



- #4 (ARDS, Human):ti,ab,kw OR (Human ARDS):ti,ab,kw OR (Respiratory Distress Syndrome, Pediatric):ti,ab,kw OR (Pediatric Respiratory Distress Syndrome):ti,ab,kw OR (Respiratory Distress Syndrome, Adult):ti,ab,kw (Word variations have been searched) 3496
- #5 (ALD):ti,ab,kw OR (Adult Respiratory Distress Syndrome):ti,ab,kw OR (acute lung injury):ti,ab,kw (Word variations have been searched) 6663
- #6 #1 or #2 or #3 or #4 or #5 11299
- #7 MeSH descriptor: [Mesenchymal Stem Cells] explode all trees 260
- #8 (Stem Cell, Mesenchymal):ti,ab,kw OR (Mesenchymal Stem Cell):ti,ab,kw OR (Mesenchymal Stem Cells):ti,ab,kw OR (Stem Cells, Mesenchymal):ti,ab,kw OR (Bone Marrow Mesenchymal Stem Cells):ti,ab,kw (Word variations have been searched) 2012
- #9 (Bone Marrow Mesenchymal Stem Cell):ti,ab,kw OR (Bone Marrow Stromal Cells):ti,ab,kw OR (Bone Marrow Stromal Cell):ti,ab,kw OR (Bone Marrow Stromal Cells, Multipotent):ti,ab,kw OR (Multipotent Bone Marrow Stromal Cell):ti,ab,kw (Word variations have been searched) 868
- #10 (Multipotent Bone Marrow Stromal Cells):ti,ab,kw OR (Adipose-Derived Mesenchymal Stem Cells):ti,ab,kw OR (Adipose Derived Mesenchymal Stem Cells):ti,ab,kw OR (Adipose-Derived Mesenchymal Stromal Cells):ti,ab,kw OR (Adipose Derived Mesenchymal Stromal Cells):ti,ab,kw (Word variations have been searched) 322
- #11 (Mesenchymal Stem Cells, Adipose-Derived):ti,ab,kw OR (Mesenchymal Stem Cells, Adipose Derived):ti,ab,kw OR (Adipose-Derived Mesenchymal Stem Cell):ti,ab,kw OR (Adipose Derived Mesenchymal Stem Cell):ti,ab,kw OR (Adipose Tissue-Derived Mesenchymal Stem Cell):ti,ab,kw (Word variations have been searched) 299
- #12 (Adipose Tissue Derived Mesenchymal Stem Cell):ti,ab,kw OR (Adipose Tissue-Derived Mesenchymal Stem Cells):ti,ab,kw OR (Adipose Tissue Derived Mesenchymal Stem Cells):ti,ab,kw OR (Adipose Tissue-Derived Mesenchymal Stromal Cells):ti,ab,kw OR (Adipose Tissue Derived Mesenchymal Stromal Cells):ti,ab,kw (Word variations have been searched) 208
- #13 (Adipose Tissue-Derived Mesenchymal Stromal Cell):ti,ab,kw OR (Adipose Tissue Derived Mesenchymal Stromal Cell):ti,ab,kw OR (Mesenchymal Stromal Cells):ti,ab,kw OR (Mesenchymal Stromal Cell):ti,ab,kw OR (Stromal Cell, Mesenchymal):ti,ab,kw (Word variations have been searched) 483
- #14 (Stromal Cells, Mesenchymal):ti,ab,kw OR (Multipotent Mesenchymal Stromal Cells):ti,ab,kw OR (Multipotent Mesenchymal Stromal Cell):ti,ab,kw OR (Mesenchymal Stromal Cells, Multipotent):ti,ab,kw OR (Mesenchymal Progenitor Cell):ti,ab,kw (Word variations have been searched) 558
- #15 (Mesenchymal Progenitor Cells):ti,ab,kw OR (Progenitor Cell, Mesenchymal):ti,ab,kw OR (Progenitor Cells, Mesenchymal):ti,ab,kw OR (Wharton Jelly Cells):ti,ab,kw OR (Wharton's Jelly Cells):ti,ab,kw (Word variations have been searched) 175
- #16 (Wharton's Jelly Cell):ti,ab,kw OR (Whartons Jelly Cells):ti,ab,kw OR (Bone Marrow Stromal Stem Cells):ti,ab,kw OR (MSC):ti,ab,kw OR (MSCs):ti,ab,kw (Word variations have been searched) 1715
- #17 #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 2770
- #18 #6 and #17

## Embase

- #69. #64 AND #68 1,409 12 Mar 2023
- #68. #61 OR #66 OR #67 117,827 12 Mar 2023
- #67. 'mscs':ab,ti 46,194 12 Mar 2023
- #66. 'msc':ab,ti 37,293 12 Mar 2023
- #65. #61 AND #64 1,252 12 Mar 2023
- #64. #24 OR #63 123,727 12 Mar 2023
- #63. 'acute lung injury':ab,ti 22,608 12 Mar 2023
- #62. #24 AND #61 1,200 12 Mar 2023
- #61. #17 OR #18 OR #19 OR #20 OR #23 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR 104,512 12 Mar 2023

#34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR  
 #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR  
 #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR  
 #55 OR #56 OR #57 OR #58 OR #59 OR #60

#60. 'bone marrow stromal stem cells':ab,ti	325	12 Mar 2023
#59. 'whartons jelly cells':ab,ti	1	12 Mar 2023
#58. 'wharton jelly cells':ab,ti	5	12 Mar 2023
#57. 'progenitor cells, mesenchymal':ab,ti	64	12 Mar 2023
#56. 'progenitor cell, mesenchymal':ab,ti	6	12 Mar 2023
#55. 'mesenchymal progenitor cells':ab,ti	1,342	12 Mar 2023
#54. 'mesenchymal progenitor cell':ab,ti	270	12 Mar 2023
#53. 'mesenchymal stromal cells, multipotent':ab,ti	2	12 Mar 2023
#52. 'multipotent mesenchymal stromal cell':ab,ti	93	12 Mar 2023
#51. 'multipotent mesenchymal stromal cells':ab,ti	1,056	12 Mar 2023
#50. 'stromal cells, mesenchymal':ab,ti	54	12 Mar 2023
#49. 'stromal cell, mesenchymal':ab,ti	7	12 Mar 2023
#48. 'mesenchymal stromal cell':ab,ti	2,432	12 Mar 2023
#47. 'mesenchymal stromal cells':ab,ti	12,431	12 Mar 2023
#46. 'adipose tissue derived mesenchymal stromal cell':ab,ti	6	12 Mar 2023
#45. 'adipose tissue-derived mesenchymal stromal cell':ab,ti	6	12 Mar 2023
#44. 'adipose tissue derived mesenchymal stromal cells':ab,ti	175	12 Mar 2023
#43. 'adipose tissue-derived mesenchymal stromal cells':ab,ti	176	12 Mar 2023
#42. 'adipose tissue derived mesenchymal stem cells':ab,ti	1,257	12 Mar 2023
#41. 'adipose tissue-derived mesenchymal stem cells':ab,ti	1,257	12 Mar 2023
#40. 'adipose tissue derived mesenchymal stem cell':ab,ti	121	12 Mar 2023
#39. 'adipose tissue-derived mesenchymal stem cell':ab,ti	121	12 Mar 2023
#38. 'adipose derived mesenchymal stem cell':ab,ti	387	12 Mar 2023
#37. 'adipose-derived mesenchymal stem cell':ab,ti	387	12 Mar 2023
#36. 'mesenchymal stem cells, adipose derived':ab,ti	38	12 Mar 2023
#35. 'mesenchymal stem cells, adipose-derived':ab,ti	38	12 Mar 2023
#34. 'adipose derived mesenchymal stromal cells':ab,ti	293	12 Mar 2023
#33. 'adipose-derived mesenchymal stromal cells':ab,ti	293	12 Mar 2023
#32. 'adipose derived mesenchymal stem cells':ab,ti	2,795	12 Mar 2023
#31. 'adipose-derived mesenchymal stem cells':ab,ti	2,795	12 Mar 2023
#30. 'multipotent bone marrow stromal cells':ab,ti	21	12 Mar 2023
#29. 'multipotent bone marrow stromal cell':ab,ti	3	12 Mar 2023
#28. 'bone marrow stromal cells, multipotent':ab,ti	1	12 Mar 2023
#27. 'bone marrow stromal cell':ab,ti	1,766	12 Mar 2023
#26. 'bone marrow stromal cells':ab,ti	8,078	12 Mar 2023
#25. 'bone marrow mesenchymal stem cell':ab,ti	1,489	12 Mar 2023

#24. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #21 OR #22 119,797 12 Mar 2023

#23. 'bone marrow mesenchymal stem cells':ab,ti 10,138 12 Mar 2023

#22. 'respiratory distress syndrome':ab,ti 46,233 12 Mar 2023

#21. 'ali':ab,ti 16,599 12 Mar 2023

#20. 'stem cells, mesenchymal':ab,ti 335 12 Mar 2023

#19. 'mesenchymal stem cell':ab,ti 16,508 12 Mar 2023

#18. 'stem cell, mesenchymal':ab,ti 35 12 Mar 2023

#17. 'mesenchymal stem cell'/exp 78,096 12 Mar 2023

#16. 'adult respiratory distress syndrome':ab,ti 5,120 12 Mar 2023

#15. 'respiratory distress syndrome, adult':ab,ti 10 12 Mar 2023

#14. 'pediatric respiratory distress syndrome':ab,ti 3 12 Mar 2023

#13. 'respiratory distress syndrome, pediatric':ab,ti 4 12 Mar 2023

#12. 'ards':ab,ti 28,992 12 Mar 2023

#11. 'human ards':ab,ti 106 12 Mar 2023

#10. 'ards, human':ab,ti 6 12 Mar 2023

#9. 'acute respiratory distress syndrome':ab,ti 28,627 12 Mar 2023

#8. 'respiratory distress syndrome, acute':ab,ti 212 12 Mar 2023

#7. 'lung, shock':ab,ti 22 12 Mar 2023

#6. 'shock lung':ab,ti 607 12 Mar 2023

#5. 'syndrome, respiratory distress':ab,ti 32 12 Mar 2023

#4. 'respiratory distress syndromes':ab,ti 148 12 Mar 2023

#3. 'distress syndromes, respiratory':ab,ti 1 12 Mar 2023

#2. 'distress syndrome, respiratory':ab,ti 51 12 Mar 2023

#1. 'respiratory distress syndrome'/exp 100,893 12 Mar 2023

0.24 0.817 -3.284018 4.004743

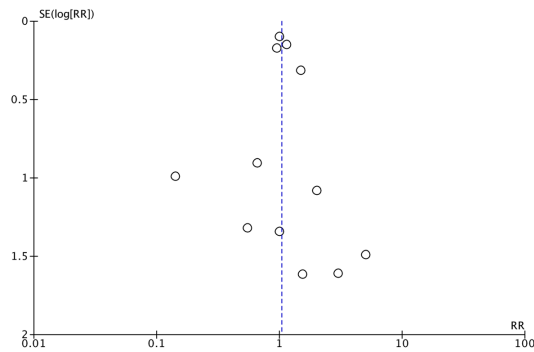
**Table S1** Concomitant treatments of the included studies

References	Concomitant treatments
Monsel <i>et al.</i> (23)	1. Vasopressors 2. Neuromuscular blocking agents 3. Corticosteroids
Bowdish <i>et al.</i> (15)	1. Remdesivir 2. Convalescent plasma 3. IL-6 inhibitor 4. Glucocorticoid 5. Antibiotics 6. Anticoagulation antiplatelets 7. ACE inhibitor or ARB 8. Neuromuscular blockade 9. Pulmonary vasodilators
Rebelatto <i>et al.</i> (25)	1. Anticoagulant 2. Steroids 3. Antibiotics 4. Antiviral drugs
Lanzoni <i>et al.</i> (20)	1. Heparin 2. Remdesivir 3. Convalescent plasma 4. Corticosteroids 5. Tocilizumab 6. Hydroxychloroquine 7. Alteplase
Zheng <i>et al.</i> (29)	NR
Aghayan <i>et al.</i> (14)	NR
Dilogo <i>et al.</i> (16)	NR
Matthay <i>et al.</i> (22)	Vasopressors
Kaffash Farkhad <i>et al.</i> (19)	1. Dexamethasone 2. Remdesivir 3. Antibiotics
Gorman <i>et al.</i> (18)	1. Airway pressure release ventilation 2. High-frequency oscillatory ventilation 3. Neuromuscular-blocking drugs 4. Nitric oxide 5. Prone position

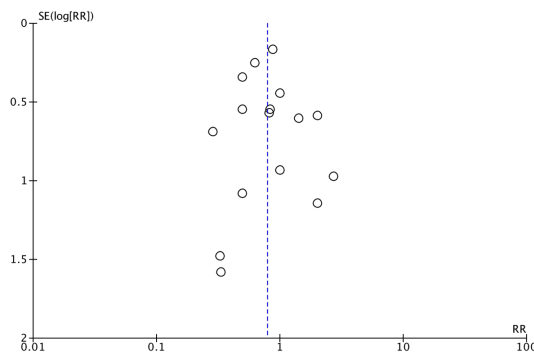
**Table S1** (continued)**Table S1** (continued)

References	Concomitant treatments
Pochon <i>et al.</i> (24)	1. Prone positioning 2. Corticosteroids 3. Vasopressors
Zarrabi <i>et al.</i> (28)	1. Dexamethasone 2. Oral prednisolone 3. Enoxaparin 4. Heparin 5. Remdesivir
Adas <i>et al.</i> (13)	1. Antibiotics 2. Antivirals 3. Dexamethasone 4. Hydroxychloroquine 5. Enoxaparine
Shi <i>et al.</i> (26)	1. Antiviral drugs 2. Antibiotics 3. Corticosteroids
Shu <i>et al.</i> (27)	1. Antiviral agents 2. Antibiotic agents 3. Glucocorticoid
Martínez-Muñoz <i>et al.</i> (21)	1. Remdesivir 2. Glucocorticoid 3. Tocilizumab 4. Low molecular weight heparin
Fathi-Kazerooni <i>et al.</i> (17)	NR

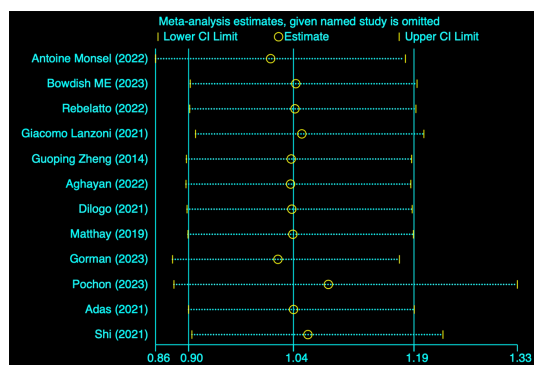
NR, not reported.



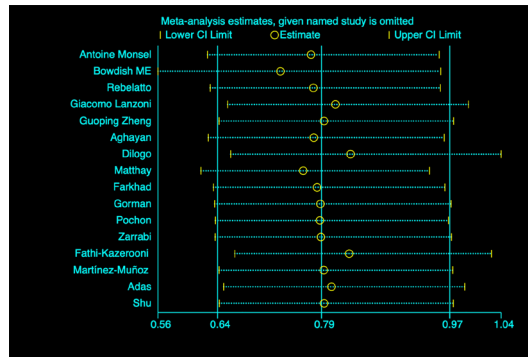
**Figure S1** Funnel plot of adverse events. X-axis: represents the RR of adverse events. Y-axis: represents the SE of the effect size of adverse events. RR, relative risk; SE, standard error.



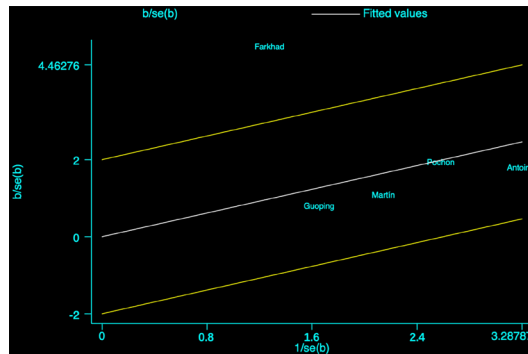
**Figure S2** Funnel plot of all-cause mortality. X-axis: represents the RR of all-cause mortality. Y-axis: represents the SE of the effect size of all-cause mortality. RR, relative risk; SE, standard error.



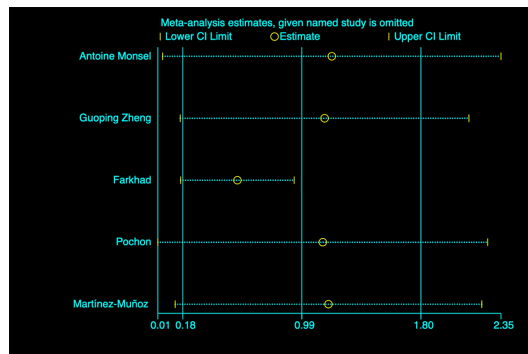
**Figure S3** Sensitivity analysis of adverse events. X-axis: represents the meta-analysis effect size estimates of adverse events and their CIs. Y-axis: represents the names and years of the individual studies. CIs, confidence intervals.



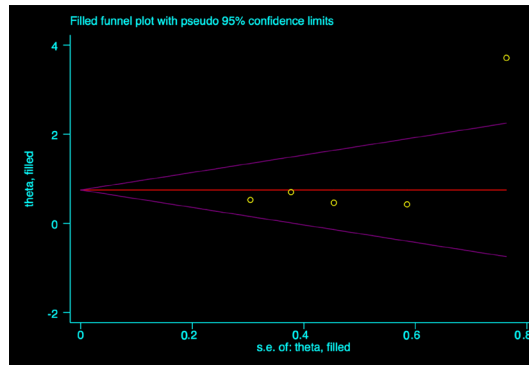
**Figure S4** Sensitivity analysis of all-cause mortality. X-axis: represents the meta-analysis effect size estimates of all-cause mortality and their CIs. Y-axis: represents the names of the individual studies. CIs, confidence intervals.



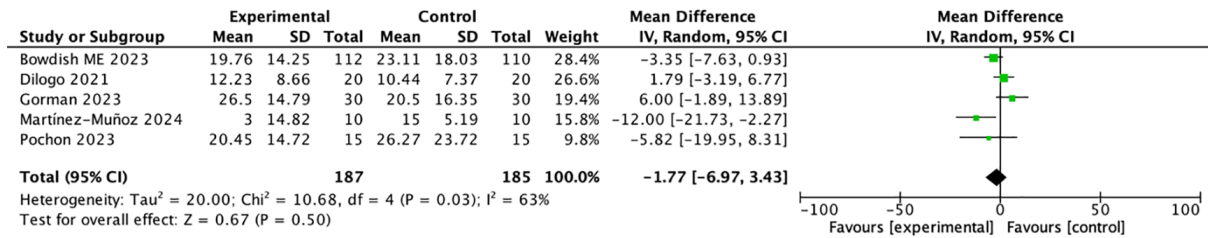
**Figure S5** Galbraith plot for heterogeneity of  $\Delta\text{PaO}_2/\text{FiO}_2$ . X-axis: represents the inverse of the standard error of the effect size of  $\Delta\text{PaO}_2/\text{FiO}_2$  [ $1/\text{standard error of the effect size, } 1/\text{se}(b)$ ]. Y-axis: represents the ratio of the effect size to its standard error of  $\Delta\text{PaO}_2/\text{FiO}_2$  [effect size divided by its standard error,  $b/\text{se}(b)$ ].



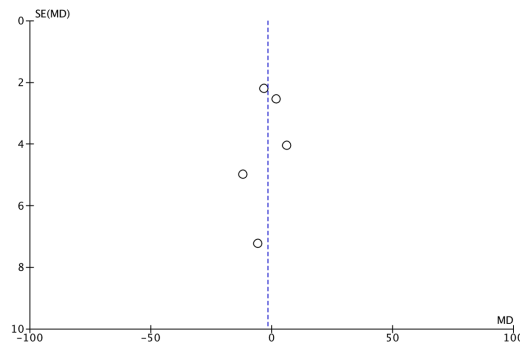
**Figure S6** Sensitivity analysis of  $\Delta\text{PaO}_2/\text{FiO}_2$ . X-axis: represents the meta-analysis effect size estimates of  $\Delta\text{PaO}_2/\text{FiO}_2$  and their CIs. Y-axis: represents the names of the individual studies. CIs, confidence intervals.



**Figure S7** Trim and fill analysis of  $\Delta\text{PaO}_2/\text{FiO}_2$ . X-axis: represents the standard error of the filled effect size of  $\Delta\text{PaO}_2/\text{FiO}_2$  (standard error of the effect size, filled). Y-axis: represents the filled effect size estimate of  $\Delta\text{PaO}_2/\text{FiO}_2$  (effect size, filled).

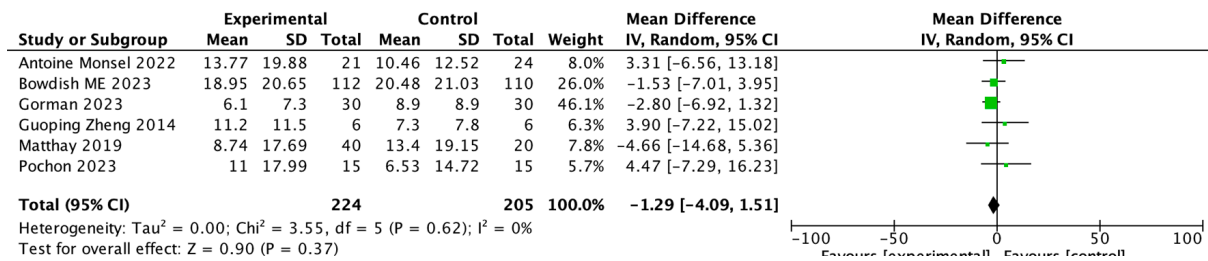


**Figure S8** Forest plot of the ICU length of stay. IV, inverse variance; SD, standard deviation; CI, confidence interval; ICU, intensive care unit.

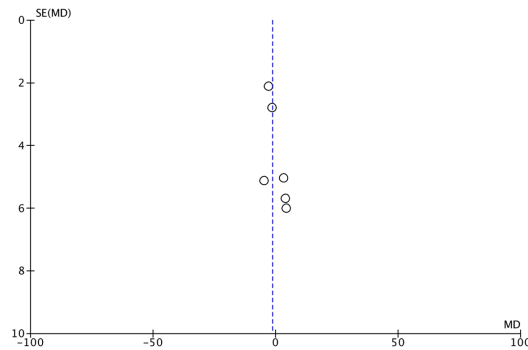


**Figure S9** Funnel plot of the ICU length of stay. X-axis: represents the MD of the ICU length of stay. Y-axis: represents the SE(MD) of the ICU length of stay. MD, mean difference; SE(MD), standard error of the mean difference; ICU, intensive care unit.

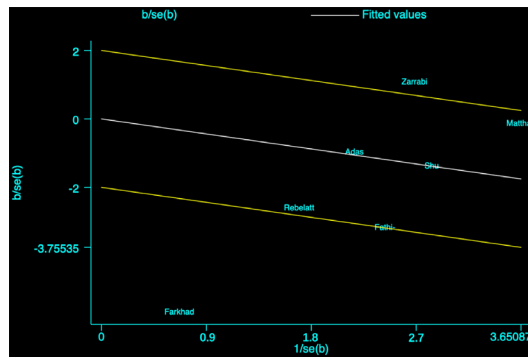




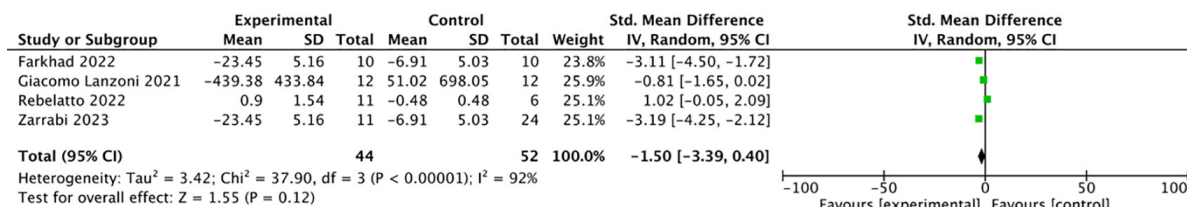
**Figure S10** Forest plot of the ventilation-free days. IV, inverse variance; SD, standard deviation; CI, confidence interval.



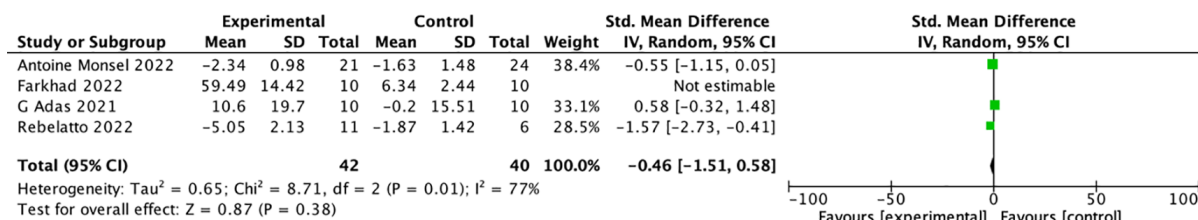
**Figure S11** Funnel plot of the ventilation-free days. X-axis: represents the MD of ventilation-free days. Y-axis: represents the SE(MD) of ventilation-free days. MD, mean difference; SE(MD), standard error of the mean difference.



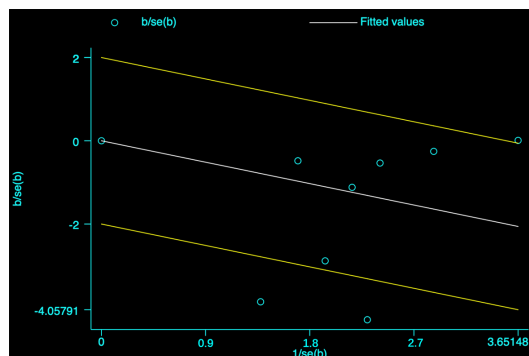
**Figure S12** Galbraith plot for heterogeneity of  $\Delta$ CRP. X-axis: represents the inverse of the standard error of the effect size of  $\Delta$ CRP [1/standard error of the effect size, 1/se(b)]. Y-axis: represents the ratio of the effect size to its standard error of  $\Delta$ CRP [effect size divided by its standard error, b/se(b)]. CRP, C-reactive protein.



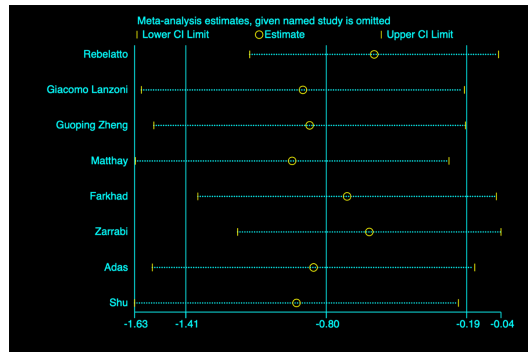
**Figure S13** Forest plot of the  $\Delta$ TNF- $\alpha$ . IV, inverse variance; SD, standard deviation; CI, confidence interval; TNF, tumor necrosis factor.



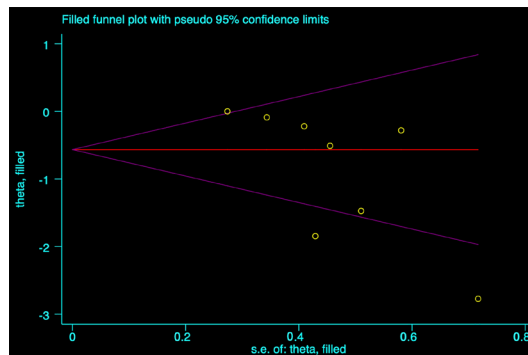
**Figure S14** Forest plot of the  $\Delta$ IL-10. IV, inverse variance; SD, standard deviation; CI, confidence interval; IL, interleukin.



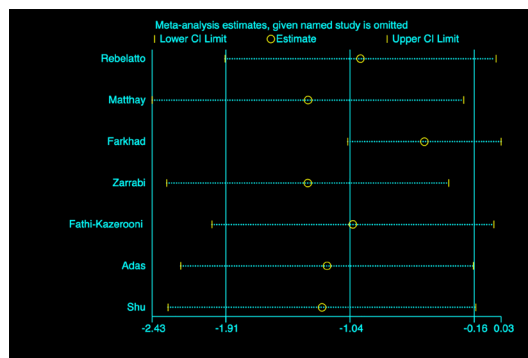
**Figure S15** Galbraith plot for heterogeneity of  $\Delta$ IL-6. X-axis: represents the inverse of the standard error of the effect size of  $\Delta$ IL-6 [ $1/\text{standard error of the effect size}, 1/\text{se}(b)$ ]. Y-axis: represents the ratio of the effect size to its standard error of  $\Delta$ IL-6 [effect size divided by its standard error,  $b/\text{se}(b)$ ]. IL, interleukin.



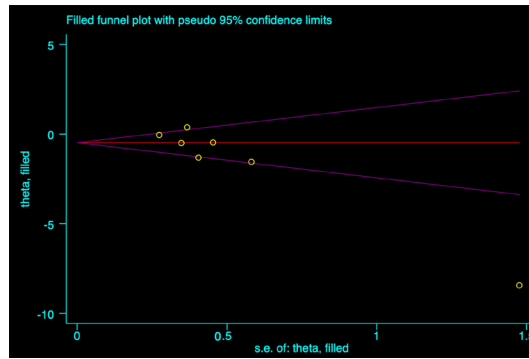
**Figure S16** Sensitivity analysis of  $\Delta$ IL-6. X-axis: represents the meta-analysis effect size estimates of  $\Delta$ IL-6 and their CIs. Y-axis: represents the names of the individual studies. CIs, confidence intervals; IL, interleukin.



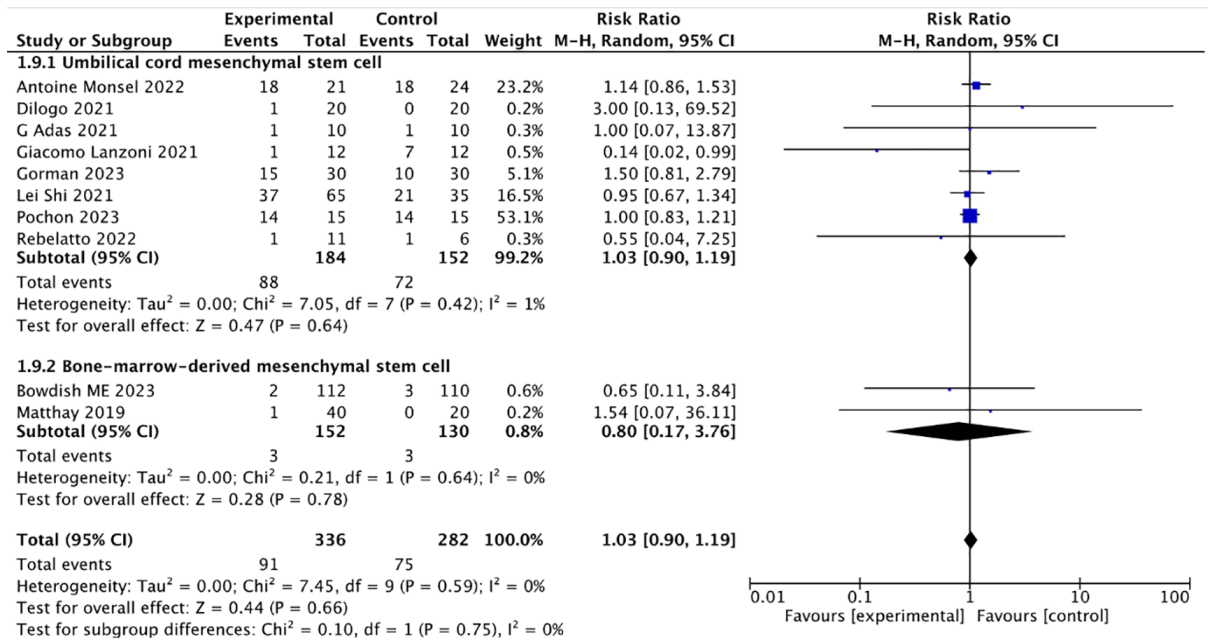
**Figure S17** Trim and fill analysis of  $\Delta$ IL-6. X-axis: represents the standard error of the filled effect size of  $\Delta$ IL-6 (standard error of the effect size, filled). Y-axis: represents the filled effect size estimate of  $\Delta$ IL-6 (effect size, filled). IL, interleukin.



**Figure S18** Sensitivity analysis of  $\Delta$ CRP. X-axis: represents the meta-analysis effect size estimates of  $\Delta$ CRP and their CIs. Y-axis: represents the names of the individual studies. CIs, confidence intervals; CRP, C-reactive protein.



**Figure S19** Trim and fill analysis of  $\Delta$ CRP. X-axis: represents the standard error of the filled effect size of  $\Delta$ CRP (standard error of the effect size, filled). Y-axis: represents the filled effect size estimate of  $\Delta$ CRP (effect size, filled). CRP, C-reactive protein.



**Figure S20** Forest plot of subgroup analyses for the adverse events. M-H, Mantel-Haenszel test; CI, confidence interval.

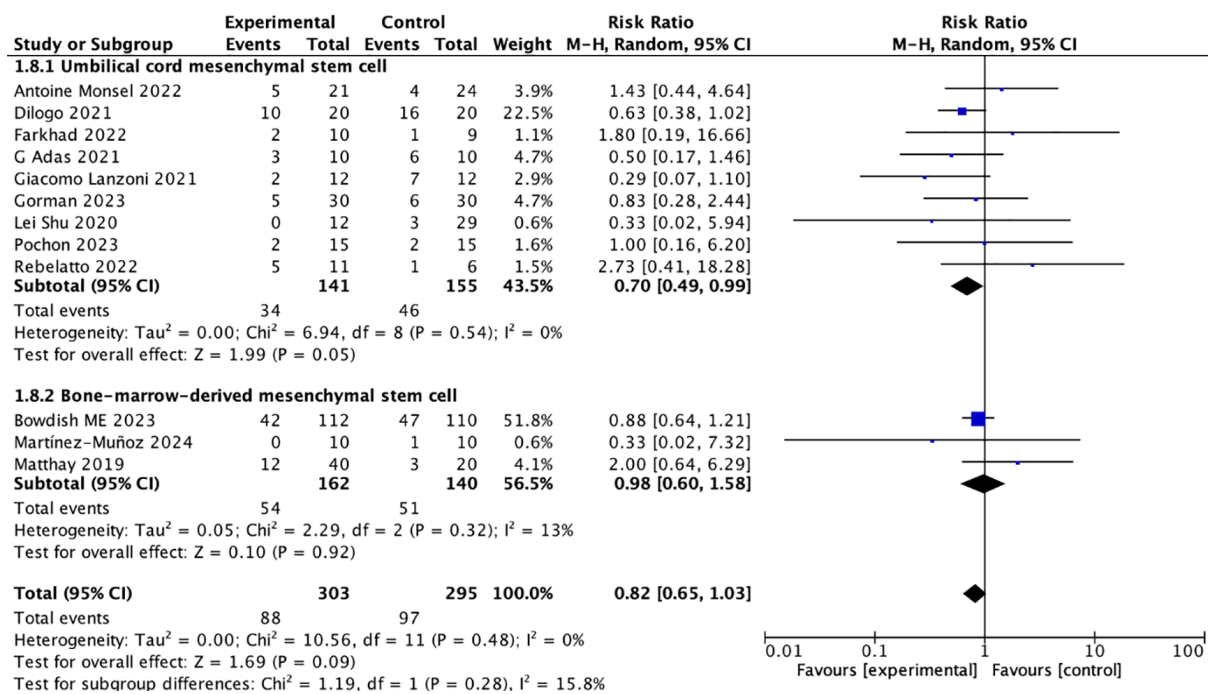


Figure S21 Forest plot of subgroup analyses for the all-cause mortality rates. M-H, Mantel-Haenszel test; CI, confidence interval.

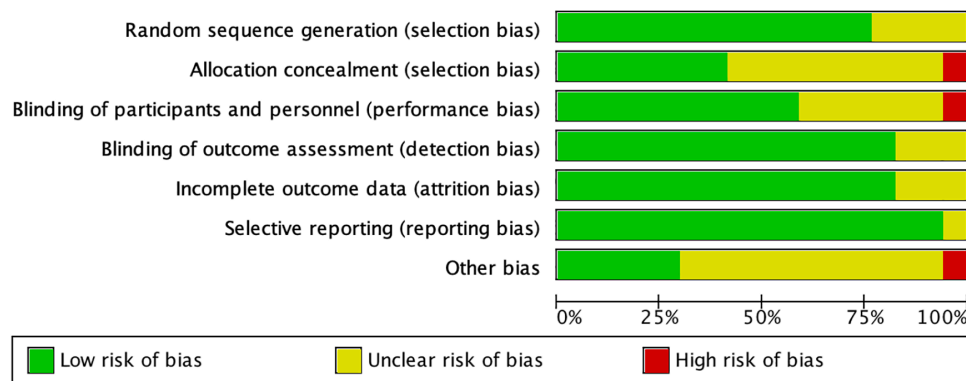


Figure 22 Risk of bias.