



Supplements during lactation

The more the merrier?

Franziska Delgas, Anna Lederer, Sabine Holzäpfel, Maren C. Podszun

Abstract

The German “Healthy Start – Young Family” network (*Gesund ins Leben*), affiliated with the Federal Center for Nutrition (*Bundeszentrum für Ernährung*, BZfE), recommends iodine supplementation during lactation, as well as docosahexaenoic acid (DHA) intake for breastfeeding women with low fish consumption. But what do dietary supplements (DS) for breastfeeding women contain and in what dosage? We investigated 50 supplements and compared their iodine and DHA dosage to the recommendations set by the “Healthy Start – Young Family” network.

10% of the DS contained iodine according to the supplementation recommendation, while 72% exceeded and 4% fell short. 14% of the investigated DS did not contain iodine at all. In the case of DHA, 32% contained exactly the recommended amount, while 24% of the preparations exceeded and 2% fell short of this recommendation. 42% of the supplements did not contain any DHA.

Our analysis shows that many DS do not meet the supplementation recommendations for iodine and DHA in the lactation period. In addition, all the investigated DS contained a large number of nutrients, some of which exceed the maximum levels proposed by the German Federal Institute for Risk Assessment (*Bundesinstitut für Risikobewertung*, BfR). A reformulation of the preparations by the manufacturer, taking into account the recommendations as well as the proposed upper limits by the BfR, is desirable.

Keywords: dietary supplements, lactation, multinutrient supplements, DHA, iodine, n-3 fatty acids, supplements

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Introduction

The market for dietary supplements (DS) is vast and confusing with products being sold in a variety of locations including pharmacies, drugstores, discount stores, and online. Advertising addresses a wide variety of target groups and their needs, including lactating mothers. During this vulnerable phase, lactating individuals are dual providers and it's crucial to ensure adequate nutrient supply for the wellbeing of the mother as well as optimal infant health and development. Manufacturers of DS take advantage of a mother's basic emotional need to provide her child with all the required nutrients by addressing precisely these maternal wishes and concerns in the advertising of their products. They use statements such as “For the special needs of you and your baby during lactation [Femibion *Stillzeit*]”, “Only the best for you and your child [Eucell natal]”, and “comprehensively supplied [Abtei Vita Mama]” in flyers, brochures, or on the internet. Advertising statements like these can lead lactating mothers to believe that they are not providing enough nutrients for their child without taking similar DS. Manufacturers often add a wide range of vitamins and minerals in various dosages to their products. To the best of our knowledge, there is currently no overview of the various DS available to breastfeeding women in Germany. Furthermore, data on the included micronutrients as well as their dosage is lacking, a research gap we could like to close with this work.

Important nutrients during lactation

Lactation is a critical period for both the mother and child, as it sets the foundation for the child's healthy development [1]. Besides supplying energy-providing macronutrients, the mother's dietary choices also affect the amount of micronutrients supplied to the breastfed infant, to varying degrees. The carbohydrate, protein, and fat content of breast milk is largely independent of diet and is normally stable [2], whereas dietary fat choices are reflected in the



fatty acid pattern of breast milk [3, 4]. The content of some nutrients in breast milk, including, for example, fat-soluble vitamins, vitamin B₁ and vitamin C, and, for example the mineral iodine, are also related to maternal nutrition [5–8]. For some nutrients, such as biotin, vitamin C, and iodine [9], this results in higher reference values for lactation compared to those set during pregnancy. However, with few exceptions, these additional requirements can be covered by a balanced diet with appropriate food choices. Vitamin D, vitamin K, and fluoride as well as iodine for older infants are exceptions, for which there are explicit supplementation recommendations in the first year of infancy in addition to breastfeeding/formula nutrition [10].

In general, similar recommendations apply with regard to maternal nutrition during lactation as for non-lactating women: a balanced, regular, and varied diet with the consumption of sea fish twice a week, including fatty fish (e.g., herring, mackerel, salmon, sardine) at least once a week [10]. An exception is the supply of iodine, where deficiency cannot be excluded even with optimal food choices [11–13]. Iodine supply is generally low in Germany and studies have found that as much as 30% of the population does not consume adequate amounts [14]. Supply also appears to be critical during lactation, and 64% of breast milk samples from breastfeeding women in Germany who did not supplement iodine were below the reference value for iodine in breast milk [15]. A good supply of iodine is important for the formation of infant thyroid hormones which are essential for the development of the brain, nervous system, and mental abilities [14, 16, 17]. Thus, the iodine supply status of the mother directly affects the iodine concentration of breast milk, and therefore the mother's iodine deficiency can be transmitted to the fully breastfed infant [11, 13]. Infant iodine deficiency can lead to mental as well as physical irreversible developmental disorders [18]. The “Healthy Start – Young Family” network (*Gesund ins Leben*) of the German Federal Center for Nutrition (*Bundeszentrum für Ernährung*, BZfE) therefore recommends daily iodine supplementation of 100 µg during lactation, in addition to the use of iodized table salt [10]. However, the daily iodine supplementation as a DS should not exceed 150 µg/day, even for breastfeeding women, according to the proposed maximum amount set by the Federal Institute for Risk Assessment (*Bundesinstitut für Risikobewertung*, BfR) [19]. Lactating women with thyroid disease should seek advice from a physician before taking iodine supplements.

In addition to iodine, there is another supplementation recommendation from the “Healthy Start – Young Family” network, but this only applies to lactating women who do not consume fish at least twice a week [10]. Fish consumption in Germany is generally low [12] and only 41% of breastfeeding women in a German study reported consuming fish more than once a week [20]. Therefore, for lactating women who consume fish less than twice a week, additional supplementation of 200 mg of docosahexaenoic acid (DHA) per day is advised [10]. DHA (like eicosapentaenoic acid, EPA) is one of the n-3 fatty acids that can only be formed to a small extent by the body from essential fatty acid precursors and must therefore be supplied by the diet (or DS) [16]. DHA and EPA are important for infantile vision and brain development. Furthermore, studies show a lower incidence of allergies in children whose mothers were well supplied with EPA and DHA during pregnancy and lactation [21].

The BfR has not yet proposed a maximum amount for supplementation with DHA, but recommended in 2009 that maximum amounts should be set for the fortification of foods with n-3 fatty acids [22].

The recommendations of the “Healthy Start – Young Family” network and the BfR recommended maximum amount for DS are summarized in ♦ Table 1.

	Iodine ^a	DHA ^b
Recommendations for dietary supplements of the “Healthy Start – Young Family” network [10]	100 µg/day	200 mg/day
Maximum level by the BfR [19]	150 µg/day	–

Tab. 1: Supplementation recommendation of the “Healthy Start – Young Family” network for iodine and docosahexaenoic acid (DHA) and recommended maximum amount of the Federal Institute for Risk Assessment (*Bundesinstitut für Risikobewertung*, BfR) for iodine in dietary supplements

^a applies to all breastfeeding mothers

^b applies only to breastfeeding women who consume fish less than twice a week

Study objective

A Germany-wide analysis was conducted to investigate the range of DS available to lactating women. The supplements were compared and evaluated based on the supplementation recommendations of the “Healthy Start – Young Family” network for lactating women. Three central questions were investigated in the present work:

- 1) Do DS advertised for lactating women and available in Germany contain 100 µg of iodine per day in accordance with the supplementation recommendation, or are the values below or exceed the maximum amount suggested by the BfR?
- 2) How high is the DHA content in DS that are recommended for lactating women?
- 3) Which other micronutrients are contained in the preparations and how do the dosages compare to the maximum recommended amounts of the BfR?

Methods

Procedure for the identification of DS

DS included in this analysis are composed of a) supplements advertised for the breastfeeding period from the Marktcheck 2021 of the *Verbraucherzentrale Baden-Württemberg* on DS



from preconception to breastfeeding [23]. This list was completed by b) the results of a digital survey study conducted by us, in which 2054 breastfeeding women in Germany provided information on the use of supplements during lactation; and c) through an online search via Google Shopping in July 2022 using the keywords "breastfeeding" and "dietary supplements", as well as the related search terms "postnatal", "after birth" or "preparations", and "multivitamin". Please note that the research was conducted in German and search terms were translated for this publication. The identified products were screened whether they matched our inclusion criteria:

- 1) Is it a multinutrient preparation for the lactation period? In this study, this is defined as a preparation containing at least two micronutrients (vitamins and minerals). Preparations were also included if the intake within one product takes place in several dosage forms (e.g. a preparation containing both a capsule and a granulate).
- 2) Is the product explicitly advertised on the product as suitable for lactation or for pregnancy and lactation or on the manufacturer's product homepage?
- 3) Is the product available on the German market?

Evaluation of the DS

Product information such as ingredients and prices were researched online. The prices reflect the current status and may have changed in the meantime. Nutritional values were recorded per daily dose as stated by the manufacturer for their product. This recommended daily dose could consist of a single tablet or capsule, or several.

The ingredients and their dosage were compared with the recommendations of the "Healthy Start – Young Family" network. The focus of the analysis was placed on iodine and DHA, since recommendations for supplementation during lactation are only available for these two nutrients. In addition, a comparison of the dosage with the maximum quantity suggestions, if available, for vitamins and minerals in food supplements of the BfR was performed.

Statistical/descriptive evaluation of DS

Results were evaluated according to different micronutrients (♦ Table 2, p. 71). The results were grouped into supplements containing both iodine and DHA, supplements containing only one of the two nutrients, and supplements containing neither of the two nutrients. The graphical analysis and illustration were performed using GraphPad Prism (version 9.4.1.).

Results

50 multinutrient dietary supplement preparations for lactating women were analyzed – with a focus on iodine and DHA. Results were compared to the supplementation recommendations of the "Healthy Start – Young Family" network and the proposed maximum levels of nutrients set by the BfR. Among these, 8 supplements (16%) were marketed exclusively for lactation and 42 supplements (84%) for pregnancy and lactation. The prices of the DS per day

ranged from € 0.03 to € 2.50. For a clear presentation of the results, the preparations were assigned numbers from 1–50 (♦ Table 3, p. 74). 86% of the investigated preparations contained iodine (n = 43). 52% of the preparations contained both iodine and DHA (n = 26). 40% of the preparations contained one of each (n = 20), with 34% (n = 17) containing only iodine and no DHA and 6% (n = 3) containing only DHA and no iodine. Another 8% of the supplements contained neither iodine nor DHA (n = 4).

♦ Figure 1 illustrates the concentrations of the daily intake of iodine of the 50 preparations in relation to the recommendation of the "Healthy Start – Young Family" network (100 µg/day) as well as the suggested maximum amount of the BfR (150 µg/day). Five preparations (10%) contained exactly 100 µg iodine, two preparations contained less (4%) and seven contained no iodine at all (14%). 27 preparations (54%) were above the recommendation but with 150 µg/day not above the maximum amount recommendation for supplements of the BfR. Nine supplements (18%) were above the recommended maximum amount and in some cases significantly exceeded it. The highest declared value was 250 µg iodine, which exceeds the maximum recommended amount by 100 µg.

Supplementation with 200 mg DHA per day is recommended for lactating women who consume fish less than 2 times per week. As shown in ♦ Figure 2, of the 50 multinutrient preparations studied, 16 exactly met the supplementation recommendation (32%), while 12 preparations (24%) exceeded the "Healthy Start – Young Family" network supplementation recommendations for DHA. One preparation contained less than the recommendation (2%), while 42% of the preparations contained no DHA at all (n = 21).

With five of the supplements (10%), it is possible to achieve the exact intake recommendations of the "Healthy Start – Young Family" network for iodine (100 µg/day). However, all preparations additionally contain DHA (200 mg/day) (No. 1, 6, 7, 8, 14). All five supplements also contain many other vitamins and minerals. Three of these five preparations (6%) did not exceed any of the maximum recommendations set by the BfR (No. 6, 7, 14). One of the five supplements (No. 1) exceeded only the maximum amount for selenium (by 22.2%) and one preparation (No. 8) contained iodine and DHA in the optimal amount, but five

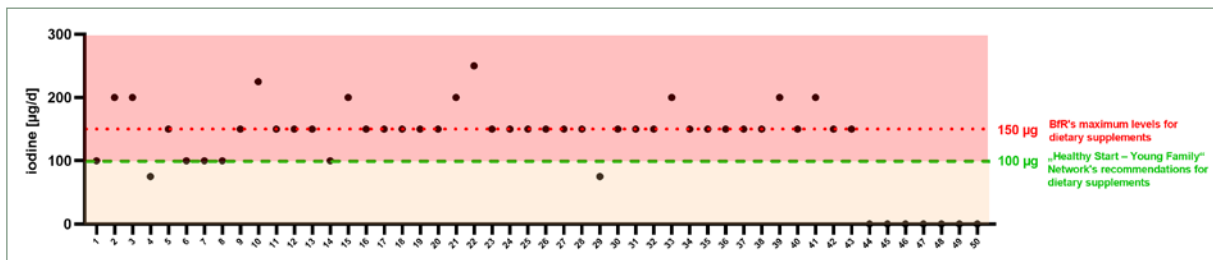


Fig. 1: Daily iodine dose of the individual dietary supplement for the lactation period in relation to the supplementation recommendation of the “Healthy Start – Young Family” network and the maximum recommended dose of the BfR (n = 50)

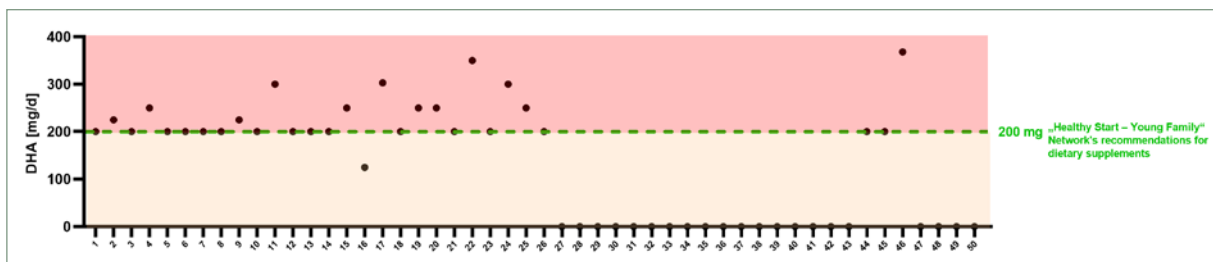


Fig. 2: Daily DHA dose of the individual dietary supplement for the lactation period in relation to the supplementation recommendation of the “Healthy Start – Young Family” network (n = 50)
DHA = docosahexaenoic acid

added ingredients (vitamin A, folic acid, iron, selenium, and zinc) exceeded the recommended maximum amount of the BfR (by 66.5%, 50%, 150%, 100%, and 53.9%, respectively).

100% of the preparations included in this analysis (n = 50) had other nutrients added in addition to iodine and DHA. Most frequent additional nutrients were folic acid (n = 48), vitamin B₁₂ (n = 47), and vitamin B₁ (n = 41). Out of the 50 preparations analyzed, 34 of them had at least one nutrient that exceeded the maximum levels (68%). Some of the exceedances were massive; for example, preparation No. 3 exceeded the maximum recommended amount for iron by 300%, preparation No. 17 for vitamin K by 700%, and preparation No. 10 for vitamin A by 440.5%. An overview of the individual nutrients of all preparations included in the evaluation (n = 50), their price at the time of the research and the percentage exceedance of the BfR maximum recommended dose can be seen in ♦ Table 2, p. 71.

Discussion

A recent German survey study on breastfeeding in Germany showed that 94.6% of women consumed DS during pregnancy [24]. 36.1%, 33.6%, 16.6%, and 8.2% also reported taking either one, two, three, or four (or more) supplements. Of these, slightly more than half

of the participants reported taking multinutrient supplements. Comparable data on supplementation behavior during lactation are lacking. However, it can be assumed that the trend for multi-nutrient combination preparations also continues in the lactation period, especially since many products for lactation are follow-up preparations from pregnancy (e.g. Femibion *Schwangerschaft* and Femibion *Stillzeit*).

The official recommendation of the “Healthy Start – Young Family” network for lactating women includes a daily supplementation of 100 µg of iodine. In the absence of fish consumption, an additional supplementation of 200 mg/day of DHA is also recommended [10]. However, supplements available and marketed for lactation contain a variety of micronutrients with dosages that often deviate from the recommendation. During our analysis, we did not find any product that contains only iodine and DHA in appropriate dosages for lactation. Furthermore, no monopreparation for iodine in the ideal concentration of 100 µg/day, which is advertised for iodine supply during lactation, could be identified. All preparations that contained 100 µg iodine also contained DHA, the supplementation of which is, however, only recommended in the case of low or no fish consumption.

With five of the 50 multinutrient supplements analyzed, a breastfeeding woman without sufficient fish consumption can cover her need for iodine and DHA, but at the same time she takes in a wide variety of other micronutrients. The question arises, why are there no supplements that exactly meet the recommendations for nutrient supplementation during lactation? 14% of the multi-nutrient preparations (n = 7) explicitly recommended during lactation do not contain iodine. Supplementss without iodine for lactation are only relevant for women with thyroid disease, and can be considered after medical consultation. At the same time, the absence of iodine in these supplements is misleading for healthy women, as a multinutrient supplement for lactation suggests that all nutritional needs for mother and baby are met. A warning



similar to “this product does not cover your increased iodine requirements during breastfeeding” or an adjustment of the product composition of the manufacturer would be necessary to better protect breastfeeding women and their children. A general adjustment of the product composition to the recommended 100 µg of iodine per day would be desirable, as some preparations even significantly exceeded the maximum amount suggested by the BfR. Depending on the existing thyroid function, an oversupply of iodine carries the risk of mild to severe symptoms [25] and, in the long term, the development of hyperthyroidism [13]. In the “Advice for Medical Practice: Iodine, Folate/Folic Acid, and Pregnancy” of the BfR, in order not to exceed the total daily iodine intake of 500 µg, which is considered to be safe for health, an individual iodine anamnesis (during pregnancy and lactation) is recommended. By taking a medical history, multiple supplementations can be detected and avoided, and targeted supplementation and thus optimal supply can be achieved [13].

Supplementation with DHA is recommended only in the absence or insufficient consumption of fish. Still, DHA was contained in 58% of the analyzed multinutrient supplements. However, the dosage was also above recommendation for 24% of the preparations. In contrast to iodine there are, however, multiple mono-preparations with DHA on the market that are explicitly marketed for lactation period, but which were not included in this analysis. The European Food Safety Authority (EFSA) classifies a daily consumption of up to 1 g DHA via supplements as safe for the general population [26] and this amount was not exceeded by any of the products.

Although an official and clear recommendation is only available for iodine and DHA, a large number of vitamins and minerals are added to all the investigated preparations. However, a clear, scientifically confirmed benefit for lactation is lacking. There is a conflict between the advice to use DS according to individual needs and the abundance of multinutrient preparations intended for lactating women that do not cater to specific requirements. Combination supplements with a large number of vitamins and minerals are generally not useful. The fact that the BfR's proposed maximum quantities are sometimes significantly exceeded is worrisome, and there is a lack of research on whether this poses risks for breastfeeding women and their infants. The exceedances of the BfR's maximum quantity proposals in the current analysis also coincide with exceedances in food supplements in general, as shown by another German study on micronutrient dosages in DS. Here, 106 DS from the local retail trade were examined, of which 51.8% exceeded the maximum recommended doses [27].

In addition, combination supplements for pregnancy and lactation are not very useful due to the different requirements in the two phases as the recommended intake of individual micronutrients differs significantly in the two phases of life (e.g. folic acid). The simultaneous recommendation for pregnancy and lactation in some preparations could also be the reason for the choice of a dosage of 150 µg iodine, since iodine supplementation between 100 and 150 µg is recommended during this period [10]. In general, advice tailored to the respective situation should be given and information provided on the supplementation recommendations.

Limitations

This study is a non-representative overview and evaluation of DS for lactation. As the market is continuously growing and the product range is constantly changing, this overview is only a snapshot and cannot guarantee completeness at any time. New products for this target group may be launched and preparations may also be withdrawn or their formulations adapted. It is also possible that not all products were identified in this research. This analysis is also limited to preparations that are available on the German market and therefore only includes supplements from abroad to a limited extent. Due to the study design, only multinutrient preparations and no monopreparations for nutritional supplementation in the breastfeeding period were included in this overview. Consumers also have the option of combining several mono-preparations independently and in line with their needs. However, this procedure is very time-consuming. In addition, this research did not identify any monopreparation for iodine that is advertised for the lactation period.

Conclusion

- 1.) 10% of the investigated DS (n = 5), which are advertised for lactating women, contained exactly 100 µg of iodine per day according to the recommendation. 72% (n = 36) exceeded and 4% (n = 9) fell short of this recommendation. 14% (n = 7) did not contain iodine at all.
- 2.) 32% (n = 16) of the DS contained 200 mg DHA, while 24% (n = 12) exceeded and 2% (n = 1) fell short of this value. 42% (n = 21) of the supplements did not contain DHA.
- 3.) All products contained other nutrients besides iodine and DHA and 68% of the supplements contained these in dosages above the maximum quantity recommendations of the BfR.

The formulation of supplements for lactation should generally be adapted to the recommendations of the “Healthy Start – Young Family”



network. To date, there is no monoprparation for iodine that is advertised for lactation, a gap that urgently needs to be closed. In addition, for women who eat little or no fish, there is no preparation that contains only DHA and iodine. Five preparations contained iodine and DHA in the recommended dosage (No. 1, 6, 7, 8, 14), however, these as well as all other examined preparations contained many other nutrients besides DHA and iodine. There is no evidence that the saying “the more the merrier” is true for DS in the lactation period; rather, it is a cause for concern that many of the preparations exceeded the suggested maximum amounts of the BfR. Whether this oversupply of nutrients poses potential risks for lactating women and their infants is unclear and should be examined in interventional studies.

Conflict of Interest

The authors declare no conflict of interest.

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Product (No.)	Iodine Recommendation of the "Healthy Start – Young Family" network: 100 µg/day	DHA Recommendation of the "Healthy Start – Young Family" network: 200 mg/day	Other vitamins present	Other substances present	Percentage deviation from the recommended maximum amounts of the BfR	Price/day	Comments
1	•	•	Vitamin B ₁ , Vitamin B ₂ , Vitamin B ₆ , Pantothenic acid, Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Selenium, Zinc, Phosphatidylserine	Selenium +22,2%	0,83 €	
2	↑ (+100%)	↑ (+12,5%)	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Zinc, Selenium, Iron, Manganese, Copper, EPA	Vitamin A +66,5% Folic acid +50% Iodine +33,3% Iron +150%	0,13 €	
3	↑ (+100%)	•	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Copper, Magnesium, Manganese, Selenium, Zinc, EPA, Molybdenum, Chrome, L-Carnitine, Lutein, Citrus bioflavonoids	Vitamin A +66,5% Niacin +150% Vitamin B ₆ +42,9% Folic acid +50% Vitamin E +50% Iodine +33,3% Iron +300% Manganese +300% Selenium +33,3% Zinc +53,9%	1,00 €	
4	↓ (-25%)	↑ (+25%)	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Magnesium, Selenium, Zinc, EPA, Chrome		0,67 €	
5	↑ (+50%)	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	EPA		0,67 €	
6	•	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	EPA		0,57 €	
7	•	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin E	EPA		0,43 €	
8	•	•	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Magnesium, Selenium, Zinc	Vitamin A +66,5% Folic acid +50% Iron +150% Selenium +100% Zinc +53,9%	0,30 €	
9	↑ (+50%)	↑ (+12,5%)	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Magnesium, Zinc, EPA	Vitamin A +66,5% Iron +66,7%	0,67 €	
10	↑ (+125%)	•	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Copper, Selenium, Zinc, EPA, Lutein	Vitamin A +440,5% Beta-carotene +85,7% Niacin +6,3% Folic acid +25% Iodine +50% Iron +50% Selenium +22,2% Zinc +53,9%	0,96 €	
11	↑ (+50%)	↑ (+50%)	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E, Vitamin K ₁	Iron, Calcium, Magnesium, Selenium, Zinc, EPA, Phosphatidylserine, Molybdenum, Chrome, Milk thistle extract	Vitamin A +66,5% Vitamin B ₆ +28,8%	1,47 €	
12	↑ (+50%)	•	Vitamin A, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Selenium, Zinc, Cholin, Lutein	Vitamin A +165% Niacin +12,3% Iron +133,3% Zinc +38,5%	1,13 €	
13	↑ (+50%)	•	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Copper, Magnesium, Selenium, Zinc, EPA	Vitamin A +66,5% Iron +183,3% Selenium +44,4% Zinc +130,8%	1,03 €	
14	•	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Calcium		0,78 €	



15	↑ (+100%)	↑ (+25%)	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Calcium, Magnesium, Zinc, EPA	Vitamin A +66,5% Niacin +6,3% Vitamin B ₆ +14,3% Folic acid +100% Iodine +33,3% Iron +150% Magnesium +20%	0,77 €	
16	↑ (+50%)	↓ (-37,5%)	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Magnesium, Selenium, Zinc, EPA	Folic acid +100% Iron +233,3% Selenium +11,1% Zinc +7,7%	0,67 €	
17	↑ (+50%)	↑ (+51,5%)	Folic acid, Vitamin C, Vitamin D ₃ , Vitamin K ₂	Iron, Calcium, Magnesium, Zinc, EPA	Folic acid +100% Vitamin D ₃ +25% Vitamin K ₂ +700% Iron +133,3% Calcium +35,6% Magnesium +35,6% Zinc +53,9%	2,50 €	
18	↑ (+50%)	•	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E, Vitamin K ₁	Selenium, Zinc, EPA, Chrome		0,90 €	
19	↑ (+50%)	↑ (+25%)	Vitamin B ₁ , Vitamin B ₂ , Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D	Iron, Zinc, EPA, Cholin, Lutein	Folic acid +12,5% Vitamin D +25% Iron +66,7% Zinc +53,9%	1,00 €	
20	↑ (+50%)	↑ (+25%)	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Magnesium, Selenium, Zinc, EPA	Folic acid +50%	0,13 €	
21	↑ (+100%)	•	Vitamin A, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Calcium, Copper, Selenium, Zinc, EPA, Taurine	Vitamin A +300% Iodine +33,3% Iron +133,3% Zinc +53,9%	1,23 €	According to the manufacturer not suitable for pregnant women!
22	↑ (+150%)	↑ (+75%)	Vitamin A, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E, Vitamin K ₁	Iron, Calcium, Copper, Magnesium, Manganese, Selenium, Zinc, EPA, Lutein	Vitamin A +100% Niacin +25% Vitamin B ₆ +14,3% Folic acid +50% Iodine +66,7% Iron +200% Manganese +300% Selenium +46,7% Zinc +84,6%	0,96 €	
23	↑ (+50%)	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Magnesium, Selenium, Zinc	Niacin +12,5% Iron +133,3% Selenium +11,1% Zinc +69,2%	1,92 €	
24	↑ (+50%)	↑ (+50%)	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E, Vitamin K ₁	Iron, Calcium, Copper, Magnesium, Selenium, Zinc, EPA, Cholin, Molybdenum, Chrome, Lutein	Vitamin A +66,5% Niacin +125% Vitamin B ₆ +42,9% Folic acid +25% Vitamin E +20%	0,30 €	
25	↑ (+50%)	↑ (+25%)	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Iron, Calcium, Magnesium, EPA	Folic acid +50% Iron +150%	0,70 €	
26	↑ (+50%)	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin D, Vitamin E	Selenium, Zinc	Folic acid +50%	0,61 €	
27	↑ (+50%)	not present	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Calcium, Copper, Magnesium, Manganese, Selenium, Zinc, Molybdenum, Chrome	Iron +168,3% Manganese +100% Selenium +22,2% Zinc +53,9%	0,12 €	
28	↑ (+50%)	not present	Folic acid, Vitamin B ₁₂			0,07 €	
29	↓ (-25%)	not present	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E, Vitamin K ₁	Magnesium, Selenium, Zinc, Chrome		0,28 €	
30	↑ (+50%)	not present	Vitamin B ₁ , Vitamin B ₂ , Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin D, Vitamin E	Selenium, Zinc	Selenium +33,3%	0,33 €	



31	↑ (+50%)	not present	Vitamin A, Vitamin B ₁ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	Copper, Manganese, Selenium, Zinc, Molybdenum, Chrome	Selenium +11,1% Zinc +4,6%	0,32 €	
32	↑ (+50%)	not present	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E, Vitamin K ₁ , Vitamin K ₂	Iron, Calcium, Copper, Magnesium, Manganese, Selenium, Zinc, Cholin, Molybdenum, Chrome, L-Carnitine	Iron +66,7% Manganese +100% Zinc +15,4%	0,66 €	
33	↑ (+100%)	not present	Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin D ₃ , Vitamin E	Iron, Calcium, Magnesium, Zinc	Niacin +6,3% Vitamin B ₆ +14,3% Folic acid +100% Vitamin D/D ₃ +50% Iodine +33,3% Iron +150% Magnesium +20%	0,32 €	
34	↑ (+50%)	not present	Folic acid, Vitamin B ₁₂ , Vitamin D ₃			0,09 €	
35	↑ (+50%)	not present	Vitamin A, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E, Vitamin K ₂	Copper, Manganese, Selenium, Zinc, Molybdenum, Chrome	Vitamin K ₂ +200% Selenium +11,1% Zinc +4,6%	0,33 €	
36	↑ (+50%)	not present	Vitamin A, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C	Iron, Copper, Magnesium, Manganese, Selenium, Zinc, Chrome, Camu-Camu extract	Niacin +87,5% Folic acid +50% Iron +66,7% Copper +100% Manganese +300% Selenium +11,1% Zinc +7,7%	0,44 €	
37	↑ (+50%)	not present	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E, Vitamin K ₂	Iron, Calcium, Copper, Magnesium, Manganese, Selenium, Zinc, Cholin, Molybdenum, L-Carnitine	Vitamin A +125% Folic acid +100% Vitamin D ₃ +25% Vitamin K ₂ +100% Iron +233,3% Magnesium +8% Selenium +55,6% Zinc +130,8%	1,33 €	
38	↑ (+50%)	not present	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E, Vitamin K ₂	Iron, Selenium, Zinc, Cholin, Chrome	Folic acid +100% Vitamin B ₁₂ +100% Vitamin D ₃ +25% Iron +133,3% Selenium +22,2% Zinc +53,9%	0,54 €	
39	↑ (+100%)	not present	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Selenium	Niacin +275% Vitamin B ₆ +88,6% Iodine +33,3% Iron +150% Selenium +22,2%	0,37 €	
40	↑ (+50%)	not present	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃ , Vitamin E	Iron, Magnesium, Zinc	Folic acid +50% Iron +133,3% Zinc +53,9%	0,61 €	
41	↑ (+100%)	not present	Folic acid		Iodine +33,3%	0,03 €	
42	↑ (+50%)	not present	Vitamin B ₁ , Vitamin B ₂ , Niacin, Vitamin B ₆ , Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D ₃	Calcium, Copper, Zinc		0,27 €	
43	↑ (+50%)	not present	Vitamin A, Beta-carotene, Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E			0,28 €	
44	not present	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E	EPA		0,67 €	
45	not present	•	Vitamin B ₁ , Vitamin B ₂ , Niacin, Pantothenic acid, Vitamin B ₆ , Biotin, Folic acid, Vitamin B ₁₂ , Vitamin C, Vitamin D, Vitamin E			1,06 €	
46	not present	↑ (+84%)	Vitamin E	EPA		0,97 €	



47	not present	not present	Vitamin B ₆ , Folic acid, Vitamin B ₁₂		Vitamin B ₆ +28,6% Folic acid +50%	0,34 €	
48	not present	not present	Folic acid, Vitamin B ₁₂ , Vitamin D ₃			0,10 €	
49	not present	not present	Vitamin B ₁₂ , Vitamin D ₃	Phosphatidylserine, Milk thistle extract		1,78 €	
50	not present	not present	Folic acid, Vitamin B ₁₂	Iron	Folic acid +12,5% Iron +230%	0,83 €	

Tab. 2: Overview of all analyzed preparations for dietary supplementation during lactation on the German market and comparison with the supplementation recommendations of the “Healthy Start – Young Family” network and the recommended maximum amounts of the Federal Institute for Risk Assessment (*Bundesinstitut für Risikobewertung, BfR*) for dietary supplements

↑ (+ %): Increase (percentage increase compared to the daily supplementation recommendation of the “Healthy Start – Young Family” network)

↓ (– %): Reduction (percentage reduction compared to the daily supplementation recommendation of the “Healthy Start – Young Family” network)

•: the substance is present in the preparation in the recommended dosage

not present: the substance is not present in the preparation

DHA = docosahexaenoic acid; EPA = eicosapentaenoic acid

No.	Name of dietary supplement	Manufacturer
1	adfetal	adpharm GmbH Ole Hoop 18, 22587 Hamburg
2	altapharma Schwangerschafts-Vitamine + DHA	Dirk Rossmann GmbH Isernhägener Straße 16, 30938 Burgwedel
3	amitamin fertil F phase 2	Active Bio Life Science GmbH Lilienthalstr. 6, 12529 Schönefeld (Berlin)
4	BabyFORTE Folsäure + Omega 3	BabyFORTE Medical UG Berliner Allee 72, 13088 Berlin
5	Caneafem 2 Extrafolate-S DHA mit Jod	Pharma Peter GmbH Tarpfenring 12, 22419 Hamburg
6	Denk lactonatal + DHA	Denk Pharma GmbH & Co. KG Prinzregentenstraße 79, 81675 München
7	Denk prenatal + DHA	Denk Pharma GmbH & Co. KG Prinzregentenstr. 79, 81675 München
8	Doppelherz Mama plus	Queisser Pharma GmbH & Co. KG Schleswiger Straße 74, 24941 Flensburg
9	Doppelherz system Schwangere + Mutter	Queisser Pharma GmbH & Co. KG Schleswiger Straße 74, 24941 Flensburg
10	elevit Stillzeit	Bayer Vital GmbH 51368 Leverkusen
11	Eucell natal	Dr. Gehring Vitalstoffe GmbH & Co. KG Hannoversche Straße 24, 31848 Bad Münder
12	Femibion Stillzeit	P&G Health Germany GmbH Sulzbacher Straße 40–50, 65824 Schwalbach am Taunus
13	Femix omega	Pharma K Medical GmbH Alte Bunder Straße 9, 32584 Löhne
14	Femmoal Plus	MOAB Pharma UG (haftungsbeschränkt) Waldenserstraße 2–4, 10551 Berlin
15	Fetusan plus Omega-3	Intercell Pharma GmbH Altlaufstraße 42, 85635 Höhenkirchen
16	Gravida	MediVITAL Concept GmbH Parkstr. 12, 59556 Lippstadt
17	Innonature Kinderwunsch-Schwangerschaft-Stillpaket	InnoNature GmbH Harkortstraße 79e, 22765 Hamburg
18	MensSana Multi für Schwangere + DHA	MensSana AG Am Bahnhof 1, 74670 Forchtenberg
19	miapanda 3 Stillzeit	health1 GmbH Aschauer Straße 21, 81549 München
20	Mivolis Mama Folsäure + DHA	dm-drogeriemarkt GmbH Am dm-Platz 1, 76227 Karlsruhe
21	NatalBen Stillzeit	ITF Pharma GmbH Prinzregentenplatz 14, 81675 München
22	Natalis lact	SanaExpert GmbH Schillerstr. 40, 80336 München



23	Novalac Prenatal	Medis GmbH Campus21, Europaring F15, A – 2245 Brunn am Gebirge
24	Orthomol Natal	Orthomol pharmazeutische Vertriebs GmbH Herzogstraße 30, 40764 Langenfeld
25	tetesept Femi Baby	tetesept pharma GmbH 60048 Frankfurt
26	Velnatal plus	Exeltis Germany GmbH Adalperstraße 84, 85737 Ismaning
27	Abtei Vita Mama	Omega Pharma Deutschland GmbH Benzstr. 25, 71083 Herrenberg
28	Avitale Folsäure 400 Plus	Avitale GmbH Butenring 7, 26479 Ellerau
29	BabyFORTE Folsäure Plus	BabyFORTE Medical UG Berliner Allee 72, 13088 Berlin
30	Cefavit natal	Cefak KG Ostbahnhofstr. 15, 87437 Kempten
31	edubily Mama multi	edubily GmbH Leidinger Str. 10, 66798 Wallerfangen
32	Fema-in-form natal 1 multi + (ab 13. SSW)	FormMed HealthCare AG Schönberger Weg 13, 60488 Frankfurt am Main
33	Fetusan	Intercell Pharma GmbH Altlaufstraße 42, 85635 Höhenkirchen
34	Folio	SteriPharm Pharmazeutische Produkte GmbH & Co. KG Podbielskiallee 68, 14195 Berlin
35	into life Mama Multi	Kareen Dannhauer into life Immanuelkirchstraße 29A, 10405 Berlin
36	Mama Fit	NatuGena GmbH Münchner Str. 113, 85051 Ingolstadt
37	more nutrition pregnancy support	Quality First GmbH Gorch-Fock-Wall 1A, 20354 Hamburg
38	Multivitamin Schwangerschaft	Heidelberger Chlorella GmbH In der Heidelslach 4, 69181 Leimen
39	Optigrav 400	BioMada GesundheitsNetzWerke GmbH Schulstraße 13, 93087 Alteglofsheim
40	pure encapsulations Schwangerschaftsformel	pro medico GmbH Ottobrunner Straße 41, 82008 Unterhaching
41	Sanct Bernhard Folsäure-Jodid-Tabletten	Kräuterhaus Sanct Bernhard KG Helfensteinstr. 47, 73342 Bad Ditzgenbach
42	Sanct Bernhard Prenatal 2	Kräuterhaus Sanct Bernhard KG Helfensteinstr. 47, 73342 Bad Ditzgenbach
43	Vitaverlan	Verla-Pharm Arzneimittel GmbH & Co. KG Hauptstraße 98, 82327 Tutzing
44	Caneafem 2 Extrafolate-S + DHA	Pharma Peter GmbH Tarpensing 12, 22419 Hamburg
45	Femibion 2 Schwangerschaft + Stillzeit ohne Jod	P&G Health Germany GmbH Sulzbacher Straße 40–50, 65824 Schwalbach am Taunus
46	NORSAN Omega-3	NatuGena GmbH Münchner Str. 113, 85051 Ingolstadt
47	Canea Folsäure	Canea Pharma GmbH 22419 Hamburg
48	Folio ohne Jod	SteriPharm Pharmazeutische Produkte GmbH & Co. KG Podbielskiallee 68, 14195 Berlin
49	Humana piülatte Vitamin D ₃ und Vitamin B ₁₂ für Stillende	Humana Vertriebs GmbH Henrich Focke Straße 4, 28199 Bremen
50	Naturtreu Stillzeit	ZENKOH GmbH Dorfstraße 18c, 21614 Buxtehude

Tab. 3: Names of dietary supplements and manufacturer information