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Figure S1. Study Flow chart

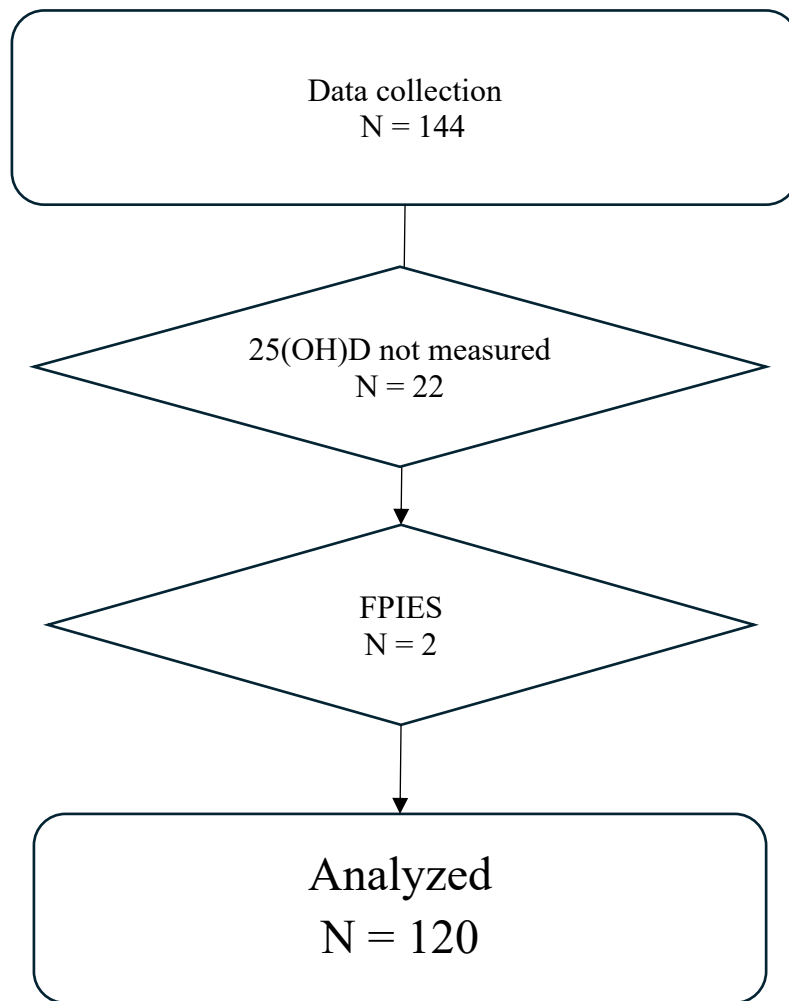


Figure S2. Relationship between serum 25(OH)D and 25(OH)D₃ concentrations

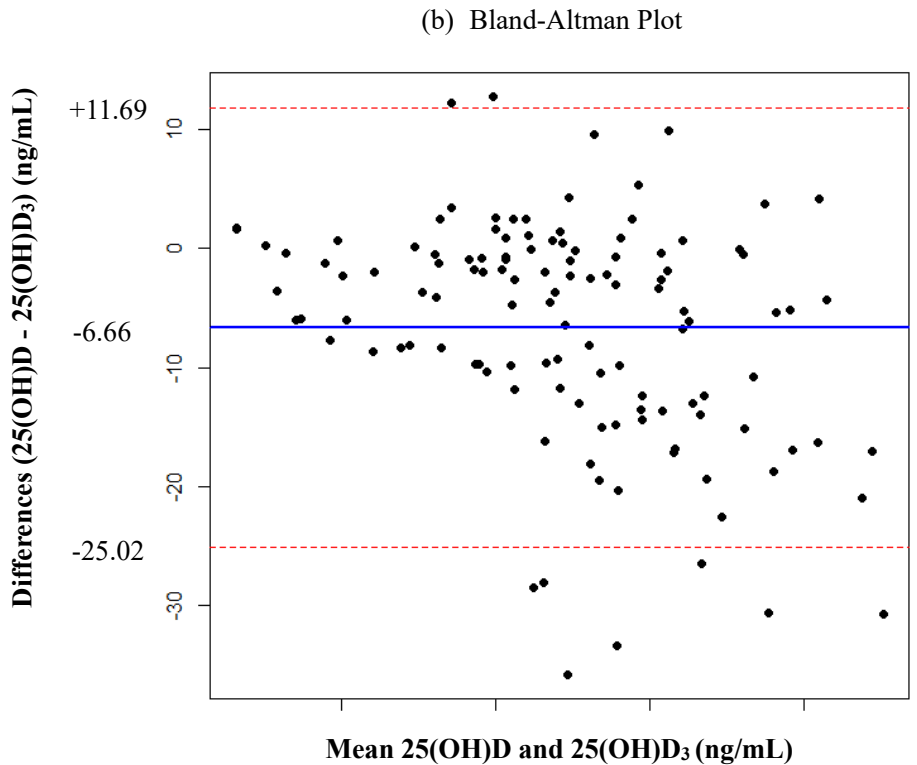
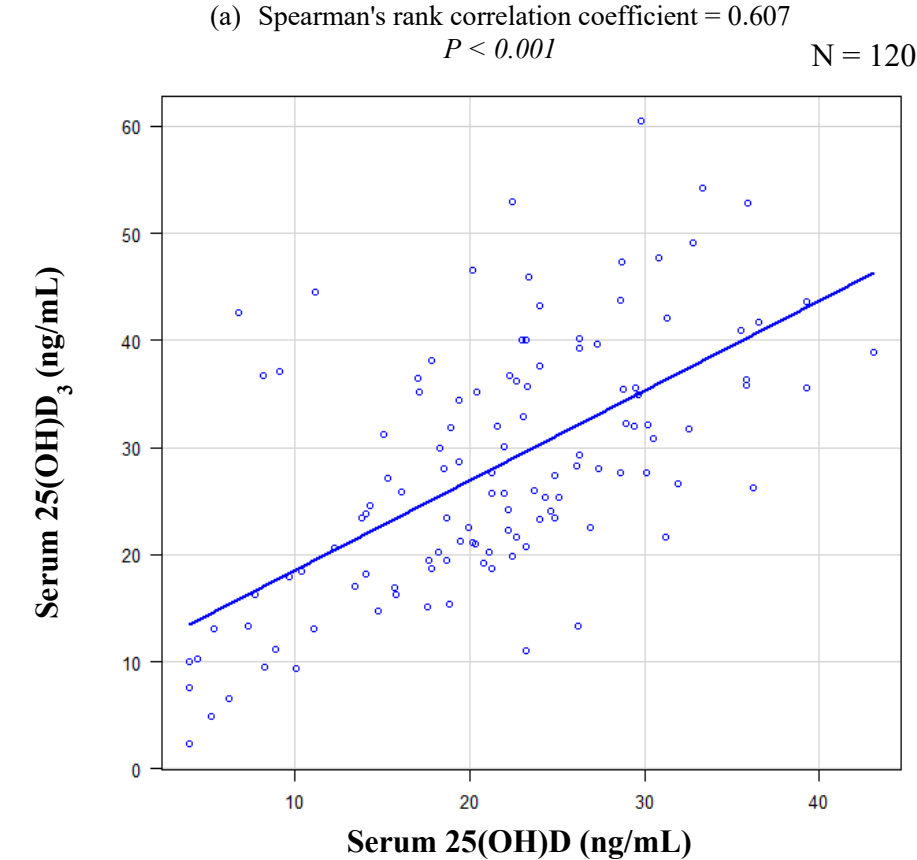
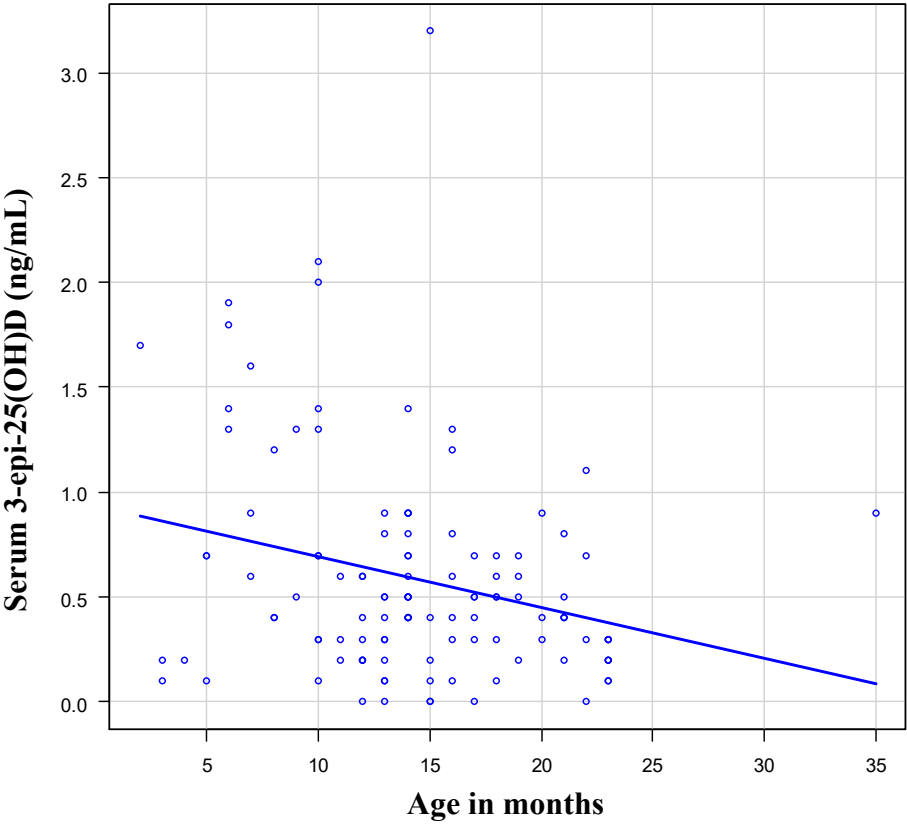


Figure S3. Relationship between serum 3-epi-25(OH)D concentrations and age in months

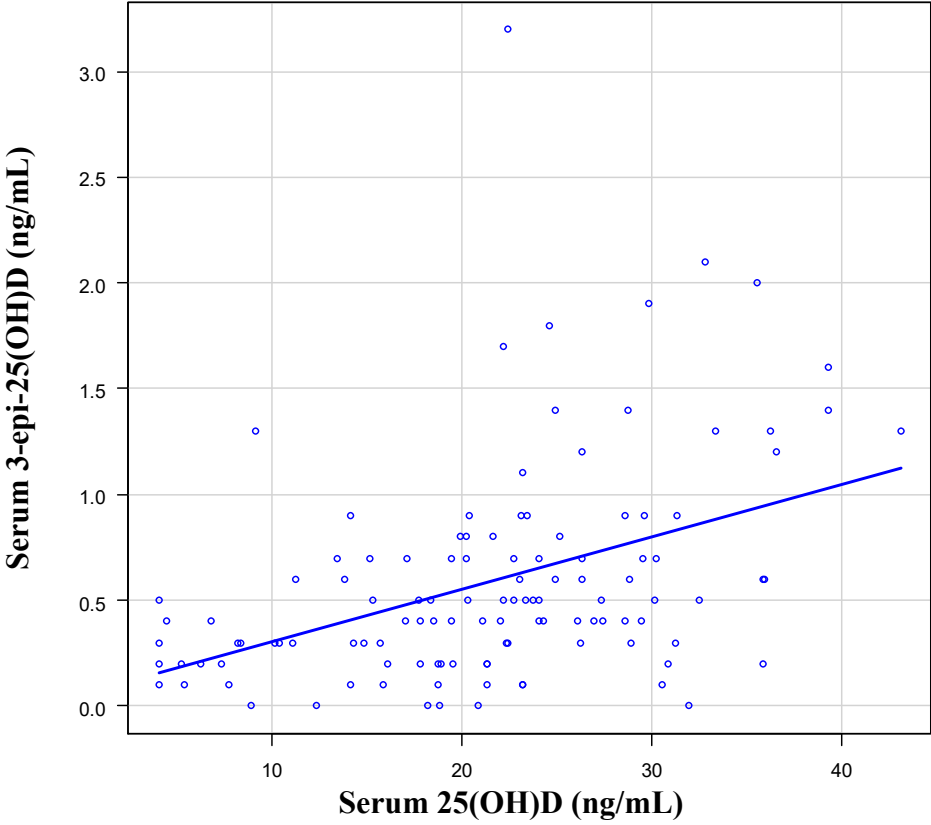
N=120



Spearman's rank correlation coefficient -0.217
P = 0.019

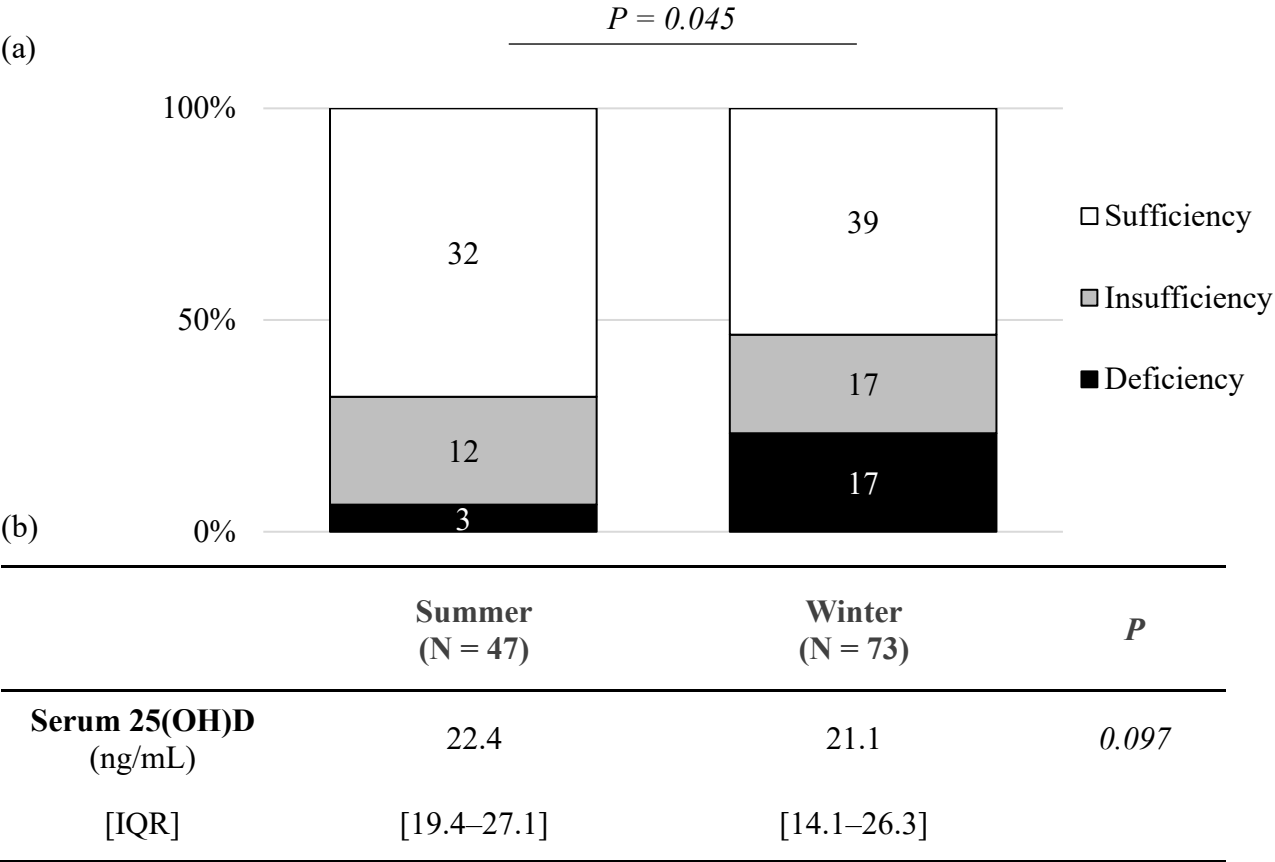
Figure S4. Relationship between serum 3-epi-25(OH)D and 25(OH)D concentrations

N = 120



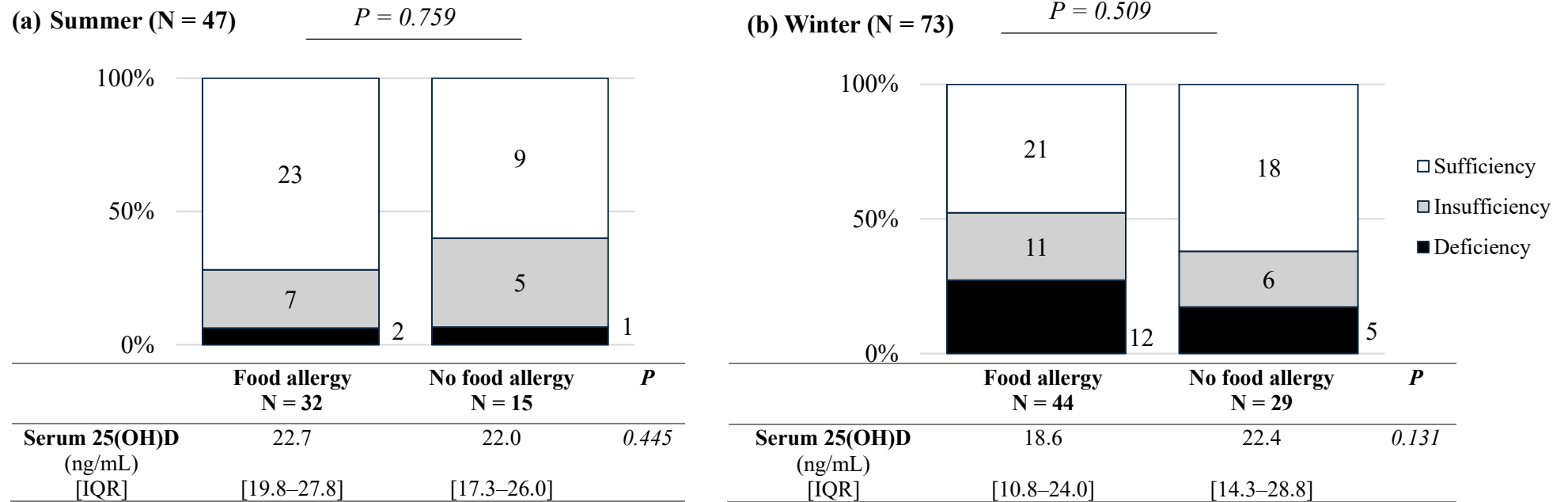
Spearman's rank correlation coefficient 0.449
 $P < 0.001$

Figure S5. Seasonal differences in serum 25(OH)D status and concentrations



- (a) Vitamin D status in infants tested in summer (April–September, N = 47) and winter (October–March, N = 73).
- (b) Serum 25(OH)D concentrations in infants tested in summer (April–September, N = 47) and winter (October–March, N = 73).

Figure S6. Vitamin D status and serum 25(OH)D concentrations in infants with and without food allergy by season



(a) Summer (April–September, N = 47).

(b) Winter (October–March, N = 73).

Vitamin D status in infants with and without food allergy (upper) and serum 25(OH)D concentrations (lower).

Figure S7. Relationship between serum 25(OH)D concentrations and total IgE

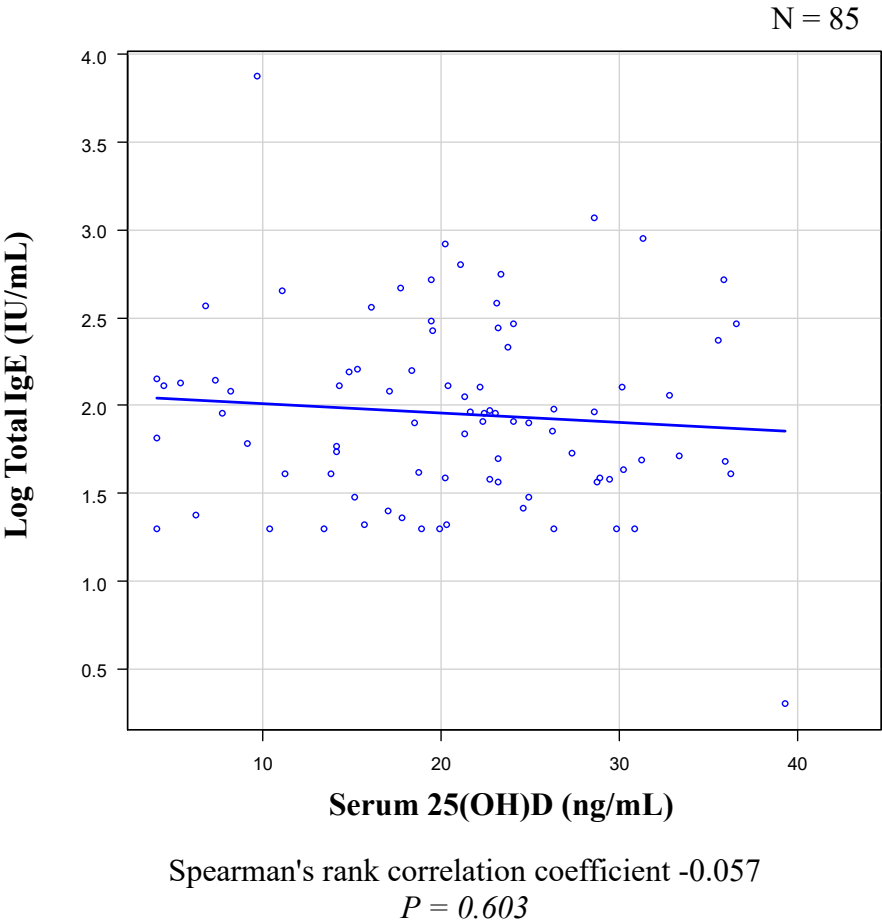
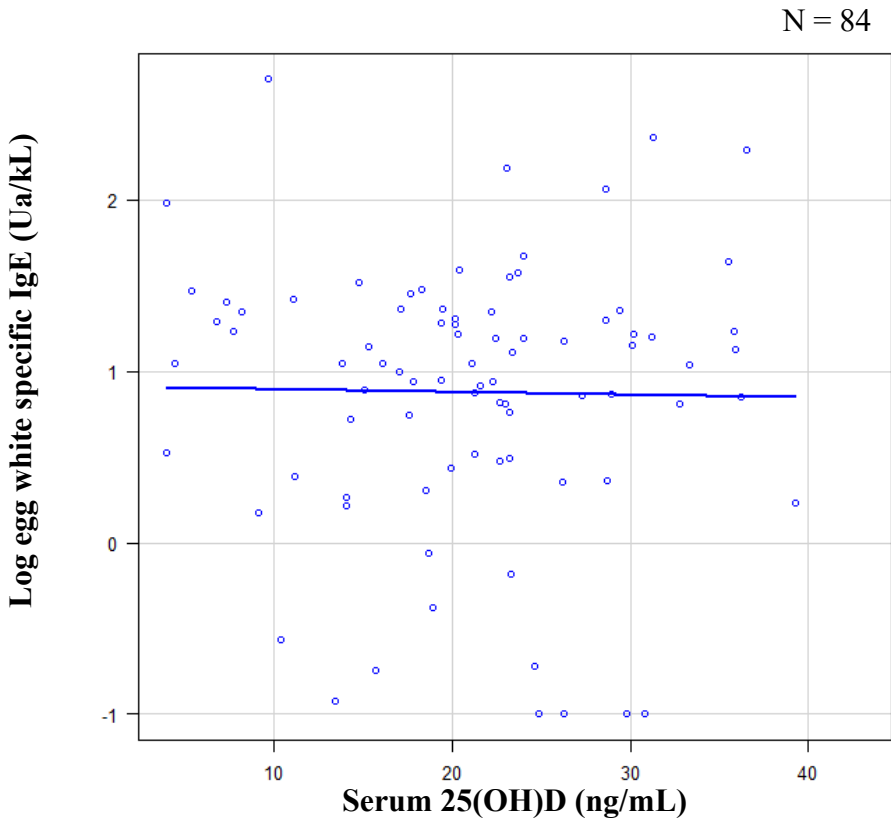
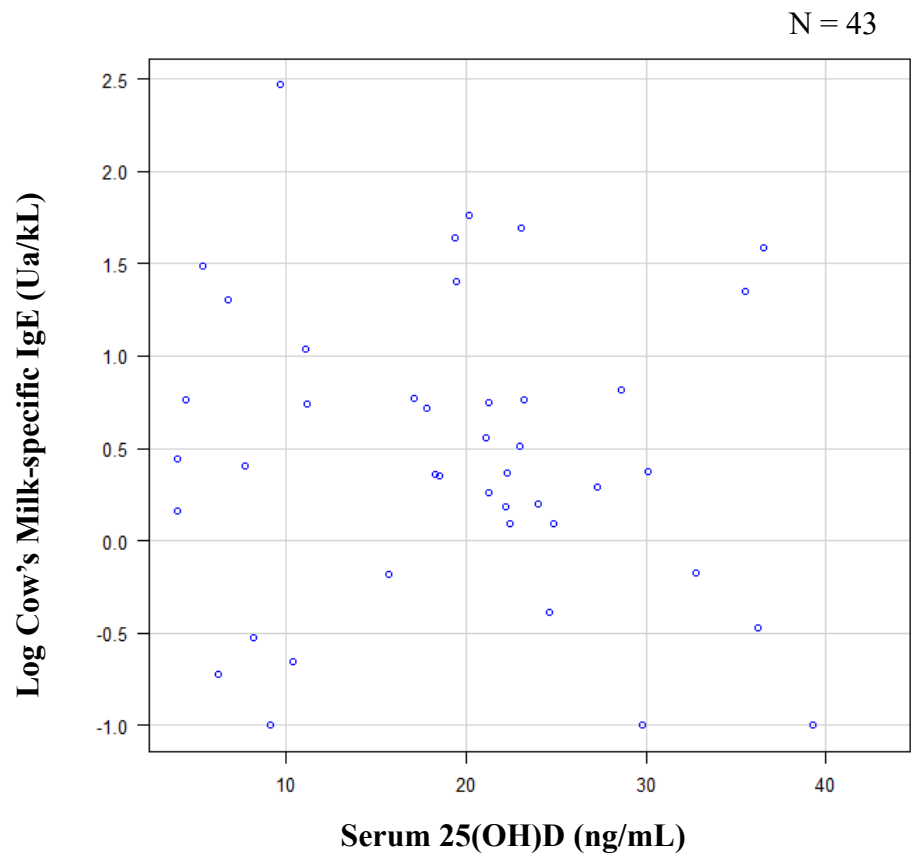


Figure S8. Relationship between 25(OH)D concentrations and egg white-specific IgE



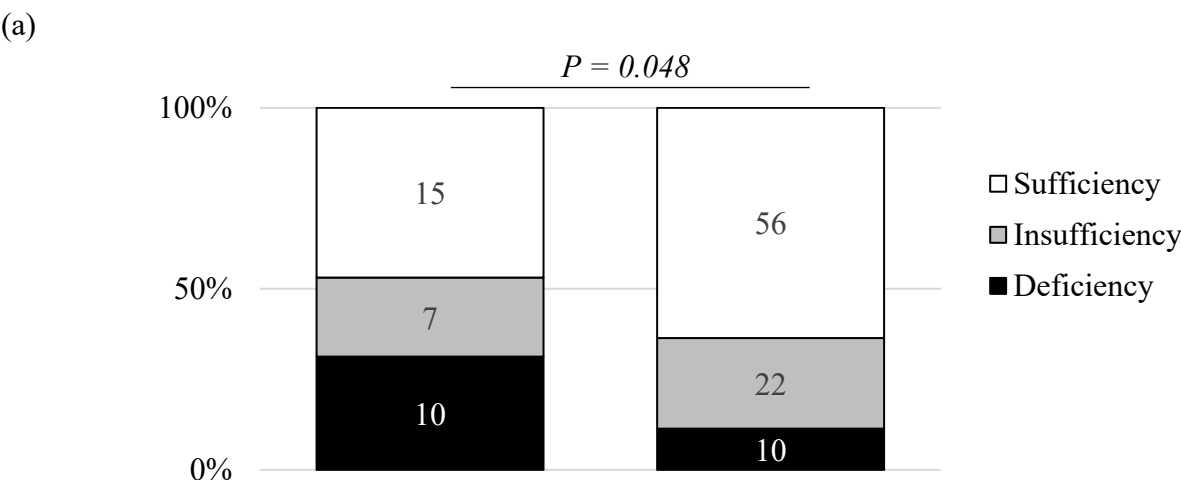
Spearman's rank correlation coefficient -0.057
 $P = 0.893$

Figure S9. Relationship between 25(OH)D concentrations and cow’s milk-specific IgE



Spearman's rank correlation coefficient -0.156
P = 0.318

Figure S10. Vitamin D status and serum 25(OH)D concentrations in infants with and without cow’s milk allergy



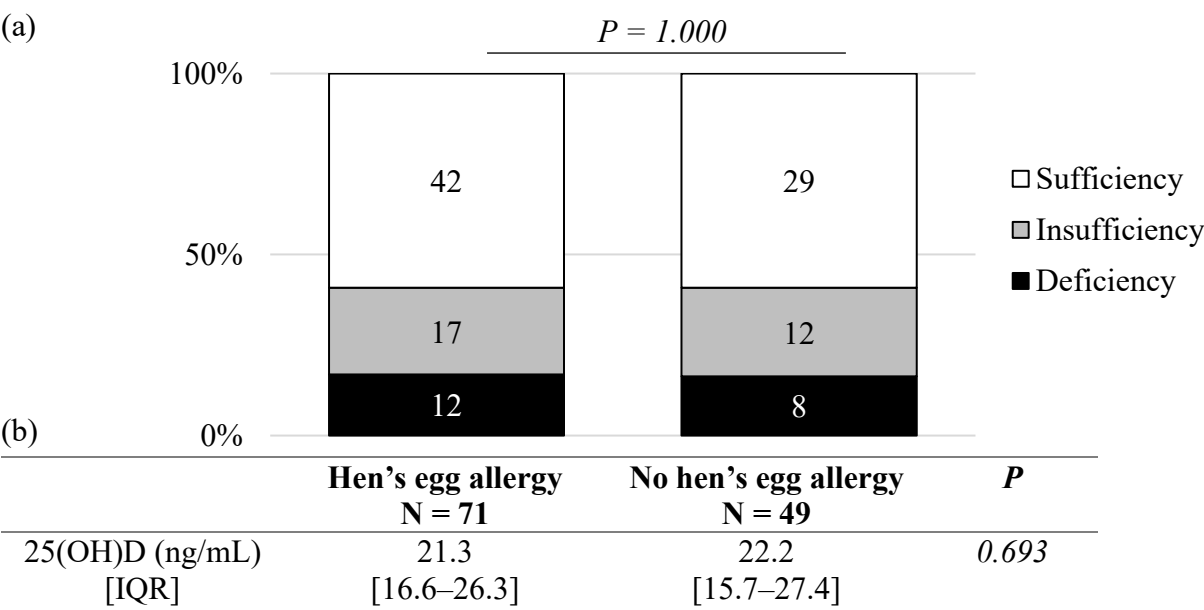
(b))

	CMA N = 32	Non-CMA N = 80	P
25(OH)D (ng/mL)	19.5	22.7	0.020
[IQR]	[10.8–23.0]	[17.5–28.7]	

- (a) Vitamin D status in participants with CMA (N = 32) and those without (N = 80).
(b) Serum 25(OH)D concentrations in participants with CMA (N = 32) and those without (N = 80).

Abbreviations: CMA: Cow’s Milk Allergy

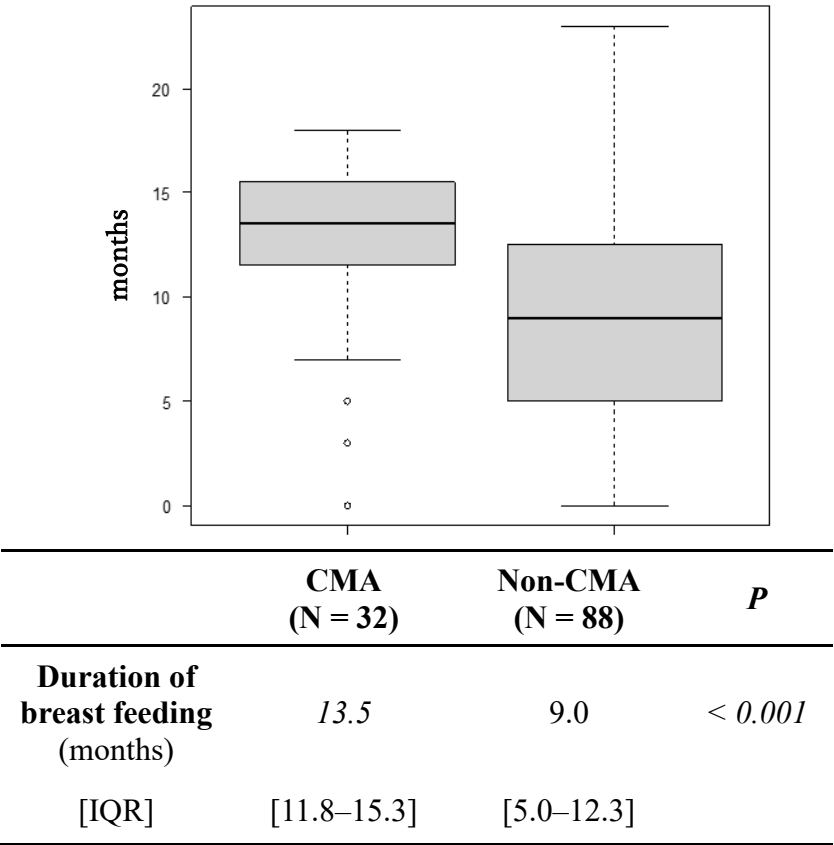
Figure S11. Vitamin D status and serum 25(OH)D concentrations in infants with and without hen’s egg allergy



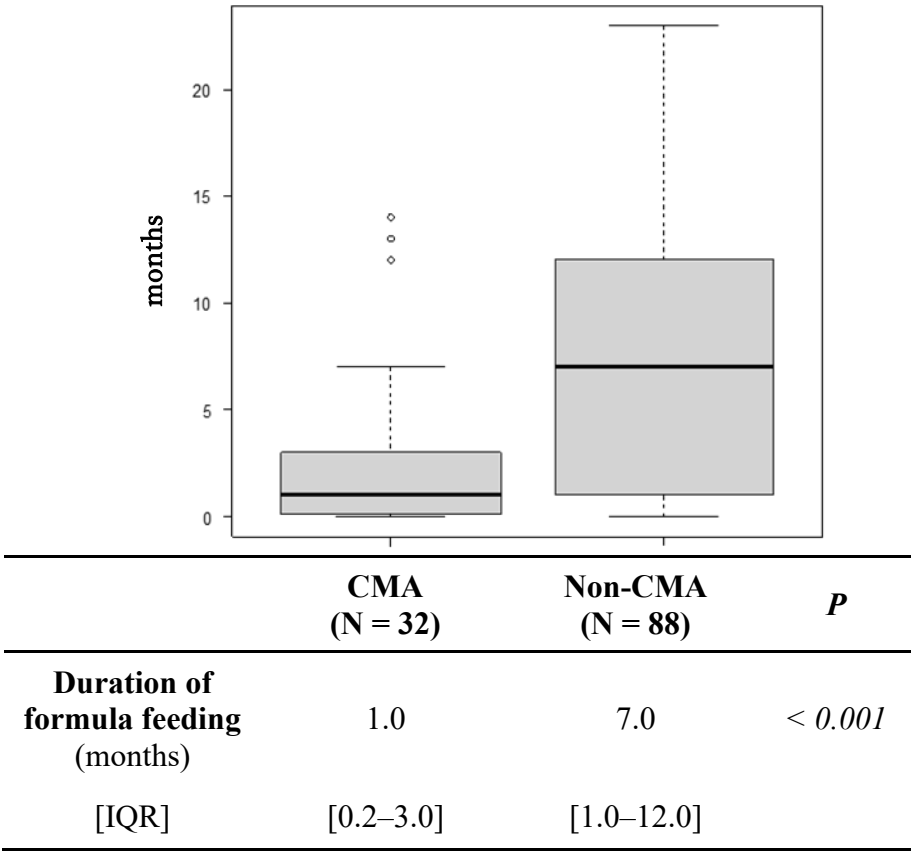
- (a) Vitamin D status in participants with hen’s egg allergy (N = 71) and those without (N = 49).
- (b) Serum 25(OH)D concentrations in participants with hen’s egg allergy (N = 71) and those without (N = 49).

Figure S12. Duration of breastfeeding and formula feeding in infants with and without cow’s milk allergy

(a) Duration of Breast Feeding



(b) Duration of Formula Feeding



Abbreviations: CMA: Cow’s Milk Allergy,

Figure S13. Vitamin D status by duration of breastfeeding

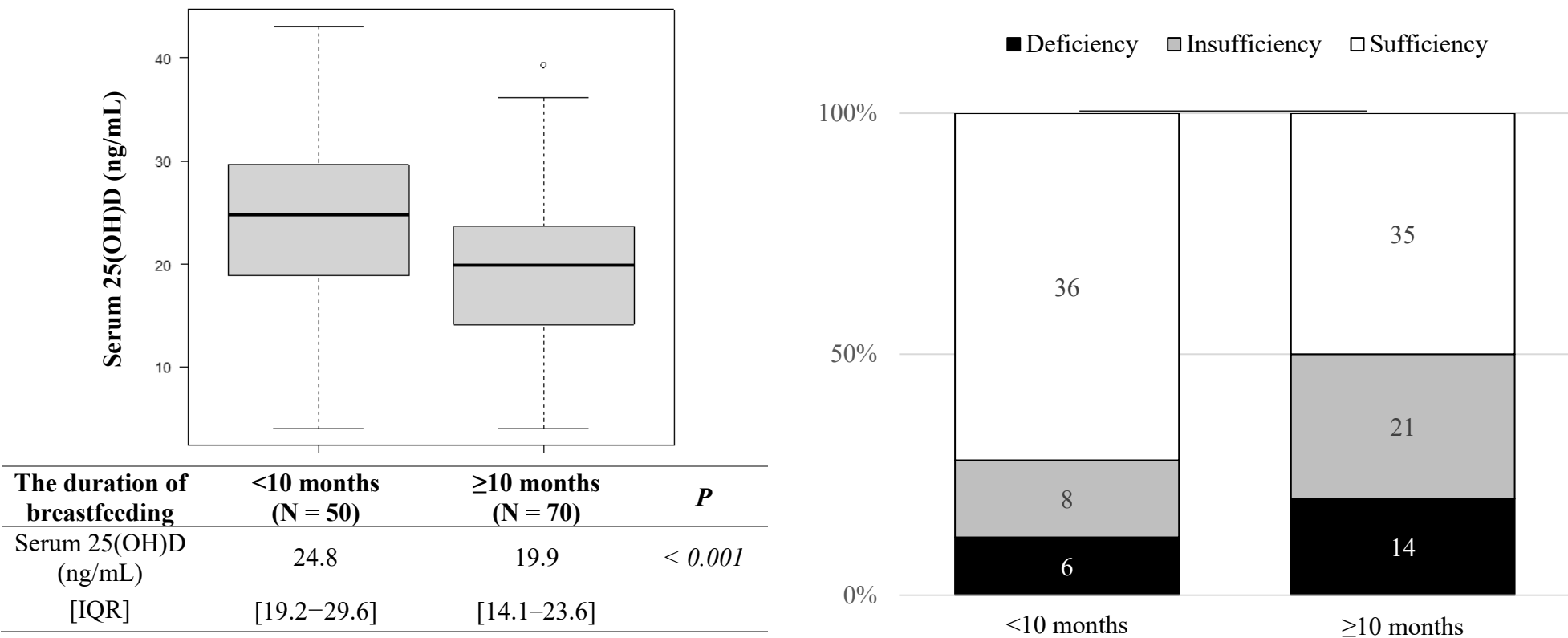
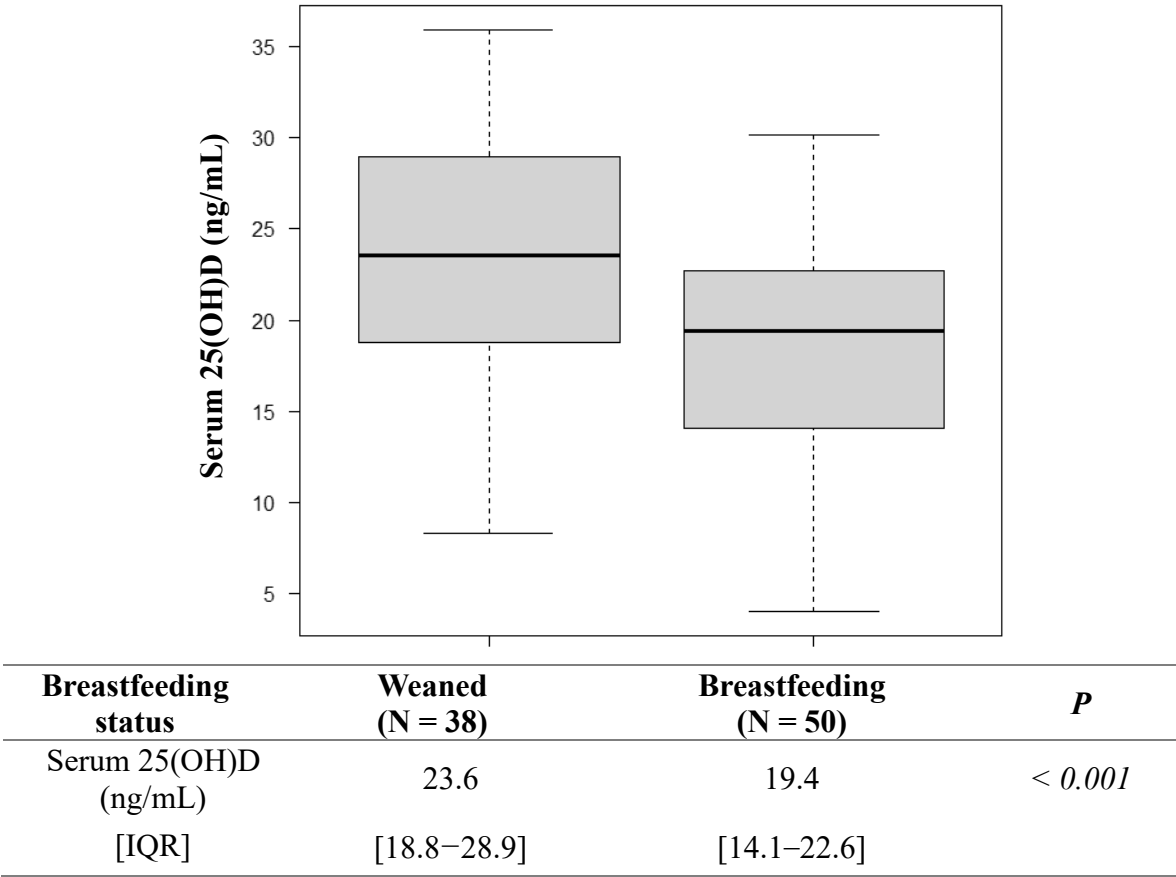


Figure S14. Differences in serum 25(OH)D concentrations by breastfeeding status in infants aged ≥ 12 months

(N = 88)



Serum 25(OH)D concentrations in infants aged ≥ 12 months according to breastfeeding status.

Table S1 (a) Study on Vitamin D2/D3 in Children with Food Allergies
Survey Form (For Your Child))

Please provide the following information about your child.

1. Current Age (Months/Years):	☐ 1–5 months ☐ 6–11 months ☐ 1 year ☐ 2 years
2. Sex:	☐ Boy ☐ Girl
3. Delivery Method:	☐ Cesarean section ☐ Vaginal delivery
4. Was your child breastfed?	☐ Yes → From () months to () months ☐ No
5. Was your child given formula milk?	☐ Yes: Brand name () ☐ Used within the first week of life ☐ Used from () months to () months ☐ No
6. When did you start introducing solid foods?	☐ From () months ☐ Not yet started
7. Fish Consumption (Include all types of fish) Frequency & Amount Per Meal (Standard: 10 g per serving, approx. 1 tablespoon)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week ☐ Not consumed (including pre-weaning and fish allergies) → Portion size per meal: ☐ Small ☐ About the same ☐ Large
8. Specific Fish Consumption (Salmon, sardine, Pacific saury, flounder, eel, herring, grunt, filefish, yellowtail) Frequency & Amount Per Meal (Standard: 10 g per serving, approx. 1 tablespoon)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week ☐ Not consumed (including pre-weaning and fish allergies) → Portion size per meal: ☐ Small ☐ About the same ☐ Large
9. Mushroom Consumption Frequency & Amount Per Meal (Standard: 10 g per serving, approx. 1 tablespoon)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week ☐ Not consumed (including pre-weaning)
10. Egg Yolk Consumption Frequency & Amount Per Meal (Standard: 1 egg yolk per serving)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week ☐ Not consumed (including pre-weaning and egg allergies)
11. Outdoor Play Frequency	☐ Twice or more per week ☐ 1–2 times per month ☐ Once per week ☐ Almost never
12. Do you use sunscreen when going outdoors?	☐ No ☐ Yes
13. In the past 3 months, how often has your child been exposed to sunlight wearing light clothing? (<i>Light clothing: arms and legs exposed</i>)	☐ Always (Daily) ☐ Usually (5–6 days/week) ☐ Sometimes (3–4 days/week) ☐ Rarely (1–2 days/week) ☐ Never (Less than 1 day/week)
14. Vitamin D Supplement Intake	Does your child take vitamin D supplements or fortified foods? ☐ Yes (Product name:) Frequency of intake: ☐ Daily ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week ☐ No

Table S1 (b) Study on Vitamin D2/D3 in Children with Food Allergies

Survey Form (For Parents))

Please provide information about yourself.

1. Age:	☐ Under 30 ☐ 40 ☐ 50 or older
2. Sex:	☐ Male ☐ Female
3. Current Season:	☐ Spring (Apr–Jun) ☐ Summer (Jul–Sep) ☐ Autumn (Oct–Dec) ☐ Winter (Jan–Mar)
4. How often do you exercise (sports)?	☐ Never ☐ 1–2 times per month ☐ Once per week ☐ Twice or more per week
Sun Exposure & Protection	
5. In the past 12 months, have you tanned*? (<i>Tanning refers to skin darkening</i>)	☐ Yes ☐ No
6. How often have you used sunscreen in the past 12 months?	☐ 5–7 days per week ☐ 0–2 days per week
7. In the past 3 months, how often have you been exposed to sunlight wearing light clothing*? (<i>Light clothing: arms and legs exposed</i>)	☐ Always (Daily) ☐ Usually (5–6 days/week) ☐ Sometimes (3–4 days/week) ☐ Rarely (1–2 days/week) ☐ Never (Less than 1 day/week)
8. Fish Consumption (Include all types of fish) Frequency & Amount Per Meal (Standard: 1 portion = 80–100 g)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week → Portion size per meal: ☐ Small ☐ About the same ☐ Large
9. Specific Fish Consumption (salmon, sardine, Pacific saury, flounder, eel, herring, grunt, filefish, yellowtail) Frequency & Amount Per Meal (Standard: 100 g per serving for most fish, 50 g for sardine/filefish)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week → Portion size per meal: ☐ Small ☐ About the same ☐ Large
10. Mushroom Consumption Frequency & Amount Per Meal (Standard: 20 g per serving, e.g., 1 shiitake mushroom, 1/10 bunch of shimeji/enoki mushrooms)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week → Portion size per meal: ☐ Small ☐ About the same ☐ Large
11. Egg Consumption Frequency & Amount Per Meal (Standard: 1 egg per serving)	☐ 2 or more times per day ☐ At least once a day ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week → Portion size per meal: ☐ Small ☐ About the same ☐ Large
12. Vitamin D Supplement Intake Do you take vitamin D supplements or fortified foods?	☐ Yes (Product name: _____) Frequency of intake: ☐ Daily ☐ 4–6 times per week ☐ 2–3 times per week ☐ Once per week ☐ Less than once per week ☐ No

Table S2. Relationship between vitamin D status and associated clinical factors

Associated factors	Insufficient/deficient (N = 49)	Sufficient (N = 71)	Total (N = 120)	<i>P</i>
Age in months [IQR]	14.0 [12.0–18.0]	14.0 [10.0–18.0]	14.0 [11.0–18.0]	0.936
Height (z-score) [IQR]	-0.4 [-1.3–0.5]	-0.6 [-1.3–0.2]	-0.5 [-1.3–0.5]	0.439
Winter blood sampling (%)	34 (69.4)	39 (54.9)	73 (60.8)	0.130
Food allergy (%)	32 (65.3)	44 (61.2)	76 (63.3)	0.847
Hen's egg allergy (%)	29 (59.2)	42 (59.2)	71 (59.2)	0.461
Cow's milk allergy (%)	17 (34.7)	15 (21.1)	32 (26.7)	0.298
Atopic dermatitis (%)	34 (69.3)	42 (59.2)	76 (63.3)	0.335
Histories of wheezing (%)	12 (24.5)	14 (19.7)	26 (21.7)	0.797
Total IgE (IU/mL) [IQR]	91.0 [30.0–158.0]	81.0 [39.0–150.8]	81.0 [39.0–158.0]	0.936
Eosinophils (/μL) [IQR]	250.7 [155.5–472.1]	268.7 [161.9–465.3]	265.2 [155.6–466.8]	0.946
25(OH)D ₃ (ng/mL) [IQR]	19.5 [13.3–28.1]	32.0 [25.3–39.9]	27.3 [19.8–36.2]	< 0.001
Ca (mg/dL) [IQR]	10.4 [9.9–10.7]	10.3 [9.9–10.7]	10.3 [9.9–10.7]	0.653
P (mg/dL) [IQR]	5.3 [4.9–5.7]	5.1 [4.8–5.4]	5.2 [4.8–5.6]	0.097
ALP (IU/L) [IQR]	290.5 [219.5–340.0]	263.0 [209.5–328.0]	272.0 [215.5–336.0]	0.190
Caesarean section (%)	11 (22.4)	9 (12.7)	20 (20.0)	0.211
Breastfeeding (%)	49 (100)	68 (95.8)	117 (97.5)	0.269
Duration (months) [IQR]	12.0 [9.0–14.0]	9.0 [6.0–13.0]	10.0 [6.0–14.0]	0.070
Use of Formula feeding (%)	41 (83.7)	60 (84.5)	101 (84.2)	1.000
Duration (months)[IQR]	3.0 [0.3–6.0]	7.0 [0.6–12.0]	4.0 [0.3–12]	0.046
Age at solid food introduction (months) [IQR]	5.0 [5.0–6.0]	5.0 [5.0–6.0]	5.0 [5.0–6.0]	0.480
Frequency score				
Egg yolk intake [IQR]	3.0 [1.0–4.0]	2.0 [0.0–3.0]	2.0 [1.0–3.0]	0.034
Mushroom intake [IQR]	3.0 [1.0–3.0]	2.0 [1.0–3.0]	3.0 [1.0–3.0]	0.539
Fish intake [IQR]	3.0 [3.0–4.0:]	3.0 [2.0–4.0]	3.0 [2.0–4.0]	0.090
Outdoor playing [IQR]	3.0 [2.0–3.0]	3.0 [2.5–3.0]	3.0 [2.0–3.0]	0.103
Sun exposure [IQR]	1.0 [1.0–3.0]	3.0 [1.5–4.0]	2.5 [1.0–3.0]	0.004
Use of sunscreen (%)	7 (14.3)	12 (16.9)	19 (15.8)	0.802

Vitamin D status was classified based on serum 25(OH)D concentrations as deficiency (<12 ng/mL), insufficiency (12 to <20 ng/mL), and sufficiency (≥20 ng/mL).

Values are presented as median [IQR] or n (%).

Table S3. Relationship between vitamin D status and associated factors related to mother

Associated factors	Insufficient/deficient (N = 43)	Sufficient (N = 68)	Total (N = 111)	<i>P</i>
Age below 40 (%)	40 (93.0)	57 (83.8)	97 (87.4)	0.068
Frequency score for exercise [IQR]	0 [0.0-1.0]	0 [0.0-1.0]	0.0 [0.0–1.0]	0.885
Use of sunscreen (%)	22 (100)	37 (95.8)	59 (53.1)	0.816
Histories of suntan (%)	19 (83.7)	42 (84.5)	61 (55.0)	0.081
Frequency score Sun exposure [IQR]	1.0 [1.0–3.0]	2.0 [1.0–3.0]	2.0 [1.0–3.0]	0.080
Egg yolk intake [IQR]	4.0 [3.0-4.0]	3.5 [3.0-4.0]	4.0 [3.0–4.0]	0.405
Mushroom intake [IQR]	3.0 [3.0–4.0]	3.0 [3.0–4.0]	3.0 [3.0–4.0]	0.698
Fish intake [IQR]	3.0 [2.0–3.0]	3.0 [2.0–3.0]	3.0 [2.0–3.0]	0.385
Use of vitamin D supplements (%)	2 (4.7)	0 (0.0)	2 (1.8)	0.148

Vitamin D status was classified based on serum 25(OH)D concentrations as deficiency (<12 ng/mL), insufficiency (12 to <20 ng/mL), and sufficiency (≥20 ng/mL). Values are presented as median [IQR] or n (%). Data on paternal factors were excluded due to missing values.

Table S4. Factors associated with vitamin D status by age

N=113			
Associated factors	6-< 12 months (N = 25)	12-< 24 months (N = 88)	<i>P</i>
Spring–Summer (%)	7 (28.0)	37 (42.0)	0.936
Duration of breastfeeding [IQR]	9.0 [7.0–10.0]	12.0 [7.8–14.0]	0.006
Duration of formula feeding [IQR]	7.0 [1.0–10.0]	3.5 [0.3–12.0]	0.982
Age of introduction to solid foods [IQR]	5.0 [5.0–6.0]	5.0 [5.0–6.0]	0.268
Frequency score egg yolk intake [IQR]	3.0 [1.0–3.0]	3.0 [1.0–4.0]	0.458
mushroom intake [IQR]	1.0 [0.0–2.0]	3.0 [2.0–3.5]	< 0.001
fish intake [IQR]	3.0 [2.0–4.0]	3.0 [2.0–4.0]	0.785
outdoor playing [IQR]	3.0 [2.0–3.0]	3.0 [3.0–3.0]	0.107
sun exposure [IQR]	2.0 [1.0–3.0]	3.0 [1.0–4.0]	0.052
Use of sunscreen (%)	4 (16.0)	12 (13.6)	0.506

Infants were stratified into two age groups (6–<12 months, N = 25; 12–<24 months, N = 88); infants aged <6 months (N = 7) were excluded. Values are presented as median [IQR] or n (%).