

## Supplementary file S7: Grade assessment

**Table 1. GRADE Assessment – Vitamin D fortification vs. no fortification with vitamin D (Evidence profile table for the primary outcomes)**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		

**Serum 25-hydroxy vitamin D concentrations (µmol/L) (follow-up: 12 weeks)**

1 <sup>1</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	30	32	-	MD <b>6.59</b> <b>nmol/L</b> <b>higher</b> (6.89 lower to 20.07 higher)	⊕⊕○○ Low	CRITICAL
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**Vitamin D deficiency - not measured**

[illegible]

**Osteomalacia in elderly - not measured**

[illegible]

**Nutritional rickets - not measured**

[illegible]

**Adverse effects (hypervitaminosis, hypercalcemia, kidney stones) - not measured**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		
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**Morbidity - not measured**

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**Mortality - not measured**

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**CI:** confidence interval; **MD:** mean difference; **RR:** risk ratio

### *Explanations*

a. This is a single study so inconsistency cannot be judged.

b. Downgraded by two levels for imprecision since results are derived from one study, where total sample size was very low (n<100).

### *References*

1.Ghasemifard, N., Hassanzadeh-Rostami, Z., Abbasi, A., Naghavi, A. M., Faghih, S.. Effects of vitamin D-fortified oil intake versus vitamin D supplementation on vitamin D status and bone turnover factors: a double blind randomized clinical trial. Clinical nutrition ESPEN; 2022.

**Table 2. GRADE Assessment – Vitamin A fortification vs. no fortification with vitamin A – Secondary outcomes**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin A fortified oils or fats	same oils or fats without vitamin A	Relative (95% CI)	Absolute (95% CI)		

**Dietary vitamin A intake (µg RE/day) - Randomized Studies (follow-up: 6 months)**

1 <sup>1</sup>	randomised trials	serious <sup>b</sup>	not serious <sup>e</sup>	not serious	serious <sup>c</sup>	none	268	144	-	MD <b>15.7 µg RE/day lower</b> (105.82 lower to 74.42 higher)	⊕⊕○○ Low	IMPORTANT
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**Dietary vitamin A intake (µg RE/day) - Non-randomized Studies (follow-up: 2 months)**

1 <sup>3</sup>	controlled clinical trials	serious <sup>b</sup>	not serious <sup>e</sup>	not serious	very serious <sup>d</sup>	none	15	16	-	MD <b>240.6 µg RE/day higher</b> (175.07 higher to 306.13 higher)	⊕○○○ Very low	IMPORTANT
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**Liver stores of vitamin A - not measured**

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**Retinol in breast milk (µmol/L) (follow-up: 6 months)**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin A fortified oils or fats	same oils or fats without vitamin A	Relative (95% CI)	Absolute (95% CI)		
1 <sup>2</sup>	randomised trials	serious <sup>b</sup>	not serious <sup>e</sup>	not serious	very serious <sup>d</sup>	none	37	26	-	MD <b>0.79 µmol/L higher</b> (0.72 higher to 0.86 higher)	⊕○○○ Very low	IMPORTANT

**Mothers with low concentrations of retinol in breast milk (<1.05 µmol/L) (follow-up: 6 months)**

1 <sup>2</sup>	randomised trials	serious <sup>b</sup>	not serious <sup>e</sup>	not serious	very serious <sup>d</sup>	none	2/62 (3.2%)	39/39 (100.0%)	<b>RR 0.04</b> (0.01 to 0.14)	<b>960 fewer per 1 000</b> (from 990 fewer to 860 fewer)	⊕○○○ Very low	IMPORTANT
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**Prevalence of biochemical vitamin A deficiency (measured by Modified Relative Dose Response test; MRDR) - not measured**

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**Retinol-binding protein level - not measured**

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**Beta-carotene levels - not measured**

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**Serum ferritin - not measured**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin A fortified oils or fats	same oils or fats without vitamin A	Relative (95% CI)	Absolute (95% CI)		
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#### Anaemia - not measured

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#### BMI - Non-randomized Studies (follow-up: 2 months)

1 <sup>3</sup>	randomised trials	serious <sup>b</sup>	not serious <sup>e</sup>	not serious	very serious <sup>d</sup>	none	15	16	-	MD <b>0.69 kg/m2 higher</b> (0.09 higher to 1.29 higher)	⊕○○○ Very low	
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#### Weight-for-height (in z-scores) (follow-up: 6 months)

1 <sup>1</sup>	randomised trials	serious <sup>b</sup>	not serious <sup>e</sup>	not serious	serious <sup>f</sup>	none	268	145	-	MD <b>0.02 z-scores lower</b> (0.21 lower to 0.17 higher)	⊕⊕○○ Low	
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#### IgG levels (µmol/L) - Non-randomized Studies (follow-up: range 2 to 5 months)



Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin A fortified oils or fats	same oils or fats without vitamin A	Relative (95% CI)	Absolute (95% CI)		

#### Type-2 diabetes mellitus

1 <sup>5</sup>	observational studies	extremely serious <sup>i</sup>	not serious	not serious	not serious	none	1273/101178 (1.3%)	1322/92625 (1.4%)	<b>RR 0.88</b> (0.82 to 0.95)	<b>2 fewer per 1 000</b> (from 3 fewer to 1 fewer)	⊕○○○ Very low	
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**CI:** confidence interval; **MD:** mean difference; **RR:** risk ratio

#### Explanations

- Downgraded by one level for RoB since 1 out of 2 included studies was rated with a high RoB, and none of the included studies was rated with a low RoB
- Downgraded by one level for RoB since the included study was rated with some concerns for RoB
- Downgraded by one level for imprecision. There was only one study included, but the total sample size was larger than 400 (n=412)
- Downgraded by two levels for imprecision since results are derived from one study, where total sample size was very low (n<100).
- This is a single study so inconsistency cannot be judged.
- Downgraded by one level for imprecision. There was only one study included, but the total sample size was larger than 400 (n=413)
- Downgraded by one level for imprecision since results are derived from two small studies with a low total sample size (n=110).
- Downgraded by two levels for RoB since the included study was rated with high RoB
- Downgraded by three levels for RoB since the study included was a birth cohort study rated with serious concerns for RoB with the ROBINS-I tool

#### References

1. Candelaria, L. V., Magsadia, C. R., Velasco, R. E., Pedro, M. R., Barba, C. V., Tanchoco, C. C.. The effect of vitamin A-fortified coconut cooking oil on the serum retinol concentration of Filipino children 4-7 years old. Asia Pacific journal of clinical nutrition; 2005.

2. Atalhi, N., El Hamdouchi, A., Barkat, A., Elkari, K., Hamrani, A., El Mzibri, M., Haskell, M. J., Mokhtar, N., Aguenou, H.. Combined consumption of a single high-dose vitamin A supplement with provision of vitamin A fortified oil to households maintains adequate milk retinol concentrations for 6 months in lactating Moroccan women. *Physiologie appliquee, nutrition et metabolisme [Applied physiology, nutrition, and metabolism]*; 2020.
3. Marliyati, S. A., Martianto, D., Andarwulan, N., Fauzi, S.. Efficacy of non-branded cooking oil fortified with carotene from RPO on blood retinol and IgG of children aged 7-9 years. *Pakistan journal of nutrition*; 2016.
4. Donglan, Wang, Qingmin, Xiao, Yan, Hong, Shutian, L., I., Weiqiang, Chen, Yingyong, Cheng. Effects of vitamin A-fortified edible oil on improving the immune function of children. *Acta Nutrimenta Sinica*; 2006.
5. Keller, A., Angquist, L., Jacobsen, R., Vaag, A., Heitmann, B. L.. A retrospective analysis of a societal experiment among the Danish population suggests that exposure to extra doses of vitamin A during fetal development may lower type 2 diabetes mellitus (T2DM) risk later in life. *British journal of nutrition*; 2017.



**Table 3. GRADE Assessment – Vitamin D fortification vs. no fortification with vitamin D – Secondary outcomes**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		

**Intake of dietary vitamin D (follow-up: 12 weeks; assessed with: mcg/day)**

1 <sup>1</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	30	32	-	MD <b>22.35 mcg lower</b> (52.88 lower to 8.18 higher)	⊕⊕○○ Low	IMPORTANT
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**Serum parathyroid hormone (PTH) (follow-up: 12 weeks; assessed with: pmol/L)**

1 <sup>1</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	18	18	-	MD <b>0.1 pmol/L higher</b> (0.99 lower to 1.99 higher)	⊕⊕○○ Low	IMPORTANT
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**Bone alkaline phosphatase (B-ALP) (follow-up: 12 weeks; assessed with: IU/L)**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		
1 <sup>1</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	18	18	-	MD <b>5.76 IU/L higher</b> (0.12 lower to 11.64 higher)	⊕⊕○○ Low	IMPORTANT

#### Incidence of gestational diabetes mellitus

1 <sup>2</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	serious <sup>d</sup>	none	297/14016 (2.1%)	361/14855 (2.4%)	<b>RR 0.87</b> (0.75 to 1.01)	<b>3 fewer per 1 000</b> (from 6 fewer to 0 fewer)	⊕○○○ Very low	IMPORTANT
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#### Weight gain during pregnancy - not measured

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#### Preeclampsia

1 <sup>3</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	serious <sup>d</sup>	none	1310/35124 (3.7%)	1370/38113 (3.6%)	<b>RR 1.04</b> (0.96 to 1.12)	<b>1 more per 1 000</b> (from 1 fewer to 4 more)	⊕○○○ Very low	IMPORTANT
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#### Gestational hypertension

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		
1 <sup>3</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	serious <sup>d</sup>	none	399/35124 (1.1%)	396/38113 (1.0%)	<b>RR 1.09</b> (0.95 to 1.26)	<b>1 more per 1 000</b> (from 1 fewer to 3 more)	⊕○○○ Very low	

#### Eclampsia

1 <sup>3</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	serious <sup>d</sup>	none	267/35124 (0.8%)	396/38113 (1.0%)	<b>RR 0.98</b> (0.83 to 1.16)	<b>0 fewer per 1 000</b> (from 2 fewer to 2 more)	⊕○○○ Very low	
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#### Preterm birth - not measured

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#### Low birth weight (<2500 g)

1 <sup>4</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	serious <sup>d</sup>	none	301/4836 (6.2%)	308/5716 (5.4%)	<b>RR 1.16</b> (0.99 to 1.35)	<b>9 more per 1 000</b> (from 1 fewer to 19 more)	⊕○○○ Very low	IMPORTANT
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#### Postpartum depression - not measured

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#### Postpartum haemorrhage - not measured

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		
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#### Breastmilk vitamin D content of lactating women - not measured

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#### BMI

1 <sup>5</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	5029	5803	-	MD <b>0.1 kg/m<sup>2</sup> lower</b> (0.17 lower to 0.03 lower)	⊕⊕○○ Low	IMPORTANT
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#### Overweight

1 <sup>5</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	1172/5029 (23.3%)	1469/5803 (25.3%)	<b>RR 0.92</b> (0.86 to 0.98)	<b>20 fewer per 1 000</b> (from 35 fewer to 5 fewer)	⊕⊕○○ Low	IMPORTANT
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#### Obesity

1 <sup>5</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	523/5029 (10.4%)	708/5803 (12.2%)	<b>RR 0.85</b> (0.77 to 0.95)	<b>18 fewer per 1 000</b> (from 28 fewer to 6 fewer)	⊕⊕○○ Low	IMPORTANT
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Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		

### Type-1 diabetes mellitus

1 <sup>6</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	298/127207 (0.2%)	404/134749 (0.3%)	<b>RR 0.78</b> (0.67 to 0.91)	<b>1 fewer per 1 000</b> (from 1 fewer to 0 fewer)	⊕⊕○○ Low	IMPORTANT
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**Type-2 diabetes mellitus - not measured**

[illegible]

## Fracture events

1 <sup>7</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	12330/104406 (11.8%)	16058/113577 (14.1%)	<b>RR 0.84</b> (0.82 to 0.85)	<b>23 fewer per 1 000</b> (from 25 fewer to 21 fewer)	⊕⊕○○ Low	IMPORTANT
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## Childhood asthma

1 <sup>8</sup>	observational studies	not serious	not serious <sup>a</sup>	not serious	not serious	none	1427/106347 (1.3%)	1613/115900 (1.4%)	<b>RR 0.96</b> (0.90 to 1.03)	<b>1 fewer per 1 000</b> (from 1 fewer to 0 fewer)	⊕⊕○○ Low	IMPORTANT
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**Hypertension - not measured**

[illegible]

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		

#### Cardiovascular disease - not measured

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#### Respiratory infections - not measured

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#### Menopause onset - not measured

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#### IBD

1 <sup>9</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	875/98856 (0.9%)	1102/108044 (1.0%)	<b>RR 0.87</b> (0.79 to 0.95)	<b>1 fewer per 1 000</b> (from 2 fewer to 1 fewer)	⊕⊕○○ Low	
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#### Total cholesterol (follow-up: 12 weeks; assessed with: mmol/L)

1 <sup>10</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	30	32	-	<b>MD 0.01 mmol/L higher</b> (0.38 lower to 0.4 higher)	⊕⊕○○ Low	
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Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		

**LDL Cholesterol (follow-up: 12 weeks; assessed with: mmol/L)**

1 <sup>10</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	30	32	-	MD <b>0.02 mmol/L higher</b> (0.25 lower to 0.29 higher)	⊕⊕○○ Low	
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**HDL cholesterol (follow-up: 12 weeks; assessed with: mmol/L)**

1 <sup>10</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	30	32	-	MD <b>0.03 mmol/L higher</b> (0.07 lower to 0.13 higher)	⊕⊕○○ Low	
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**Triglyceride (follow-up: 12 weeks; assessed with: mmol/L)**

1 <sup>10</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	30	32	-	MD <b>0.02 mmol/L higher</b> (0.34 lower to 0.38 higher)	⊕⊕○○ Low	
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**Energy intake (kcal) (follow-up: 12 weeks)**

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	vitamin D fortified oils or fats	same oils or fats without vitamin D	Relative (95% CI)	Absolute (95% CI)		
1 <sup>1</sup>	randomised trials	not serious	not serious <sup>a</sup>	not serious	very serious <sup>b</sup>	none	31	30	-	MD <b>280 kcal lower</b> (513.33 lower to 46.67 lower)	⊕⊕○○ Low	

#### High birth weight (>4000 g)

1 <sup>4</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	not serious	none	407/4836 (8.4%)	583/5716 (10.2%)	<b>RR 0.83</b> (0.73 to 0.93)	<b>17 fewer per 1 000</b> (from 28 fewer to 7 fewer)	⊕⊕○○ Low	
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#### Celiac disease

1 <sup>11</sup>	observational studies	very serious <sup>c</sup>	not serious <sup>a</sup>	not serious	serious <sup>d</sup>	none	148/98856 (0.1%)	199/108044 (0.2%)	<b>RR 0.81</b> (0.66 to 1.01)	<b>0 fewer per 1 000</b> (from 1 fewer to 0 fewer)	⊕○○○ Very low	
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**CI:** confidence interval; **MD:** mean difference; **RR:** risk ratio

#### Explanations

a. This is a single study so inconsistency cannot be judged.

b. Downgraded by two levels for imprecision since results are derived from one study, where total sample size was very low (n<100).

c. Downgraded by two levels for RoB since the study included was a birth cohort study rated with some concerns for RoB with the ROBINS-I tool



d. Downgraded by one level for imprecision since results are derived from one study, and the confidence interval was crossing the line of no effect

### *References*

- 1.Ghasemifard, N., Hassanzadeh-Rostami, Z., Abbasi, A., Naghavi, A. M., Faghih, S.. Effects of vitamin D-fortified oil intake versus vitamin D supplementation on vitamin D status and bone turnover factors: a double blind randomized clinical trial. *Clinical nutrition ESPEN*; 2022.
- 2.Keller, A., Stougard, M., Frederiksen, P., Thorsteinsdottir, F., Vaag, A., Damm, P., Jacobsen, R., B, L.,Heitmann. In utero exposure to extra vitamin D from food fortification and the risk of subsequent development of gestational diabetes: the D-tect study. *Nutrition journal*; 2018.
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