Clin Transplant Res 2024;38:212-221
https://doi.org/10.4285/ctr.24.0031

Supplementary Table 1. Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool results for nonrandomized studies

Study	Confounding	Selection	Classification of interventions	Deviations from intended interventions	Missing data	Measurement of outcomes	Reported result	Overall
Cacho et al. (2022) [16]	Serious	Serious	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Colaneri et al. (2022) [23]	Serious	Serious	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Elec et al. (2022) [24]	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Fesu et al. (2022) [17]	Serious	Serious	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Razia et al. (2023) [25]	Serious	Serious	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Solera et al. (2023) [18]	Low	Low	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Villamarín et al. (2022) [19]	Serious	Serious	Moderate	Moderate	Low	Moderate	Moderate	Moderate

Moderate: the study is sound for a nonrandomized study with regard to this domain but cannot be considered comparable to a well-performed randomized trial. Low: the study is comparable to a well-performed randomized trial with regard to this domain. Serious risk of bias: the study has some important problems.

Supplementary Table 2. Assessment of certainty of evidence using the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) approach

Type	Certainty assessment							Effect	Certainty
	No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Odds ratio (95% CI)	
Mortality rate	5	RS	Very serious	Very serious	Not serious	Serious	None	1.19 (0.59–2.39)	Low
Hospitalization rate	5	RS	Very serious	Very serious	Not serious	Serious	None	0.69 (0.10–4.79)	Low
ICU admission	4	RS	Very serious	Very serious	Not serious	Serious	None	2.39 (1.24–4.57)	Low
Need for mechanical ventilation	3	RS	Very serious	Very serious	Not serious	Serious	None	0.98 (0.44–2.18)	Low
Need for oxygen therapy	4	RS	Very serious	Very serious	Not serious	Serious	None	3.73 (0.75–18.34)	Low

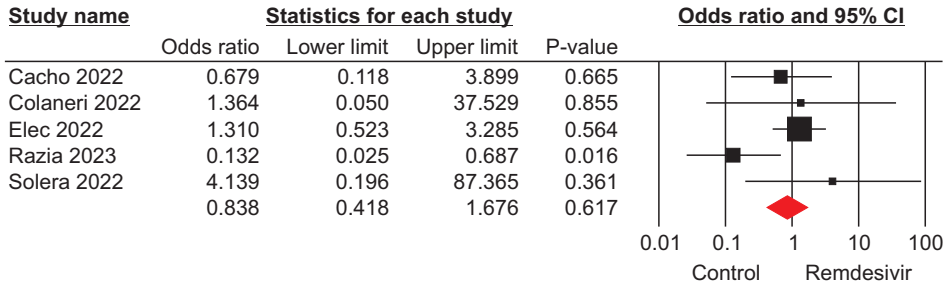
Low: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect. Moderate: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

CI, confidence interval; RS, retrospective study; ICU, intensive care unit.

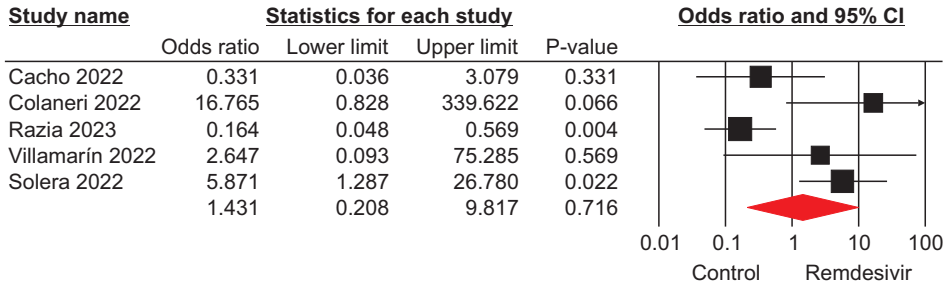
Supplementary Table 3. Subgroup analyses for effectiveness outcomes

Subgroup analysis	No. of studies	Point estimate (95% CI)	P-value	Heterogeneity		
				Q-value	P-value	I^2 (%)
Mortality rate by control group						
SOC	4	0.80 (0.37–1.72)	0.57	0.00	1.00	0
MOL	1	0.97 (0.72–1.31)	0.01	1.07	0.05	0
Hospitalization rate by control group						
SOC	3	0.31 (0.09–1.00)	0.52	5.75	0.05	65
MOL	2	4.35 (1.35–13.99)	0.01	2.33	0.12	57
ICU admission by control group						
SOC	3	1.93 (0.95–3.92)	0.06	3.16	0.20	36
MOL	1	7.59 (1.45–39.63)	0.01	0.00	1.00	0
Mortality rate by SARS-CoV-2 variant						
Omicron	2	0.94 (0.20–4.28)	0.93	1.01	0.31	1
Pre-Omicron	2	0.76 (1.45–39.63)	0.54	0.00	0.98	0
Alpha, Delta, and Omicron	1	7.59 (0.31–1.84)	0.01	0.00	1.00	0
Hospitalization rate by SARS-CoV-2 variant						
Omicron	3	0.41 (0.12–1.35)	0.14	4.36	0.11	54
Pre-Omicron	1	0.06 (0.00–1.20)	0.00	0.00	1.00	0
Alpha, Delta, and Omicron	1	6.10 (1.75–21.23)	0.06	0.00	1.00	0

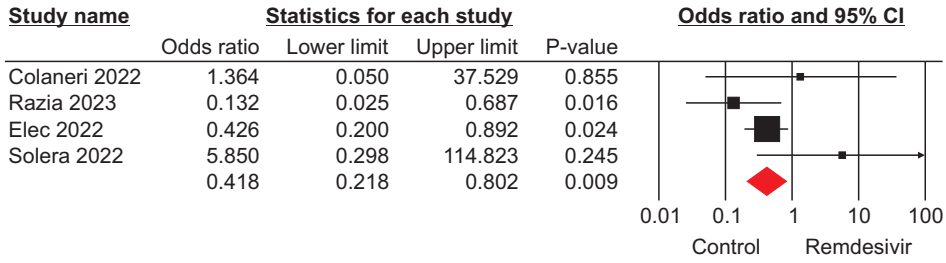
CI, confidence interval; SOC, standard of care; MOL, molnupiravir; ICU, intensive care unit; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2.



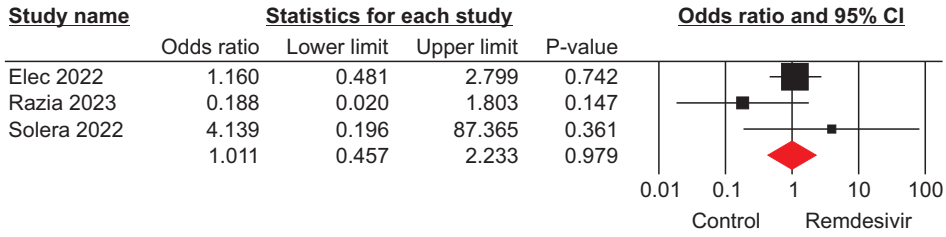
Supplementary Fig. 1. Forest plot of mortality rates comparing the control group to remdesivir. CI, confidence interval.



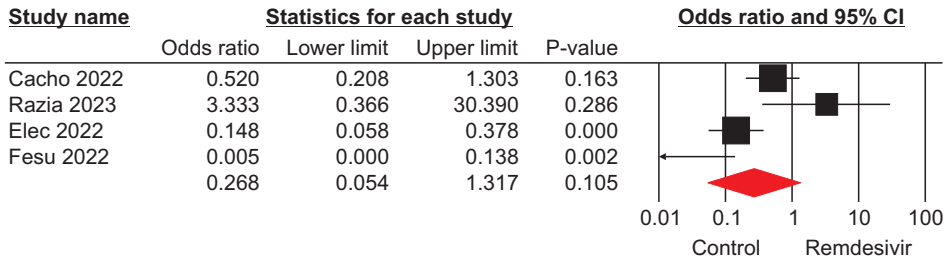
Supplementary Fig. 2. Forest plot of hospitalization rates comparing the control group to remdesivir. CI, confidence interval.



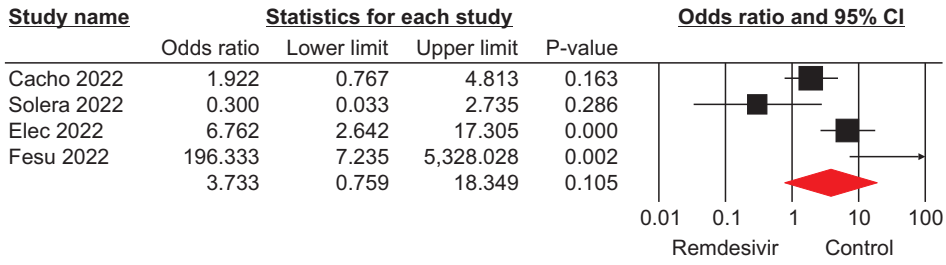
Supplementary Fig. 3. Forest plot of intensive care unit admission comparing the control group to remdesivir. CI, confidence interval.



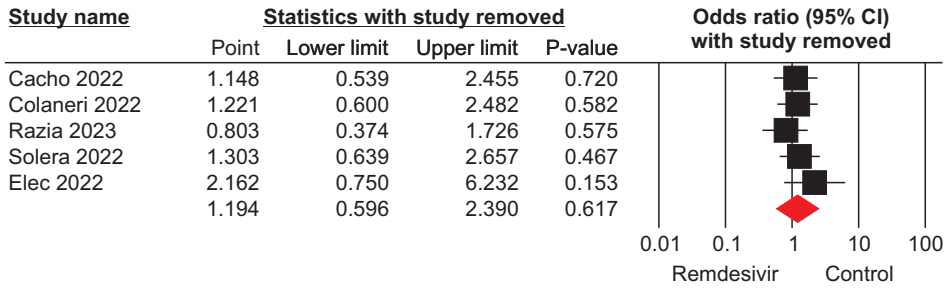
Supplementary Fig. 4. Forest plot of need for mechanical ventilation comparing the control group to remdesivir. CI, confidence interval.



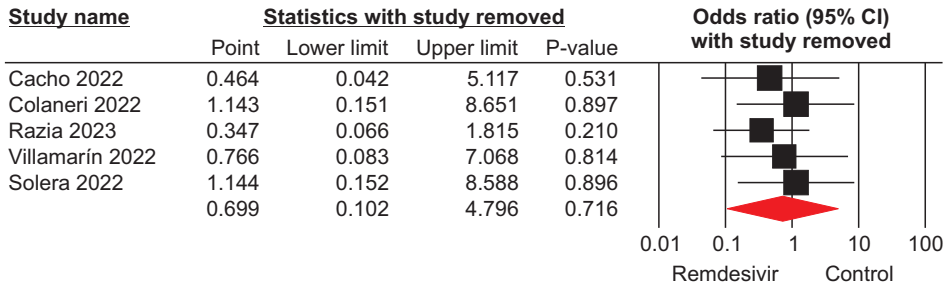
Supplementary Fig. 5. Forest plot of need for oxygen therapy comparing the control group to remdesivir. CI, confidence interval.



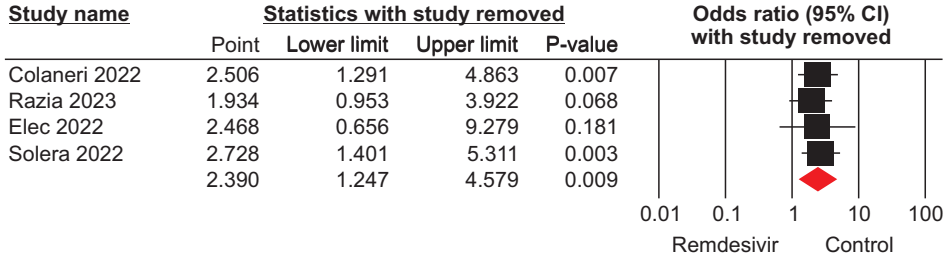
Supplementary Fig. 6. Forest plot of need for oxygen therapy comparing remdesivir to the control group in coronavirus disease 2019 patients. The forest plot indicates no significant difference in need for oxygen therapy between remdesivir and the control group. CI, confidence interval.



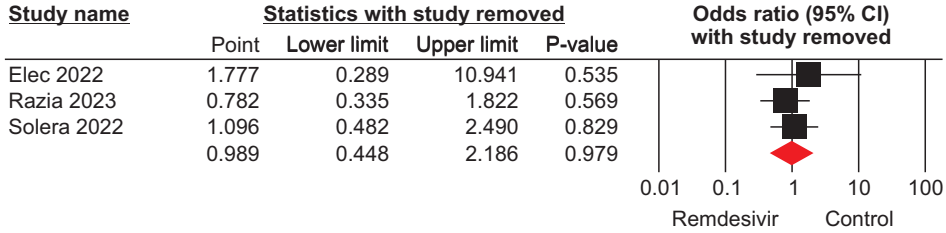
Supplementary Fig. 7. One-leave-out sensitivity analysis for mortality rate. CI, confidence interval.



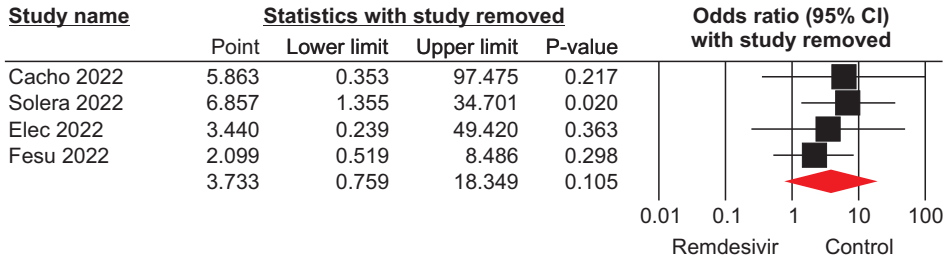
Supplementary Fig. 8. One-leave-out sensitivity analysis for hospitalization rate. CI, confidence interval.



Supplementary Fig. 9. One-leave-out sensitivity analysis for intensive care unit admission. CI, confidence interval.



Supplementary Fig. 10. One-leave-out sensitivity analysis for mechanical ventilation. CI, confidence interval.



Supplementary Fig. 11. One-leave-out sensitivity analysis for oxygen therapy. CI, confidence interval.

Supplementary Material 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist

Section and topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Remdesivir in solid organ transplant recipients with COVID-19: a systematic review and meta-analysis	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	3
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	4
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	5
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	5
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	5
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	5
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	5
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	5
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	6
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	6
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	6
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	6
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	6
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	6
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	6
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	6
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	6
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	6

Supplementary Material 1. Continued

Section and topic	Item #	Checklist item	Location where item is reported
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	7
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	7
Study characteristics	17	Cite each included study and present its characteristics.	7
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	7
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	7-8
Results of syntheses	20a	For each synthesis, briefly summarize the characteristics and risk of bias among contributing studies.	7-8
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	7-8
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	7-8
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	7-8
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	7-8
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	7-8
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	9-12
	23b	Discuss any limitations of the evidence included in the review.	12
	23c	Discuss any limitations of the review processes used.	12
	23d	Discuss implications of the results for practice, policy, and future research.	12
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	5
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	5
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	12
Competing interests	26	Declare any competing interests of review authors.	12
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	12

Supplementary Material 2. Search strategy

Cochrane Library

MeSH descriptor: [Coronavirus] explode all trees OR MeSH descriptor: [SARS-CoV-2] explode all trees OR ("coronavirus"):ti,ab,kw OR (COVID-19):ti,ab,kw OR ("coronavirus infection"):ti,ab,kw OR (2019 nCoV):ti,ab,kw OR (2019nCoV):ti,ab,kw OR (nCov 2019):ti,ab,kw OR (SARS CoV2):ti,ab,kw OR (SARS CoV 2):ti,ab,kw OR (SARSCoV2):ti,ab,kw OR (SARSCoV 2):ti,ab,kw OR (severe acute respiratory syndrome coronavirus 2):ti,ab,kw AND MeSH descriptor: [Organ Transplantation] explode all trees OR (Organ Transplantation): ti,ab,kw OR MeSH descriptor: [Heart Transplantation] explode all trees OR (Heart Transplantation): ti,ab,kw OR MeSH descriptor: [Kidney Transplantation] explode all trees OR (Kidney Transplantation): ti,ab,kw OR MeSH descriptor: [Liver Transplantation] explode all trees OR (Liver Transplantation): ti,ab,kw OR MeSH descriptor: [Lung Transplantation] explode all trees OR (Lung Transplantation): ti,ab,kw OR MeSH descriptor: [Pancreas Transplantation] explode all trees OR (Pancreas Transplantation): ti,ab,kw AND remdesivir* OR GS5734 OR "GS 5734"

PubMed

#1 (COVID-19[MeSH Terms]) OR (Coronavirus[MeSH Terms])) OR (SARS CoV 2[MeSH Terms])) OR (coronavirus[Title/Abstract])) OR (COVID-19[Title/Abstract])) OR (coronavirus infection[Title/Abstract])) OR (2019 nCoV[Title/Abstract])) OR (2019nCoV[Title/Abstract])) OR (nCov 2019[Title/Abstract])) OR (SARS CoV2[Title/Abstract])) OR (SARS CoV 2[Title/Abstract])) OR (SARSCoV2[Title/Abstract])) OR (SARSCoV 2[Title/Abstract])) OR (severe acute respiratory syndrome coronavirus 2[Title/Abstract])) OR (novel corona virus disease[Title/Abstract])) OR (corona virus disease 2019[Title/Abstract])) OR (coronavirus disease 2019[Title/Abstract])) OR (novel coronavirus pneumonia[Title/Abstract])) OR (novel corona virus pneumonia[Title/Abstract])

#2 ((((((((((organ transplantation[MeSH Terms]) OR (Organ Transplantation[Title/Abstract])) OR (heart transplantation[MeSH Terms])) OR (Heart Transplantation[Title/Abstract])) OR (kidney transplantation[MeSH Terms])) OR (Kidney Transplantation[Title/Abstract])) OR (liver transplantation[MeSH Terms])) OR (Liver Transplantation[Title/Abstract])) OR (lung transplantation[MeSH Terms])) OR (Lung Transplantation[Title/Abstract])) OR (pancreas transplantation[MeSH Terms])) OR (Pancreas Transplantation[Title/Abstract])

#3 ((remdesivir*[Title/Abstract]) OR (GS5734[Title/Abstract])) OR (GS 5734[Title/Abstract])

#4 #1 AND #2 AND #3

Web of Science

1. TI= (Coronavirus OR "COVID-19" OR "COVID OR COVID19" OR "SARS-CoV2" OR "SARS-CoV-2" OR SARSCoV2 OR "SARSCoV-2" OR "SARS coronavirus 2" OR "2019 nCoV" OR "2019nCoV" OR "2019-novel CoV" OR "nCov 2019" OR "nCov 19" OR "coronavirus infection" OR "severe acute respiratory syndrome coronavirus 2" OR "novel coronavirus disease" OR "novel corona virus disease" OR "corona virus disease 2019" OR "coronavirus disease 2019" OR "novel coronavirus pneumonia" OR "novel corona virus pneumonia")
2. TI= (organ transplantation OR " heart transplantation " OR " kidney transplantation " OR " liver transplantation " OR " lung transplantation " OR " pancreas transplantation ")
3. TI= (remdesivir* OR GS5734 OR GS 5734)
4. #1 AND #2 AND #3