

Table S1 Search Strategy used in four databases

Literature search strategy in PubMed: 789
1: "HIV"[MeSH Terms] OR "HIV Infections"[MeSH Terms] OR "hiv infection"[Title/Abstract] OR "human immunodeficiency virus"[Title/Abstract] OR "aids virus"[Title/Abstract] OR "acquired immune deficiency syndrome virus"[Title/Abstract] OR "acquired immunodeficiency syndrome"[Title/Abstract] OR "HIV"[Title/Abstract]
2: "Vitamin D Deficiency"[MeSH Terms] OR "Vitamin D"[MeSH Terms] OR "Vitamin D"[Title/Abstract] OR "25 hydroxyvitamin d"[Title/Abstract] OR "1,25 dihydroxyvitamin d"[Title/Abstract] OR "Vitamin D Deficiency"[Title/Abstract] OR "Ergocalciferols"[Title/Abstract] OR "Calcifediol"[Title/Abstract] OR "Cholecalcifero"[Title/Abstract]
3: 1 AND 2
Literature search strategy in Web of Science: 721
1: Search TS = (HIV) OR (Human Immunodeficiency Virus) OR (AIDS Virus) OR (Acquired Immune Deficiency Syndrome Virus) OR (Acquired Immunodeficiency Syndrome) OR (hiv infection)
2: Search TS = (Vitamin D) OR (Vitamin D Deficiency) OR (25 hydroxyvitamin d) OR (1,25 dihydroxyvitamin d) OR (Ergocalciferols) OR (Calcifediol) OR (Cholecalciferol)
3: 1 AND 2
5: Exclude (LETTER OR EDITORIAL MATERIAL OR NOTE OR REVIEW OR BOOK CHAPTER OR CORRECTION OR BOOK OR MEETING ABSTRACT OR PROCEEDINGS PAPER OR EARLY ACCESS)
Literature search strategy in EMBASE: 3134 (1717)
1: 'hiv infection':ti,ab,kw OR 'human immunodeficiency virus':ti,ab,kw OR 'aids virus':ti,ab,kw OR 'acquired immune deficiency syndrome virus':ti,ab,kw OR 'acquired immunodeficiency syndrome':ti,ab,kw OR hiv:ti,ab,kw
2: 'human immunodeficiency virus'/exp;
3: 'human immunodeficiency virus infection'/exp
4: 1 OR 2 OR 3
5:'vitamin d':ti,ab,kw OR '25 hydroxyvitamin d':ti,ab,kw OR '1,25 dihydroxyvitamin d':ti,ab,kw OR 'vitamin d deficiency':ti,ab,kw OR ergocalciferols:ti,ab,kw OR calcifediol:ti,ab,kw OR cholecalcifero:ti,ab,kw
6: 'vitamin d'/exp
7: 'vitamin d deficiency'/exp
8: 5 OR 6 OR 7 OR
9: 4 AND 8

Exclude ([conference abstract]/lim OR [conference paper]/lim OR [conference review]/lim OR [letter]/lim OR [note]/lim OR [review]/lim)
Literature search strategy in Cochrane library: 294
1: hiv:ti,ab,kw OR 'human immunodeficiency virus':ti,ab,kw OR 'aids virus':ti,ab,kw OR 'acquired immune deficiency syndrome virus':ti,ab,kw OR 'acquired immunodeficiency syndrome':ti,ab,kw OR 'hiv infection':ti,ab,kw
2: MeSH descriptor [HIV] OR MeSH descriptor [HIV infection]
3: 1 OR 2
4: 'vitamin d':ti,ab,kw OR '25 hydroxyvitamin d':ti,ab,kw OR '1,25 dihydroxyvitamin d':ti,ab,kw OR 'Vitamin D Deficiency':ti,ab,kw OR 'Ergocalciferols':ti,ab,kw OR 'Calcifediol':ti,ab,kw OR 'Cholecalcifero':ti,ab,kw
5: MeSH descriptor [Vitamin D] OR MeSH descriptor [Vitamin D deficiency]
6: 4 OR 5
7: 3 AND 6

Table S2 subgroup analysis of VDD prevalence deference between HIV and control groups

Subgroup category	Number	Point estimate(95%CI)	P	I ²	T ²	P
Age>40	7	1.647(1.020-2.659)	0.041	94.568	0.332	<0.001
Age≤40	4	1.217(0.712-2.080)	0.474	49.552	0.146	0.114
BMI>25	5	1.057(0.556-2.011)	0.865	94.757	0.457	<0.001
BMI≤25	2	2.120(1.122-4.008)	0.021	0.000	0.000	0.988
latitude>40	3	1.331(0.695-2.549)	0.388	37.828	0.125	0.200
latitude≤40	7	1.805(1.373-2.372)	<0.001	74.576	0.070	0.001
CD4count>500	5	1.493(0.858-2.596)	0.156	82.646	0.290	<0.001
CD4count≤500	5	1.322(0.681-2.566)	0.409	94.401	0.475	<0.001
Sex(female)	1	0.585(0.468-0.731)	<0.001	0.000	0.000	1.000
Sex(male)	2	2.120(1.122-4.008)	0.021	0.000	0.000	0.998
ART-experienced	3	2.296(1.287-0.497)	0.005	19.927	0.053	0.287
ART-naive	2	1.177(0.379-3.657)	0.778	62.765	0.420	0.101
Developed country	7	1.520(0.921-2.510)	0.101	94.723	0.353	<0.001
Developing country	4	1.377(0.897-2.114)	0.144	42.282	0.079	0.158

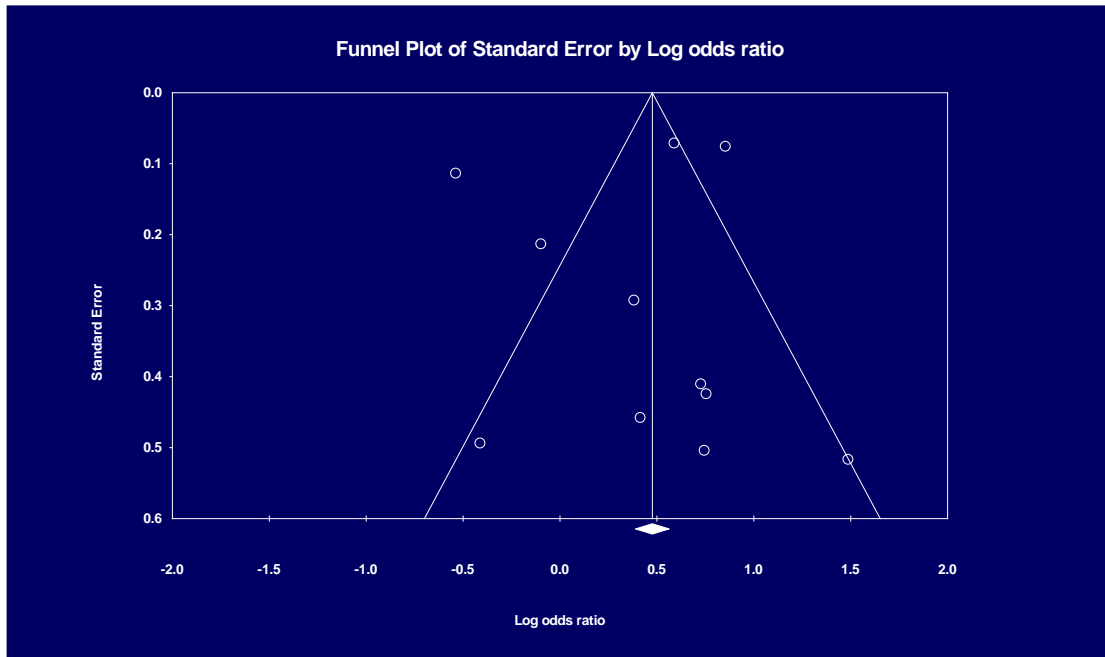
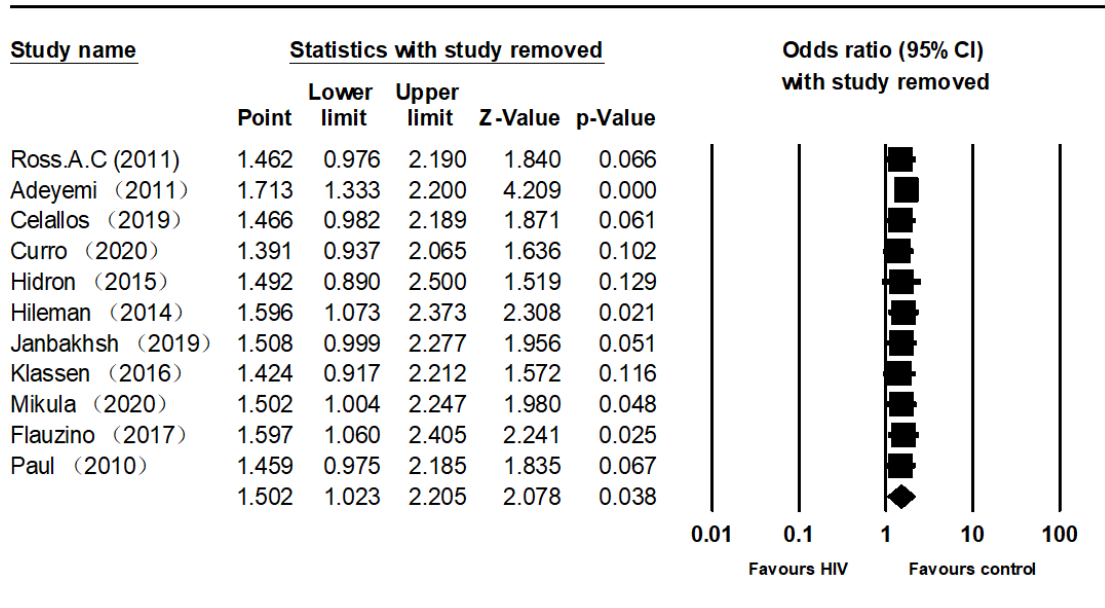


Figure S1 funnel plot of VDD prevalence difference between HIV and control groups



Vitamin D deficiency prevalence

Figure S2 sensitivity analysis of included 11 studies

Table S3 subgroup analysis of VD levels difference between HIV and control groups

Subgroup category	Number	Point estimate(95%CI)	P	I ²	T ²	P
Age>40	8	-2.849(-7.496-1.797)	0.229	99.437	42.231	<0.001
Age≤40	6	-1.764(-3.341--0.187)	0.028	27.956	1.071	0.225
BMI>25	5	1.201(-1.407-3.810)	0.367	94.040	6.989	<0.001
BMI≤25	4	-6.149(-14.103-1.804)	0.130	97.091	63.598	<0.001
latitude>40	3	1.188(-4.044-6.420)	0.656	91.061	18.770	<0.001
latitude≤40	8	-4.841(-9.515--0.167)	0.042	97.326	42.293	<0.001
Undetectable HIV RNA	1	-0.320(-5.116-4.476)	0.896	0.000	0.000	1.000
Detectable HIV RNA	2	-2.473(-4.812--0.134)	0.038	0.000	0.000	0.577
Sex(female)	1	2.000(0.936-3.064)	<0.001	0.000	0.000	1.000
Sex(male)	3	-1.340(-3.884-1.205)	0.302	65.881	3.307	0.053
ART-experienced	4	-0.918(-5.457-3.621)	0.692	96.633	18.722	<0.001
ART-naive	3	-2.684(-4.588--0.780)	0.006	0.000	0.000	0.817
Developed country	9	-2.983(-7.336-1.369)	0.179	99.366	41.797	<0.001
Developing country	5	-1.618(-3.514-0.279)	0.095	37.175	1.695	0.173

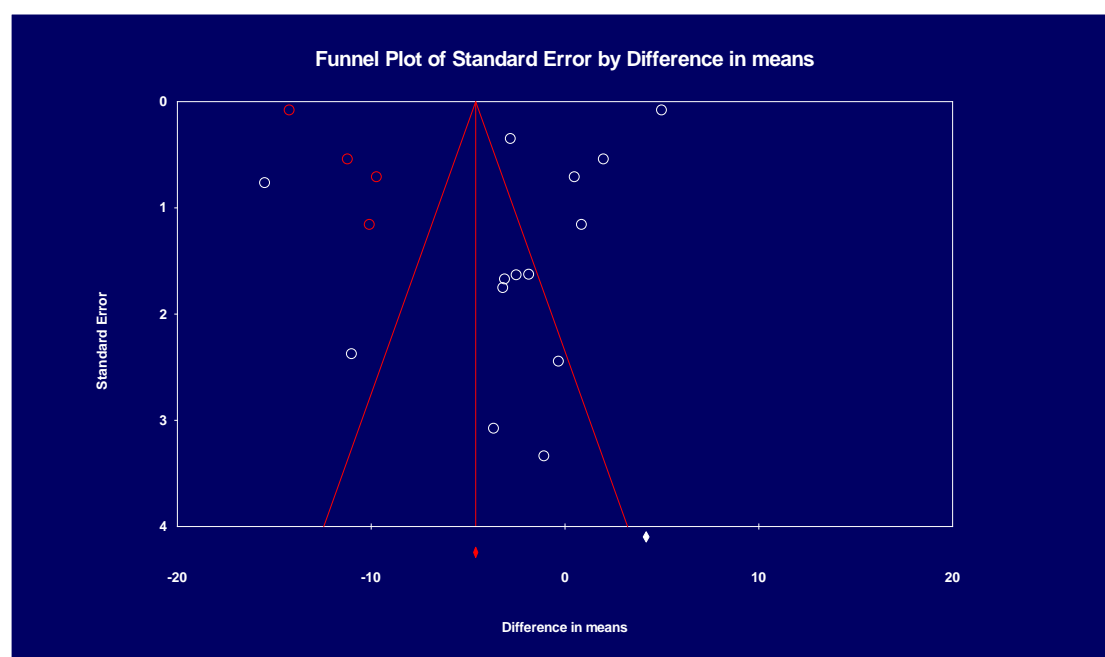


Figure S3 funnel plot of VD levels difference between HIV and control groups

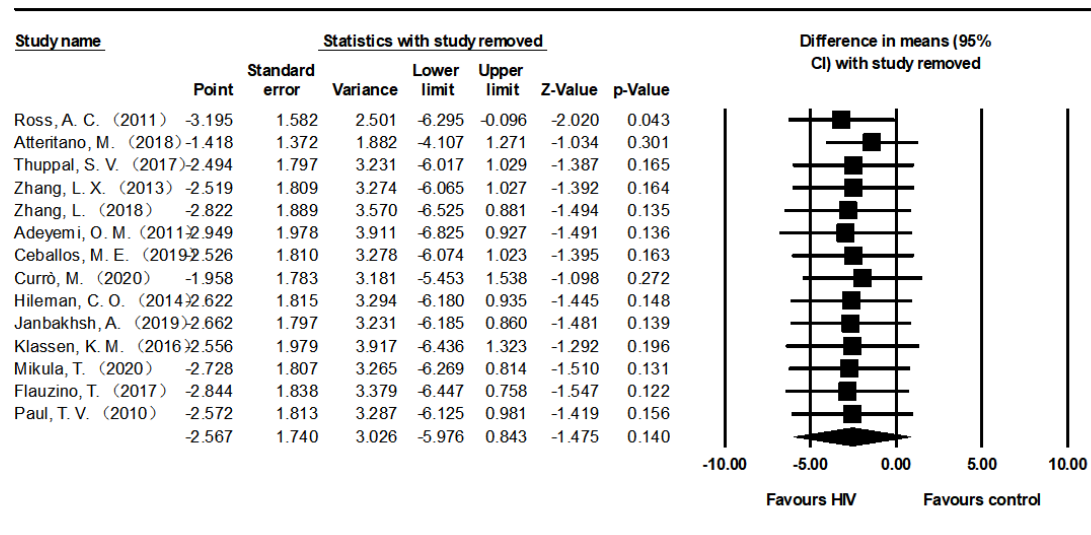


Figure S4 sensitivity analysis of included 14 studies

Table S4 Meta-regression for heterogeneity

Moderators	Number	I ²	P	Variance explained (%)
Studies for evaluating VDD prevalence				
Continuous				
Male proportion	11	91.8	<0.001	30
BMI	7	92.37	<0.001	52
Undetectable HIV	7	94.89	<0.001	7
RNA proportion				
Studies for evaluating VD level				
Categorical				
ART	14	99.02	<0.001	20
latitude	14	99.22	<0.001	28
BMI	9	99.03	<0.001	73
CD4 count	14	99.02	<0.001	40
Continuous				
Undetectable HIV	7	98.89	<0.001	31
RNA proportion				
Publication year	14	99.02	<0.001	52