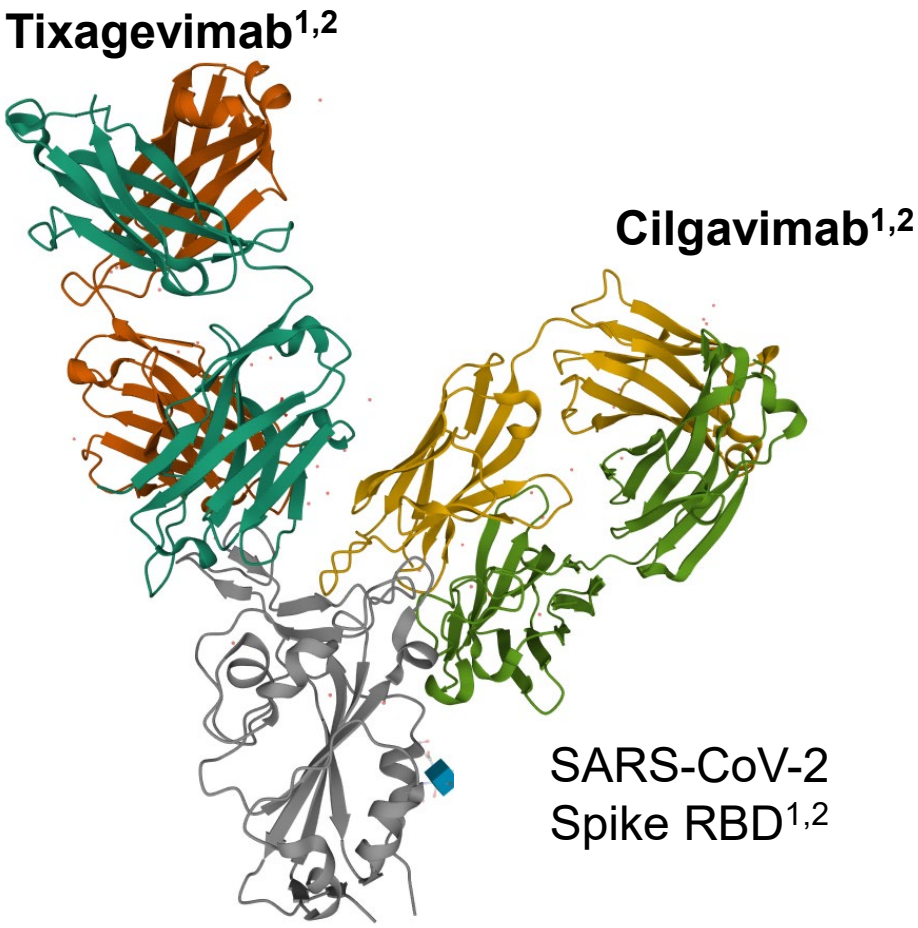
Activity of Tixagevimab/Cilgavimab against the Omicron variant of SARS-CoV-2 in a hamster model



Omicron virus requires about 20-times more antibodies in plasma than the ancestral B.1 strain (G614) virus to achieve a similar drug efficacy in reducing lung infectious titers

EuropePMC; 2022, March.

Tixagevimab/Cilgavimab: LAAB Combination



- 2 human mAbs binding 2 distinct epitopes[3]
- Highly potent[4]
- Retained neutralizing activity against variants of concern[3]
- Extended half-life (YTE modification)[5]
- Favorable safety profile[6]
- Efficacy was shown for pre-exposure prophylaxis in high-risk populations[5]

Some of the information provided is based off a preprint research paper that has not been peer reviewed.
C1q = complement component 1q; mAb = monoclonal antibody; FcR = fragment crystallizable region; LAAB = long-acting antibody; RBD = receptor-binding domain; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2; TM = triple modification; YTE = M252Y/S254T/T256E.
1. Sehnal D et al. *Nucleic Acids Res*. 2021;49:W431-W437; 2. Protein Data Bank. https://www.rcsb.org/. 7L7E. Accessed November 10, 2021; 3. Loo YM et al. Preprint published online. *medRxiv*. 2021;
4. Zost SJ et al. *Nature*. 2020;584:443-4493. 5. Fact sheet for healthcare providers. Emergency Use Authorization (EUA) of EVUSHELD™ (tixagevimab co-packaged with cilgavimab). 2021; 6. Levin M et al. Presentation at: IDWeek 2021; September 29-October 3, 2021; virtual conference.

The NEW ENGLAND JOURNAL of MEDICINE

Preexposure, N = 5197, unvaccinated, Asia 3%, CKD 5%, immunocompromised 0.5%, →2021 May

one each of 150 mg tixagevimab and 150 mg cilgavimab

ORIGINAL ARTICLE

Intramuscular AZD7442 (Tixagevimab–Cilgavimab) for Prevention of Covid-19

M.J. Levin, A. Ustianowski, S. De Wit, O. Launay, M. Avila, A. Templeton, Y. Yuan, S. Seegobin, A. Ellery, D.J. Levinson, P. Ambery, R.H. Arends, R. Beavon, K. Dey, P. Garbes, E.J. Kelly, G.C.K.W. Koh, K.A. Near, K.W. Padilla, K. Psachoulia, A. Sharbaugh, K. Streicher, M.N. Pangalos, and M.T. Esser, for the PROVENT Study Group*

Table 3. Primary End Point and Key Supportive Efficacy Analyses in the Full Preexposure Analysis Set.*

First Case of SARS-CoV-2 RT-PCR–Positive Symptomatic Illness	Primary Analysis				Median 6-Mo Follow-up†		
	AZD7442 (N=3441)	Placebo (N=1731)	Relative Risk Reduction % (95% CI)	P Value	AZD7442 (N=3441)	Placebo (N=1731)	Relative Risk Reduction % (95% CI)
	no. of participants (%)				*no. of participants (%)*		
Primary end point: first case of illness, with data censored at unblinding or receipt of Covid-19 vaccine	8 (0.2)	17 (1.0)	76.7 (46.0–90.0)	<0.001	11 (0.3)	31 (1.8)	82.8 (65.8–91.4)
Key supportive analyses							
First case of illness, regardless of unblinding or receipt of Covid-19 vaccine	10 (0.3)	22 (1.3)	77.3 (52.0–89.3)	<0.001	20 (0.6)	44 (2.5)	77.4 (61.7–86.7)
First case of illness, including all deaths, with data censored at unblinding or receipt of Covid-19 vaccine	12 (0.3)	19 (1.1)	68.8 (35.6–84.9)	0.002	18 (0.5)	36 (2.1)	75.8 (57.3–86.2)

Tixagevimab/Cilgavimab Did Not Meet the Primary Endpoint of Post-exposure Prevention of Symptomatic COVID-19 Compared With Placebo[1]

one each of 150 mg tixagevimab and 150 mg cilgavimab

Population

N+1121, → 2021 April

Unvaccinated adults with confirmed exposure to a person with a case of SARS-CoV-2 within the past 8 days (N=1121)[a]

Safety summary

TIXA/CILGA had a favorable safety profile over the extended 6-month follow-up[2]

Publication

Full results from STORM CHASER will be submitted for publication in a peer-reviewed medical journal

Summary of the results

Baseline subgroup	Onset of case post-dose	Number of cases/ number of participants		Relative risk reduction (95% CI)
		TIXA/CILGA (300-mg IM)	Placebo	
All participants (primary endpoint)	All cases	23/749	17/372	33% reduction[b] (95% CI, -26 to 65)
PCR-negative[c] (preplanned subgroup analysis)	All cases	6/715	11/358	73% reduction (95% CI, 27 to 90)
PCR-negative[c] (post hoc subgroup analysis)	≤7 days	5/715	5/358	51% reduction (95% CI, -71 to 86)
	>7 days	1/710	6/353	**92% reduction (95% CI, 32 to 99)**

This analysis focused on the effect of TIXA/CILGA on the post-exposure prevention of symptomatic COVID-19, and not on the pre-exposure prevention or treatment of COVID-19

[a]All participants had a negative SARS-CoV-2 antibody test on the day of dosing to exclude prior infection, and a nasopharyngeal swab was also collected and subsequently analysed for SARS-CoV-2 by PCR to detect virus; [b]Not statistically significant; [c]Includes 974 participants (15 cases) confirmed PCR-negative at baseline and 99 participants (2 cases) with PCR status missing at baseline.
CI = confidence interval; COVID-19 = coronavirus disease 2019; IM = intramuscular; PCR = polymerase chain reaction; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2; TIXA/CILGA = tixagevimab/cilgavimab.

1. AstraZeneca Pharmaceuticals LP press release. Published June 15, 2021; 2. Levin MJ et al. Abstract presented at: ECCMID 2022; April 23-26, 2022; Lisbon, Portugal. Abs 4789.

Efficacy and safety of intramuscular administration of tixagevimab–cilgavimab for early outpatient treatment of COVID-19 (TACKLE): a phase 3, randomised, double-blind, placebo-controlled trial

Hugh Montgomery, F D Richard Hobbs, Francisco Padilla, Douglas Arbetter, Alison Templeton, Seth Seegobin, Kenneth Kim, Jesus Abraham Simón Campos, Rosalinda H Arends, Bryan H Brodek, Dennis Brooks, Pedro Garbes, Julieta Jimenez, Gavin C K W Koh, Kelly W Padilla, Katie Streicher, Rolando M Viani, Vijay Alagappan, Menelas N Pangalos, Mark T Esser, on behalf of the TACKLE study group

Mild to Moderate COVID-19, N = 1014, unvaccinated
High risk of progression : CKD 2%, immunocompromised 5%
2021 Jan – July
one each of 300 mg tixagevimab and 300 mg cilgavimab

	Population	Tixagevimab–cilgavimab	Placebo	RR reduction (95% CI)	pvalue
Primary efficacy endpoints and supportive estimands					
Primary endpoint: severe COVID-19 or death from any cause through to day 29	Modified full analysis set*	18/407 (4%)	37/415 (9%)	50·5% (14·6–71·3)	0·0096
Secondary and exploratory endpoints					
Secondary endpoint: prevention of respiratory failure	Modified full analysis set	3/405 (1%)	11/412 (3%)	71·9% (0·3–92·1)	0·036
Exploratory: hospitalisation for COVID-19 including complications through to day 29	Modified full analysis set	17/413 (4%)	40/421 (10%)	..	..

***Lancet Respir Med* 2022** Published **Online** June 7, 2022

Tixagevimab–cilgavimab for treatment of patients hospitalised with COVID-19: a randomised, double-blind, phase 3 trial

ACTIV-3–Therapeutics for Inpatients with COVID-19 (TICO) Study Group*†

Moderate to severe COVID-19, N = 1417, 75% unvaccinated
High risk of progression : CKD 9-10%, immunocompromised 8-10%
2021 Feb – Sep (no organ failure or high-flow O2 use)
one each of 300 mg tixagevimab and 300 mg cilgavimab
Remdesivir (60+%) + corticosteroid (70+%)

	Tixagevimab–cilgavimab group (n=710)	Placebo group (n=707)	Rate or hazard ratio* (95% CI)	p value
Full cohort				
Co-primary, sustained recovery up to day 90†‡	617 (89%)	595 (86%)	1·08 (0·97–1·20)	0·21
Censored	34 (5%)	31 (4%)	..	..
Died before sustained recovery	59 (8%)	81 (11%)	..	..
Death up to day 90	61 (9%)	86 (12%)	0·70 (0·50–0·97)	0·032

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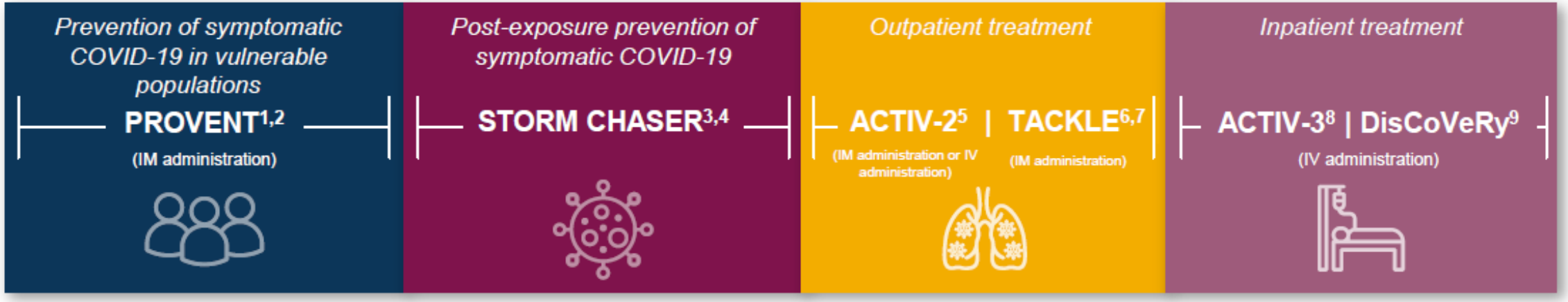
Tixagevimab/Cilgavimab Trial Program Is Evaluating Prevention and Treatment of COVID-19[1-9]

↓symptomatic cases in Preexposure

↓symptomatic cases in PCR –ve

↓Disease progression or dead

↓dead
But not improve recovery rate



PROPHYLAXIS — TREATMENT

COVID-19 = coronavirus disease 2019; IM = intramuscular; IV = intravenous; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

1. Study NCT04625725. ClinicalTrials.gov website; 2. AstraZeneca Pharmaceuticals LP press release. Published August 20, 2021; 3. Study NCT04625972. ClinicalTrials.gov website; 4. AstraZeneca Pharmaceuticals LP press release. Published June 15, 2021; 5. Study NCT04518410. ClinicalTrials.gov website; 6. Study NCT04723394. ClinicalTrials.gov website; 7. AstraZeneca Pharmaceuticals LP press release. Published October 11, 2021; 8. Study NCT04501978. ClinicalTrials.gov website; 9. Study NCT04315948. ClinicalTrials.gov website.

Indications for Evusheld Use

UK, EU (2022, March), USFDA (2021, December, EUA) for COVID-19

Pre-exposure prophylaxis

- Adults, aged≥12 years and BW≥40 kg
- not currently infected or exposed to SARS-CoV-2 and
- inadequate immune response or not recommend to COVID-19 vaccination

Emergency Use Authorization (EUA)

- Serious or Life-Threatening Disease or Condition
- Evidence of Effectiveness
- Risk-Benefit Analysis
- No Alternatives

FDA NEWS RELEASE

Coronavirus (COVID-19) Update: FDA Authorizes New Long-Acting Monoclonal Antibodies for Pre-exposure Prevention of COVID-19 in Certain Individuals

For Immediate Release: December 08, 2021

reduction in risk of developing COVID-19 was maintained for Evusheld recipients through six months. The safety and effectiveness of Evusheld for use in the pre-exposure prevention of COVID-19 continue to be evaluated.

Moderate to severe immunocompromising conditions → suboptimal COVID-19 vaccine response

Active treatment for solid tumor and hematologic malignancies
Receipt of solid-organ transplant and taking immunosuppressive therapy
Receipt of CAR-T-cell therapy or hematopoietic stem cell transplant (within 2 years of transplantation or taking immunosuppressive therapy)*
Moderate or severe primary immunodeficiency (eg, DiGeorge, Wiskott-Aldrich syndromes)
Advanced or untreated HIV infection (CD4 cell count <200 cells/microL, history of AIDS-defining illness without immune reconstitution, clinical manifestations of symptomatic HIV)
•Active treatment with: High-dose corticosteroids (ie, ≥20 mg prednisone or equivalent ≥2 weeks) •Alkylating agents •Antimetabolites •Transplant-related immunosuppressive drugs •Cancer chemotherapeutic agents classified as severely immunosuppressive •TNF blockers •Other biologic agents that are immunosuppressive or immunomodulatory

Problems of HD-COVID during phase 3 outbreak in Bangkok (up to Aug 2021, 2nd pandemic)

		new HD-COVID	mortality(%)	new COVID cases
April	HD	25	8%	1,078
	PD	14	14%	
May	HD	5 – 10/day	33%	3,226
June	HD	10 - 30/day	48%	3,644
July	HD	10 – 30/day	30%	3,977
Aug	HD	5 -10/day	14%	4,368

For these strategies, most of HD Covid patients were not delayed the dialysis and had taken the antiviral drugs within 1-3 days after diagnosis.

we had 6 cohort HD Covid centers in Bangkok metropolitans (5/6 were private centers)

>80% HD patients were vaccinated