

Table 1. Summary table.						
Study/Year	Design	Population/ Sample Size	Vitamin D Measure/ Threshold	Intervention	Main Outcomes/ Findings	Ref #
Tamblын JA et al., 2022	Systematic Review & Meta-analysis	7,663 women across 10 studies	<50 nmol/L = deficient; >75 nmol/L = sufficient	None	Vitamin D deficiency associated with increased miscarriage risk; dose-response effect	9
Andersen LB et al., 2015 (Odense Child Cohort)	Prospective cohort	1,683 pregnant women	25(OH)D <50 nmol/L = insufficiency	None	First-trimester insufficiency associated with 2–3x increased miscarriage risk	10
Ko JKY et al., 2024	Prospective cohort	371 women with first-trimester threatened miscarriage	25(OH)D deficiency vs sufficient	None	Overall, no difference in miscarriage; higher risk in early bleeding with sufficient vitamin D	15
Subramanian A et al., 2022	Prospective cohort (preconception)	362 women attempting conception	25(OH)D measured preconception	None	No significant association with miscarriage in low-risk population	16
Chien MC et al., 2024	Umbrella review/ Systematic review	>250,000 women across meta-analyses	Not applicable	None	Vitamin D deficiency associated with miscarriage and adverse pregnancy outcomes; evidence heterogeneous	17
Kasim SF, 2022	Case-control	80 women (40 miscarriage, 40 controls)	25(OH)D deficiency	None	95% of miscarriage group deficient vs 17.5% controls; strong correlation	11
Zhang F et al., 2024	Mendelian Randomization	UK Biobank (thousands of women)	Genetic proxies for lifelong low 25(OH)D	None	No causal effect of low vitamin D on miscarriage risk	12
Ji J et al., 2019	Mechanistic/ Immunologic	Women with RPL	25(OH)D measured	None	Vitamin D regulates Treg/Th17 balance, improves immune tolerance	14
Ibrahim ZM et al., 2013	Randomized Controlled Trial	Women with RPL	25(OH)D measured	0.25 µg vitamin D ₃ twice daily	Decreased IFN-γ; improved immune tolerance; non-significant reduction in miscarriage	18
Samimi M et al., 2017	Double-blind RCT	Women with unexplained RPL	25(OH)D measured	400 IU vitamin D ₃ daily	Miscarriage rate reduced 12.8% vs 34.2%; IL-23 levels reduced	19