

Effects of Vitamin D Serum Level on Morbidity and Mortality in Patients with COVID-19: A Systematic Review and Meta-Analysis

Yiyun Hu¹, Janice Y. Kung², Andrew Cave³, Hoan Linh Banh³

SUPPLEMENTS

Database	Search Strategy
MEDLINE	1. vitamin D.mp.
Ovid MEDLINE(R) ALL 1946 to March 09, 2021	2. vitamin D2.mp.
	3. vitamin D3.mp.
	4. 1-alpha hydroxyvitamin D3.mp.
	5. 1-alpha-hydroxy-vitamin D3.mp.
	6. 1-alpha hydroxy calciferol.mp.
	7. 1-alpha-hydroxy-calciferol.mp.
	8. 1,25 dihydroxyvitamin D3.mp.
	9. 1,25-dihydroxy-vitamin D3.mp.
	10. 1,25 dihydroxycholecalciferol.mp.
	11. 1,25-dihydroxycholecalciferol.mp.
	12. 25-hydroxy-vitamin D.mp.
	13. 25 hydroxy vitamin D.mp.
	14. alfacalcidol.mp.
	15. calcidiol.mp.
	16. calcitriol.mp.
	17. calciferol.mp.
	18. ergocalciferol*.mp.
	19. cholecalciferol.mp.
	20. or/1-19
	21. limit 20 to covid-19
	22. randomized controlled trial.pt.
	23. clinical trial.pt.
	24. randomi?ed.ti,ab.
	25. placebo.ti,ab.
	26. dt.fs.
	27. randomly.ti,ab.
	28. trial.ti,ab.
	29. groups.ti,ab.
	30. or/22-29
	31. animals/
	32. humans/
	33. 31 not (31 and 32)
	34. 30 not 33
	35. 21 and 34
Embase	1. vitamin D.mp.
Ovid Embase 1974 to 2021 March 09	2. vitamin D2.mp.
	3. vitamin D3.mp.
	4. 1-alpha hydroxyvitamin D3.mp.
	5. 1-alpha-hydroxy-vitamin D3.mp.
	6. 1-alpha hydroxy calciferol.mp.
	7. 1-alpha-hydroxy-calciferol.mp.
	8. 1,25 dihydroxyvitamin D3.mp.
	9. 1,25-dihydroxy-vitamin D3.mp.
	10. 1,25 dihydroxycholecalciferol.mp.
	11. 1,25-dihydroxycholecalciferol.mp.

12. 25-hydroxy-vitamin D.mp.
13. 25 hydroxy vitamin D.mp.
14. alfacalcidol.mp.
15. calcidiol.mp.
16. calcitriol.mp.
17. calciferol.mp.
18. ergocalciferol*.mp.
19. cholecalciferol.mp.
20. or/1-19
21. limit 20 to covid-19
22. Randomized controlled trial/ or Controlled clinical study/ or randomization/ or intermethod comparison/ or double blind procedure/ or human experiment/
23. (random\$ or placebo or (open adj label) or ((double or single or doubly or singly) adj (blind or blinded or blindly)) or parallel group\$1 or crossover or cross over or ((assign\$ or match or matched or allocation) adj5 (alternate or group\$1 or intervention\$1 or patient\$1 or subject\$1 or participant\$1)) or assigned or allocated or (controlled adj7 (study or design or trial)) or volunteer or volunteers).ti,ab.
24. (compare or compared or comparison or trial).ti.
25. ((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.
26. or/22-25
27. (random\$ adj sampl\$ adj7 (cross section\$ or questionnaire\$1 or survey\$ or database\$1)).ti,ab. not (comparative study/ or controlled study/ or randomi?ed controlled.ti,ab. or randomly assigned.ti,ab.)
28. Cross-sectional study/ not (randomized controlled trial/ or controlled clinical study/ or controlled study/ or randomi?ed controlled.ti,ab. or control group\$1.ti,ab.)
29. (((case adj control\$) and random\$) not randomi?ed controlled).ti,ab.
30. (Systematic review not (trial or study)).ti.
31. (nonrandom\$ not random\$).ti,ab.
32. Random field\$.ti,ab.
33. (random cluster adj3 sampl\$).ti,ab.
34. (review.ab. and review.pt.) not trial.ti.
35. "we searched".ab. and (review.ti. or review.pt.)
36. update review.ab.
37. (databases adj4 searched).ab.
38. (rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\$1).ti. and animal experiment/
39. Animal experiment/ not (human experiment/ or human/)
40. or/27-39
41. 26 not 40
42. 21 and 41

CINAHL

- 1 "vitamin D"
- 2 "vitamin D2"
- 3 "vitamin D3"
- 4 alfacalcidol
- 5 calcidiol
- 6 calcitriol
- 7 calciferol
- 8 ergocalciferol*
- 9 cholecalciferol
- 10 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9
- 11 ((MH "Coronavirus+") or coronavirus* or covid) AND (wuhan or beijing or shanghai) OR (("novel coronavirus*" AND ((MH "China") or China)) OR TI coronavirus* OR (((MH pneumonia) or pneumonia) AND Wuhan) OR ((D614G

- or "Covid-19" or Covid19 or "2019-nCoV" or "SARS-CoV-2" or (MH Coronavirus Infections)))) AND ((MH "Coronavirus+" or coronavirus* or covid) AND (wuhan or beijing or shanghai) OR (("novel coronavirus*" AND ((MH "China" or China)) OR TI coronavirus* OR (((MH pneumonia) or pneumonia) AND Wuhan) OR ((D614G or "Covid-19" or Covid19 or "2019-nCoV" or "SARS-CoV-2" or (MH Coronavirus Infections))))) AND DT 20191201-20300101)
- 12 S10 AND S11
- 13 (MH (randomized controlled trials OR double-blind studies OR single-blind studies OR random assignment OR pretest-posttest design OR cluster sample) OR TI (randomised OR randomized) OR AB random* OR TI trial OR ((MH (sample size) AND AB (assigned OR allocated OR control))) OR MH (placebos OR crossover design OR comparative studies) OR AB ((control W5 group) OR (cluster W3 RCT) OR PT (randomized controlled trial))) NOT ((MH animals+ OR MH (animal studies) OR TI (animal model*)) NOT MH (human))
- 14 S12 AND S13

Scopus

TITLE-ABS-KEY ({vitamin D} OR {vitamin D2} OR {vitamin D3} OR "1-alpha hydroxyvitamin D3" OR "1,25 dihydroxyvitamin D3" OR "1,25-dihydroxyvitamin D3" OR "1,25 dihydroxycholecalciferol" OR "1,25-dihydroxycholecalciferol" OR "25-hydroxy-vitamin D" OR alfacalcidol OR calcidiol OR calcitriol OR calciferol OR ergocalciferol* OR cholecalciferol) AND ((TITLE-ABS-KEY ((coronavirus* OR "corona virus*" OR oc43 OR nl63 OR 229e OR hku1 OR hcov* OR ncov* OR covid* OR "sars-cov*" OR sarscov* OR "Sars-coronavirus*" OR "Severe Acute Respiratory Syndrome Coronavirus*" OR d614g)) AND NOT ((TITLE-ABS-KEY ((sars OR sars-cov OR mers OR mers-cov OR "Middle East respiratory syndrome or camel*" OR dromedar* OR equine OR coronary OR coronal OR covidence* OR covidien OR "influenza virus" OR hiv OR bovine OR calves OR tgev OR feline OR porcine OR bcov))) OR (TITLE-ABS-KEY ((ped OR pedv OR pdcov OR fipv OR fcov OR sads-cov OR canine OR ccov OR zoonotic OR "avian influenza" OR h1n1 OR h5n1 OR h5n6 OR ibv OR "murine corona*")))) OR (TITLE-ABS-KEY ((pneumonia OR covid* OR coronavirus* OR "corona virus*" OR ncov* OR 2019-ncov OR sars*) AND wuhan) OR ((2019-ncov OR ncov19 OR ncov-19 OR "2019-novel cov" OR sars-cov2 OR sars-cov-2 OR sarscov2 OR sarscov-2 OR sars-coronavirus2 OR sars-coronavirus-2 OR "SARS-like coronavirus*" OR coronavirus-19 OR covid19 OR covid-19 OR "covid 2019" OR ((covid OR covid19 OR covid-19) AND pandemi*) OR (coronavirus* AND pneumonia)))) OR (TITLE ((novel OR new OR nouveau)) AND (cov OR ncov OR covid OR coronavirus* OR "corona virus" OR pandemi*))) OR (ABS ((novel OR new OR nouveau) AND (cov OR ncov OR covid OR coronavirus* OR "corona virus" OR pandemi*))) OR (KEY ((novel OR new OR nouveau) AND (cov OR ncov OR covid OR coronavirus* OR "corona virus" OR pandemi*))) AND (TITLE-ABS-KEY ({Clinical-trial} OR {controlled-trial} OR randomi* OR randomly OR (random W/4 (allocat* OR distribut* OR assign*)) OR {placebo} OR {trial} OR {groups} OR {subgroups}) OR TITLE (rct)) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019))

- Cochrane Library** 1 MeSH descriptor: [Vitamin D] explode all trees
2 vitamin D

- via Wiley
- 3 vitamin D2
 - 4 vitamin D3
 - 5 1-alpha hydroxyvitamin D3
 - 6 1-alpha-hydroxy-vitamin D3
 - 7 1-alpha hydroxy calciferol
 - 8 1-alpha-hydroxy-calciferol
 - 9 1,25 dihydroxyvitamin D3
 - 10 1,25-dihydroxy-vitamin D3
 - 11 1,25 dihydroxycholecalciferol
 - 12 25-hydroxy-vitamin D
 - 13 alfacalcidol
 - 14 calcidiol
 - 15 calcitriol
 - 16 calciferol
 - 17 ergocalciferol*
 - 18 cholecalciferol
 - 19 {OR #1-#18}
 - 20 [mh Coronavirus]
 - 21 [mh "Coronavirus Infections"]
 - 22 D614G or coronavirus* or corona virus* or OC43 or NL63 or 229E or HKU1 or HCoV* or ncov* or covid* or sars cov* or sarscov* or Sars coronavirus* or Severe Acute Respiratory Syndrome Coronavirus*
 - 23 pneumonia or covid* or coronavirus* or corona virus* or ncov* or 2019 ncov or sars*
 - 24 [mh pneumonia] and Wuhan
 - 25 2019 ncov or ncov19 or ncov 19 or 2019 novel CoV or sars cov2 or sars cov 2 or sarscov2 or sarscov 2 or Sars coronavirus2 or Sars coronavirus 2 or SARS like coronavirus* or coronavirus 19 or covid19 or covid 19 or covid 2019
 - 26 (novel or new or nouveau) NEAR/2 (CoV on nCoV or covid or coronavirus* or corona virus or pandemi*)
 - 27 (covid or covid19 or covid 19) and pandemi*
 - 28 coronavirus* and pneumonia
 - 29 {OR #20-#28}
 - 30 #19 AND #29
 - 31 (randomi* or placebo or randomly or trial* or groups or "drug therapy"):ti,ab
 - 32 #30 AND #31

Custom date range: 2019 - 2021

**Web of Science
Core Collection**

- 1 TS=("vitamin D" OR "vitamin D2" OR "vitamin D3" OR "1alpha hydroxyvitamin D3" OR "1,25 dihydroxyvitamin D3" OR "1,25dihydroxyvitamin D3" OR "1,25 dihydroxycholecalciferol" OR "1,25dihydroxycholecalciferol" OR "25hydroxyvitamin D" OR alfacalcidol OR calcidiol OR calcitriol OR calciferol OR ergocalciferol* OR cholecalciferol)
- 2 TS= ((coronavirus* OR "corona virus*" OR oc43 OR nl63 OR 229e OR hku1 OR hcov* OR ncov* OR covid* OR "sars-cov*" OR sarscov* OR "Sars-coronavirus*" OR "Severe Acute Respiratory Syndrome Coronavirus*" OR d614g) NOT (sars OR sars-cov OR mers OR mers-cov OR "Middle East respiratory syndrome" OR camel* OR dromedar* OR equine OR coronary OR coronal OR cvidence* OR covidien OR "influenza virus" OR hiv OR bovine OR calves OR tgev OR feline OR porcine OR bcov OR ped OR pedv OR pdcov OR fipv OR fcov OR sads-cov OR canine OR ccov OR zoonotic OR "avian influenza" OR h1n1 OR h5n1 OR h5n6 OR ibv OR "murine corona*"))
- 3 TS=(((pneumonia OR covid* OR coronavirus* OR "corona virus*" OR ncov* OR 2019-ncov OR sars*) AND wuhan) OR (2019-ncov OR ncov19 OR ncov-19 OR 2019-novel AND cov OR sars-cov2 OR sars-cov-2 OR sarscov2 OR sarscov-2 OR sars-coronavirus2 OR sars-coronavirus-2 OR "SARS-like coronavirus*" OR

coronavirus-19 OR covid19 OR covid-19 OR "covid 2019") OR ((covid OR covid19 OR covid-19) AND pandemic*) OR (coronavirus* AND pneumonia))
4 TI= ((novel OR new OR nouveau) AND (cov OR ncov OR covid OR coronavirus* OR "corona virus" OR pandemi*))
5 AB= ((novel OR new OR nouveau) AND (cov OR ncov OR covid OR coronavirus* OR "corona virus" OR pandemi*))
6 TS= ((novel OR new OR nouveau) AND (cov OR ncov OR covid OR coronavirus* OR "corona virus" OR pandemi*))
7 #6 OR #5 OR #4 OR #3 OR #2
8 #7 AND #1
9 TS=(randomised OR randomized OR randomisation OR randomisation OR placebo* OR (random* AND (allocat* OR assign*)) OR (blind* AND (single OR double OR treble OR triple))) NOT TS=(animal or animals or pisces or fish or fishes or catfish or catfishes or sheatfish or silurus or arius or heteropneustes or clarias or gariepinus or fathead minnow or fathead minnows or pimephales or promelas or cichlidae or trout or trouts or char or chars or salvelinus or salmo or oncorhynchus or guppy or guppies or millionfish or poecilia or goldfish or goldfishes or carassius or auratus or mullet or mullets or mugil or curema or shark or sharks or cod or cods or gadus or morhua or carp or carps or cyprinus or carpio or killifish or eel or eels or anguilla or zander or sander or lucioperca or stizostedion or turbot or turbots or psetta or flatfish or flatfishes or plaice or pleuronectes or platessa or tilapia or tilapias or oreochromis or sarotherodon or common sole or dover sole or solea or zebrafish or zebrafishes or danio or rerio or seabass or dicentrarchus or labrax or morone or lamprey or lampreys or petromyzon or pumpkinseed or pumpkinseeds or lepomis or gibbosus or herring or clupea or harengus or amphibia or amphibian or amphibians or anura or salientia or frog or frogs or rana or toad or toads or bufo or xenopus or laevis or bombina or epidalea or calamita or salamander or salamanders or newt or newts or triturus or reptilia or reptile or reptiles or bearded dragon or pogona or vitticeps or iguana or iguanas or lizard or lizards or anguis fragilis or turtle or turtles or snakes or snake or aves or bird or birds or quail or quails or coturnix or bobwhite or colinus or virginianus or poultry or poultries or fowl or fowls or chicken or chickens or gallus or zebra finch or taeniopygia or guttata or canary or canaries or serinus or canaria or parakeet or parakeets or grasskeet or parrot or parrots or psittacine or psittacines or shelduck or tadorna or goose or geese or branta or leucopsis or woodlark or lullula or flycatcher or ficedula or hypoleuca or dove or doves or geopelia or cuneata or duck or ducks or greylag or graylag or anser or harrier or circus pygargus or red knot or great knot or calidris or canutus or godwit or limosa or lapponica or meleagris or gallopavo or jackdaw or corvus or monedula or ruff or philomachus or pugnax or lapwing or peewit or plover or vanellus or swan or cygnus or columbianus or bewickii or gull or chroicocephalus or ridibundus or albigularis or great tit or parus or aythya or fuligula or streptopelia or risoria or spoonbill or platalea or leucorodia or blackbird or turdus or merula or blue tit or cyanistes or pigeon or pigeons or columba or pintail or anas or starling or sturnus or owl or athene noctua or pochard or ferina or cockatiel or nymphicus or hollandicus or skylark or alauda or tern or sterna or teal or crecca or oystercatcher or haematopus or ostralegus or shrew or shrews or sorex or araneus or crocidura or russula or european mole or talpa or chiroptera or bat or bats or eptesicus or serotinus or myotis or dasycneme or daubentonii or pipistrelle or pipistrellus or cat or cats or felis or catus or feline or dog or dogs or canis or canine or canines or otter or otters or lutra or badger or badgers or meles or fitchew or fitch or foudmart or foulmart or ferrets or ferret or polecat or polecats or mustela or putorius or weasel or weasels or fox or foxes or vulpes or common seal or phoca or vitulina or grey seal or halichoerus or horse or horses or equus or equine or equidae or donkey or donkeys or mule or mules or pig or pigs or swine or swines or hog or hogs or boar or boars or porcine or piglet or piglets or sus or scrofa or llama or llamas or lama or glama or deer or deers or cervus or elaphus or cow or cows or bos taurus or bos indicus or bovine or bull or bulls or cattle or bison or bisons or sheep or sheeps or ovis aries or ovine or lamb or

lamb or mouflon or mouflons or goat or goats or capra or caprine or chamois or rupicapra or leporidae or lagomorpha or lagomorph or rabbit or rabbits or oryctolagus or cuniculus or laprine or hares or lepus or rodentia or rodent or rodents or murinae or mouse or mice or mus or musculus or murine or woodmouse or apodemus or rat or rats or rattus or norvegicus or guinea pig or guinea pigs or cavia or porcellus or hamster or hamsters or mesocricetus or cricetus or cricetus or gerbil or gerbils or jird or jirds or meriones or unguiculatus or jerboa or jerboas or jaculus or chinchilla or chinchillas or beaver or beavers or castor fiber or castor canadensis or sciuridae or squirrel or squirrels or sciurus or chipmunk or chipmunks or marmot or marmots or marmota or suslik or susliks or spermophilus or cynomys or cottonrat or cottonrats or sigmodon or vole or voles or microtus or myodes or glareolus or primate or primates or prosimian or prosimians or lemur or lemurs or lemoridae or loris or bush baby or bush babies or bushbaby or bushbabies or galago or galagos or anthropoidea or anthropoids or simian or simians or monkey or monkeys or marmoset or marmosets or callithrix or cebuella or tamarin or tamarins or saguinus or leontopithecus or squirrel monkey or squirrel monkeys or saimiri or night monkey or night monkeys or owl monkey or owl monkeys or douroucoulis or aotus or spider monkey or spider monkeys or ateles or baboon or baboons or papio or rhesus monkey or macaque or macaca or mulatta or cynomolgus or fascicularis or green monkey or green monkeys or chlorocebus or vervet or vervets or pygerythrus or hominoidea or ape or apes or hylobatidae or gibbon or gibbons or siamang or siamangs or nomascus or symphalangus or hominidae or orangutan or orangutans or pongo or chimpanzee or chimpanzees or pan troglodytes or bonobo or bonobos or pan paniscus or gorilla or gorillas or troglodytes)

10 #9 AND #8

Web of Science Core Collection: Citation Indexes

- Science Citation Index Expanded (SCI-EXPANDED) --1900-present
- Social Sciences Citation Index (SSCI) --1900-present
- Arts & Humanities Citation Index (A&HCI) --1975-present
- Conference Proceedings Citation Index- Science (CPCI-S) --1990-present
- Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH) --1990-present
- Book Citation Index– Social Sciences & Humanities (BKCI-SSH) --2005-present
- Emerging Sources Citation Index (ESCI) --2015-present

Web of Science Core Collection: Chemical Indexes

- Current Chemical Reactions (CCR-EXPANDED) --1985-present (Includes Institut National de la Propriete Industrielle structure data back to 1840)
- Index Chemicus (IC) --1993-present

Google Scholar vitamin D" AND (covid-19 OR coronavirus)