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Assessment of meal plans for breastfeeding women in maternity wards in Cracow

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Abstract: Introduction: Breastfeeding is the gold standard for infant nutrition. Although milk production occurs independently of the mother's nutritional status, it can deplete her energy reserves and micronutrient stores. The first days after childbirth are a particularly sensitive nutritional period for both the mother and child, making it crucial to focus on nutritional needs in maternity wards.
Aim: The aim of the study was to conduct a qualitative and quantitative assessment of meal plans intended for breastfeeding women in maternity wards.
Materials and Methods: The study included four hospitals with active maternity wards in Cracow. The quantitative assessment was conducted by calculating the energy content and levels of individual dietary components for each full-day meal plan within the Kcalmar dietary program. The qualitative assessment of the menus was carried out using the point-based evaluation method by Starzyńska and the Bielińska test modified by Kulesza *et al.*
Results: Quantitative assessment revealed inaccurate intake of protein, saturated fatty acids, vitamin A, C, B2, iron and iodine in all hospitals as well as caloric content, vitamin B1, calcium, zinc and water depending on the institution. In the Starzyńska scoring method, the menus from hospitals A, B, C, and D scored 17, 25, 20, and 20 points, respectively. The Bielińska test, as modified by Kulesza *et al.*, indicated that most main dishes were nutritionally rational.
Conclusions: Hospital diets in maternity wards should be properly balanced, ensuring that meals are well-composed in terms of quality. Eliminating dietary errors in meal plans offered to breastfeeding women is crucial.

Keywords: nutrition, diet, breastfeeding, hospitals.

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Introduction

Breastfeeding is the gold standard for infant nutrition. According to the WHO (World Health Organization) infants should be exclusively breastfed for the first 6 months of life [1, 2]. This is correlated with a reduced risk of neonatal mortality as well as sepsis, ARI (acute respiratory infection) and gastrointestinal infections with diarrhea [1–3]. Among long-term benefits of breastfeeding for infants are: reduced risk of developing type 2 diabetes, overweight and obesity as well as malocclusion (improper bite) in children [4–6]. Advantages of breastfeeding for the mother include, primarily, accelerated weight loss after pregnancy and an extended interval between pregnancies, known as birth spacing [1, 3, 6–9]. Moreover, it has been shown that breastfeeding women had lower risk of developing breast cancer, which decreased the longer the lactation lasted [6–8, 10]. Similar results were found for ovarian cancer [7–9]. Other long-term benefits of breastfeeding for mothers include a reduced risk of developing hypertension, metabolic syndrome, non-alcoholic fatty liver disease (NAFLD), hypercholesterolemia and type II diabetes [7–9].

Breast milk is perfectly tailored to the infant's needs. Its composition varies depending on the duration of lactation [11] and the infant's gender [12]. The relationship between the maternal diet and the composition of the produced milk is inconclusive and requires further research. During lactation, there is increased demand for energy, macronutrients and micronutrients. It is estimated that the caloric cost of lactation in the first six months is approximately 625 kcal per day, with 505 kcal per day having to be provided through diet [13]. It is recommended to minimize intake of saturated and trans fatty acids in favor of monounsaturated and polyunsaturated fatty acids [13]. While breastfeeding, the demand for various vitamins and trace elements also increases, such as: vitamin B1, B2, B3, B5, B6, B12, A, E, C and folic acid as well as zinc, copper, selenium, iodine and manganese [13, 14]. The requirement for iron decreases during lactation but it soars again with the return of menstruation. A key component of the diet, whose requirement increases while breastfeeding, is water. On average, a lactating woman produces about 750 ml of milk per day so the recommended fluid intake should be increased to around 2700 ml per day [13].

While breastfeeding, it is also recommended to prepare meals according to the "Healthy Eating Plate" that includes consumption of vegetables and fruits in amount of about 400 g per day, with ¾ being vegetables and ¼ fruits [15]. It is best to maintain the variety of vegetables and fruits consumed and to eat them raw or cooked al dente. The National Center for Nutrition Education recommends consuming 3 servings of dairy products daily, preferably low-fat and fermented [15].

Although a mother's diet has limited effect on the content of macro- and micronutrients in breast milk — except for PUFAs — proper nutrition during lactation remains crucial [16]. While milk synthesis occurs independently of the mother's nutritional status, it can deplete her energy reserves and micronutrient stores [17–20]. For this reason, a mother's diet should be carefully balanced daily to ensure adequate intake. The postpartum period is a particularly sensitive nutritional phase for both mother and child, making it essential to focus on meeting their dietary needs in maternity wards.

Unfortunately, the quality of nutrition offered by hospital facilities is unsatisfactory. Numerous studies have revealed insufficient coverage of nutritional needs, including calcium, iron, vitamin C, B1, and B2, as well as excessive intake of vitamin A and saturated fatty acids [21–25]. The response to this issue was the pilot program "Good meal in the Hospital" [26] that aimed to provide nutrition appropriate to the health condition, including specialized diets for pregnant and lactating women. All hospitals included in the study participated in this pilot program. Diets intended

for breastfeeding women were required to meet the criteria of rational nutrition and cover energy and nutrient needs in accordance with current dietary standards. They were to be well-balanced and diverse, taking into account appropriate proportions of food groups such as grains, vegetables, fruits, meat and fish, dairy products, eggs, and both plant- and animal-based fats.

Aim of the study

The aim of the study was to assess the implementation of nutritional standards for breastfeeding women in obstetric wards, as well as to evaluate the adherence to the principles of rational nutrition in the meal planning for lactating women. Specific aims of the study included reviewing the content of macronutrients, saturated fatty acids, vitamin A, C, B1 and B2, as well as iron, calcium, iodine, zinc and water in meal plans intended for breastfeeding women in obstetric wards in Cracow.

Material and Methods

The study involved a qualitative and quantitative assessment of meal plans for breastfeeding women from obstetric wards in Cracow, Poland. All 6 hospitals with active obstetric wards in Cracow were invited to participate in the study but consent was obtained only from three institutions. Another invited hospital shared it's meal plans on it's website for general patient information, from which they were retrieved and included in the study. Meals in all hospitals were provided under a contract for full-day, comprehensive patient nutrition by an external outsourcing company.

The preliminary analysis revealed that the hospitals included in the study used different systems for developing meal plans — either a 7-day (hospital C), a 10-day (hospital B) or a 14-day system (hospitals A and D). Meal plans were assessed from August and September 2024. A total of 45 full-day menus were evaluated (Fig. 1).

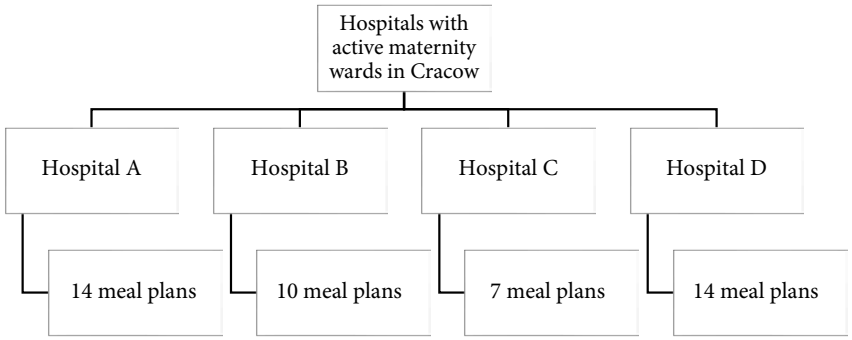

Fig. 1. Flowchart of the methodology for hospital inclusion to the study.

The quantitative assessment of the meal plans involved calculating caloric values and the levels of individual dietary components for each full-day meal plan under the dietary program Kcalmar. These values were then compared with the nutritional standards for breastfeeding women, averaged for age, height and pre-pregnancy body weight, with the activity level (PAL) of 1.4, according to the Nutritional Standards for the Population of Poland, 2024, as shown in Fig. 2 [13].

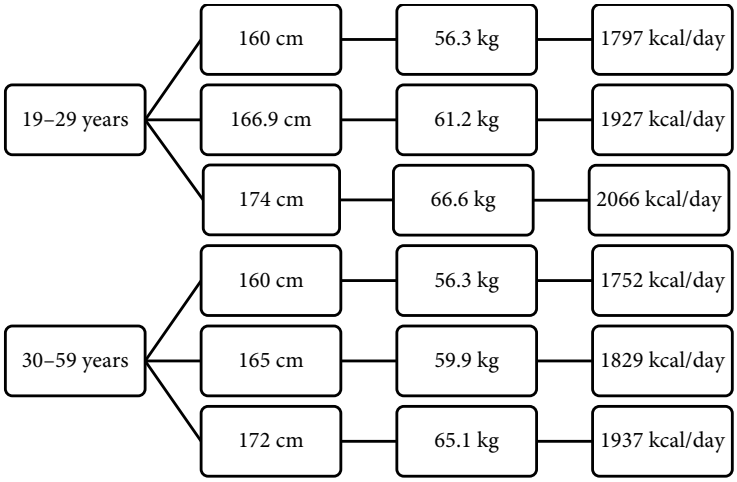

Fig. 2. Distribution of averaged groups used for calculations on the example of nutritional standards for caloric requirements.

The daily caloric content of the diet was compared to the Estimated Energy Requirement (EER), while the levels of protein, vitamins A, C, B1, B2, as well as iron, calcium, zinc, and iodine were compared to the Recommended Dietary Allowance (RDA). Fat and carbohydrate content in the diet was compared to the RI (Reference Intakes ranges for macronutrients) and water content was compared to the AI (Adequate Intake).

All values were calculated from each full-day meal plan within each hospital, and means with standard deviation were derived. A margin of error of +/– 10% was accepted between the calculated mean values and those declared by the hospitals for caloric content and nutrients. Values within +/– 10% of the values presented in the Nutritional Standards for the Population of Poland, 2024, were considered acceptable. Additionally, means and standard deviations for individual dietary components were compared between hospitals to assess differences in meal plans depending on the institution.

The quantitative assessment of the menus involved calculating the caloric requirements for breastfeeding women. This was done by averaging the caloric values proposed in the Nutritional Standards for the Polish Population, 2024 [13], resulting in a mean value of 1884.7 kcal, which was then increased by the energy cost of lactation for a single newborn (500 kcal), giving a final value of 2384.7 kcal/day. The RDA for protein content in the diet, as proposed in the Nutritional Standards for the Polish Population, was averaged, similar to the caloric requirements, resulting in a value of 50.7 g/day. This value was then increased by 19 g/day, which corresponds to the additional protein requirement resulting from the lactation process [13]. The final value was 69.7 g of protein/day. The fat content in the diet proposed in the Nutritional Standards for the Polish Population was averaged, similar to the caloric content and protein levels, resulting in mean values corresponding to 30–40% of energy, which is 62.8–83.8 g of fat/day. This value was then increased by the additional requirement for breastfeeding women, which is 16.7–22.2 g/day, resulting in final values in the range of 79.5–106 g of fat/day [13].

The statistical analysis included performing a test for homogeneity of variance to check whether the variances in the compared groups are homogeneous, followed by a one-way analysis of variance (ANOVA). If the variances between the groups were found to be heterogeneous, the non-parametric Kruskal-Wallis test would be conducted instead of the ANOVA test. A statistical significance level was set at $p < 0.05$.

Qualitative assessment involved a review of each full-day meal plan using a scoring method by Starzyńska shown in the Outline of Nutritional Assesment [27], i.e. evaluating the frequency of consumption of animal protein, milk and cheese, vegetables and fruits, bread, groats and legumes. The maximum score was 30, indicating a well-balanced diet. A lower score suggested the need to improve the meal plan or redesign it entirely (Table 1).

Table 1. Scoring method by Starzyńska as shown in the Outline of Nutritional Assessment [27].

Criterion	Points
Number of meals planned in the daily meal plan	
4–5	5
3	3
less	0
Number of meals containing animal protein sources:	
In all meals	5
In 75% of meals	2
In fewer meals	0
Frequency of milk and dairy products:	
Every day in 2 meals	5
Every day in at least 1 meal and 50% of days in 2 meals	2
Less often	0
Frequency of vegetables and fruits:	
Every day in at least 3 meals	5
Every day in at least 2 meals	2
Less often	0
Frequency of raw vegetables and fruits:	
Every day	5
In 75% of days	2
Less often	0
Frequency of whole-grain bread, groats and legumes:	
Every day, at least 1 of the above-mentioned products	5
In 75% of days, 1 of the above-mentioned products	2
Less often	0
Total	**0–30**

Qualitative assessment of meal plans also involved conducting the Bielińska test with modifications by Kulesza *et al.* shown in the Outline of Nutritional Assesment [27], i.e. categorizing meals into 9 types based on their composition (Table 2). Meals were considered rational if they were the most balanced in terms of the proportions of food groups providing essential nutrients — carbohydrates, fats, proteins, as well as vegetables, fruits and dairy products — types 5, 6 and 7.

Table 2. Characteristics of types of meals by Bielińska's test with Kulesza *et al.* modification shown in the Outline of Nutritional Assesment [27].

Type of meals	Meal category
1	Carbohydrates or carbohydrates with fats
2	As 1 + animal protein sources
3	As 1 + milk or dairy products
4	As 1 + animal protein sources + milk or dairy products
5	As 2 + vegetables or fruits
6	As 3 + vegetables or fruits
7	As 4 + vegetables or fruits
8	As 1 + vegetables or fruits
9	Vegetables or fruits

Results

The quantitative assessment determined the average values of caloric content, macronutrients, and selected micronutrients in the menus designed for breastfeeding women in the hospitals included in the study, as presented in Table 3.

Table 3. Mean values of calorie content, macronutrients and selected micronutrients in meal plans depending on the hospital.

	Hospital X ± SD				*P*
Nutrients content	A	B	C	D	
Calories (kcal)	2285.4 ± 116.1	2334.4 ± 116.2	2209.8 ± 187.7	2820.8* ± 180.6	<0.001
Protein (g)	95.7* ± 12.8	99* ± 9	102.1* ± 16.6	128.8* ± 13.1	<0.001
Fat (g)	76.6 ± 12.6	82.5 ± 10.6	77.6 ± 10.8	96.8 ± 13.1	<0.001
Fat (% of energy)	30.2 ± 3.5	31.8 ± 4	31.4 ± 3.5	30.9 ± 2.7	0.856
Saturated fat (g)	28.8 ± 3.5	39.9 ± 4	21.2 ± 4.5	36.4 ± 4.1	<0.001
Saturated fat (% of fats)	37.6 ± 3.8	48.4 ± 4.1	24.2 ± 3.2	37.6 ± 5.1	<0.001
Carbohydrate (g)	318.5 ± 23.1	315.8 ± 36	290.6 ± 33.1	375.5 ± 16.4	<0.001
Carbohydrate (% of energy)	55.7 ± 5	54.1 ± 5	52.6 ± 4.7	53.2 ± 2.4	0.313
Vitamin A (µg)	2282* ± 909.9	2072.6* ± 701.1	2078.2* ± 894.9	3397.3* ± 1030.5	0.002
Vitamin C (mg)	202.5* ± 78.3	163.5* ± 77.1	165.1* ± 41	226.9* ± 75.2	0.194
Vitamin B1 (mg)	1.4 ± 0.3	1.5 ± 0.2	1.4 ± 0.5	1.8* ± 0.5	0.017
Vitamin B2 (mg)	1.9* ± 0.3	2* ± 0.2	1.9* ± 0.5	2.4* ± 0.3	<0.001
Iron (mg)	13.5* ± 2.6	15* ± 2.2	11.7* ± 1.5	16.2* ± 1.9	<0.001

Table 3. Cont.

	Hospital X ± SD				*P*
Nutrients content	**A**	**B**	**C**	**D**	
Calcium (mg)	1191.5* ± 231.9	1030.6 ± 159.7	885.5* ± 168.1	1236.2* ± 185.7	0.001
Zinc (mg)	11.6 ± 1.3	14.1* ± 1.9	10.6* ± 1.7	14* ± 1.6	<0.001
Iodine (µg)	77.7* ± 23.4	69.8* ± 31.7	58.2* ± 17.1	60.6* ± 17.7	0.175
Water (ml)	3415.1* ± 172.4	2676.6 ± 208.5	2109.6* ± 124.9	3470.8* ± 290.9	<0.001

X + SD (average ± standard deviation); *indicates values that exceed +/–10% margin of error;
**P <0.05 indicates significant differences between the hospitals

Statistically significant differences were observed between the hospitals in terms of caloric content, protein, fat (including saturated fat), carbohydrates, vitamins A, B1, B2, as well as iron, calcium, zinc, and water content.

Hospital B provided menus with caloric values most closely aligned with the standards, while Hospitals A and C offered slightly lower caloric values (approximately 100 kcal less), though still within the acceptable margin of error. In contrast, Hospital D served menus with significantly higher caloric values compared to the standards.

All hospitals offered menus with protein content significantly exceeding the recommended levels, with Hospital D's menus supplying nearly twice the standard amount.

Hospitals B, C, and D provided menus with fat levels within the range recommended by the standards, while Hospital A offered a diet with a slightly lower fat content. However, in menus from all hospitals, the average percentage of fat content fell within the proposed range of 30–40%.

The amount of saturated fat proposed by the standards should be as low as possible while ensuring that diet provides proper nutritional value [13]. The menus offered by the hospitals contained significant amounts of saturated fats, especially Hospital B, where nearly half of the total fat content consisted of saturated fats. The smallest amount was observed in Hospital C.

RI for carbohydrates, as outlined in the nutritional standards, is 45–65% of energy [13]. All hospitals offered menus with carbohydrate content within this range.

RDA for vitamin A in the diet for breastfeeding women over 19 years of age is 1300 µg [13]. All hospitals significantly exceeded the proposed values by 159–261%. The highest amount of vitamin A in the menus was found in Hospital D.

RDA for vitamin C for breastfeeding women is 120 mg/day [13]. All hospitals exceeded the recommended amounts of this micronutrient, although Hospitals B and C exceeded it to a lesser extent than Hospitals A and D.

RDA for vitamin B1 for breastfeeding women is 1.5 mg/day [13]. Hospitals A, B, and C meet the nutritional standards for thiamine. However, Hospital D exceeded the recommended values.

The dietary need for vitamin B2 for breastfeeding women is 1.6 mg/day [13]. All hospitals included in the study offered menus with a significantly higher average amount of this micronutrient. This is particularly noticeable in the case of Hospital D.

The iron requirement, as specified in the nutritional standards in the form of the RDA for breastfeeding women, is 10 mg/day [13]. All hospitals included in the study exceeded the recommended values for this micronutrient, with Hospitals D and B exceeding the values to the greatest extent.

RDA for calcium for breastfeeding women aged 19 or older is 1000 mg/day [13]. Only Hospital B offers menus containing appropriate amounts of this micronutrient. Hospitals A and D provide higher amounts of calcium than those proposed in the nutritional standards, while the menus from Hospital C contain significantly lower amounts of this element.

The zinc content in the diet of a breastfeeding women aged 19 or older should be 12 mg/day [13]. Only Hospital A offers menus with the appropriate amount of this micronutrient. Menus from Hospitals B and D contain more, while those from Hospital C contain less of this element compared to the standards.

RDA for iodine for breastfeeding women is 290 μg/day [13]. All hospitals included in the study offered menus containing significantly lower amounts of this micronutrient compared to the standards.

Menus from Hospitals A and D offer significantly higher amounts of fluids per day. Hospital B provides an adequate water content in the diet, while Hospital C does not meet the water intake standards.

The menus differed in the number of meals provided throughout the day. Hospitals A, B, and D offered 6 meals — breakfast, second breakfast, dinner, afternoon snack, supper and a night meal, while hospital C offered 4 meals — breakfast, dinner, supper and a night meal.

The qualitative assessment of the meal plans was conducted through Starzyńska scoring method. None of the menus from the hospitals included in the study scored 30 points (Table 4). The menus from hospitals B, C, and D scored points indicating a satisfactory rating — errors were present but could be eliminated. The remaining menu, from hospital A, received only a sufficient score, indicating the presence of significant errors.

Table 4. The points awarded to hospital menus according to Starzyńska's scoring method.

Hospital	Points
A	17
B	25
C	20
D	20

None of the menus received points for the number of meals containing animal protein. Most of the menus did not earn points related to the frequency of whole grain bread, groats and/or legumes. Only the menu from hospital B offered whole grain bread every day. Most of the menus included dairy products in at least 2 meals and vegetables and fruits in at least 3 meals (including in their raw form) every day.

A qualitative assessment was also conducted using the Bielińska test with modifications by Kulesza *et al.* as shown in the Outline of Nutritional Assesment [27]. The percentage of meals meeting the quality criteria according to the test is described in Table 5.

In all the menus from all the hospitals included in the study, breakfast and dinner, as well as most suppers, were considered rational. Additionally, Hospital A also offered second breakfasts and afternoon snacks as rational meals (types 5 and 6) while night meals predominantly consisted of vegetables or fruit (type 9). Hospital B mainly offered second breakfasts as type 1, all afternoon snacks were type 3, while night meals were type 5. Most of the night meals in Hospital C were

type 3 meals. Hospital D offered afternoon snacks mostly as type 3 meals while night meals were mostly based on type 3 or 9.

None of the menus offered type 2 meals while type 4 meals were found exclusively in the night meals offered by hospital B.

Table 5. Percentage of rational meals according to the Bielińska test with modifications by Kulesza *et al.*

Meal	Percentage of rational meals (%)			
	Hospital A	Hospital B	Hospital C	Hospital D
Breakfast	100%	100%	100%	100%
II breakfast	100%	0%	—	42.9%
Dinner/Lunch	100%	100%	100%	100%
Afternoon snack	35.7%	0%	—	0%
Supper	100%	90%	100%	100%
Night meal	0%	70%	0%	0%

Discussion

This paper is the only recent quantitative study of hospital menus intended specifically for breastfeeding women in maternity wards in Poland. While previous studies have assessed hospital menus quantitatively, they did not focus on the needs of breastfeeding women.

The study showed that most hospitals offer menus that meet the nutritional standards for caloric values. Similar results were found in the studies by Orkusz and Zając, 2015 [22] and Tymoszuk and Orkusz, 2015, 2016 [23, 24]. Hospital D significantly exceeded the nutritional standards for calories which could, in the long term, lead to weight gain and the development of overweight and obesity, along with its associated health consequences.

All hospitals included in the study exceeded nutritional standards for protein. In studies evaluating hospital diets quantitatively [22, 24, 25], the protein content was close to the standards, except for the study by Tymoszuk and Orkusz, 2015 [23], where the protein content was lower than recommended.

The study showed most hospitals met the nutritional standards for fats in terms of quantity, and all hospitals met the standards regarding the percentage of fat in the diet. This is in contrast to the findings of other studies evaluating hospital diets, which showed that menus for patients provide higher amounts of fats compared to the nutrition standards at that time [22–25]. This represents a positive change compared to previous years, as excessive fat consumption can be linked to the development of overweight and obesity and their consequences, such as type 2 diabetes, hypertension, or colorectal cancer, as well as the development of metabolic syndrome, which increases cardiovascular risk [28, 29].

All hospitals, however, offered menus that provided excessive amounts of saturated fatty acids. In hospital B, their content relative to the total fat intake was nearly 50%, which contradicts the nutrition standards [13]. Similar results were obtained in the study by Tymoszuk and Orkusz, 2016 [24]. The excessive amount of saturated fatty acids in the studied menus was due to the daily inclusion of butter in at least 2 meals, as well as processed and fatty meats, including pork.

Increased consumption of saturated fatty acids can lead to higher levels of total cholesterol and LDL cholesterol, which increases the risk of developing atherosclerosis and coronary artery disease [13].

This study showed that all hospitals included in the study offered menus providing an adequate amount of carbohydrates. The exception was 2 days in hospital D, when the difference between the menu prepared by the hospital and the menu inputted into the Kcalmar program was –17%, which is more than the allowed +/– 10%. This was primarily due to the absence of certain recipes in the menus provided. Similar results regarding carbohydrate content in the menus were noted in the studies by Tymoszuk and Orkusz, 2015, 2016 [23, 24]. However, the study by Całyniuk *et al.*, 2011 [25], showed that the menus contained higher amounts of carbohydrates compared to nutrition standards, while the study by Orkusz and Zając 2015 [22], showed lower amounts. It seems that in recent years, there has been an improvement in menus regarding carbohydrate supply, which is a positive aspect of this study.

All meal plans provided significantly higher amounts of vitamin A compared to nutritional standards. This is consistent with other studies evaluating hospital diets quantitatively [22–25]. Chronic excessive consumption of vitamin A can predispose to changes in bone structure due to bone resorption and hypercalcemia [30].

Similar results were obtained for vitamin C. However, results from other studies showed lower intake of vitamin C compared to the then-current nutrition standards, regardless of the season in the studies by Tymoszuk and Orkusz, 2015, 2016 [23, 24] and Całyniuk *et al.*, 2011 [25], and in the autumn in the study by Orkusz and Zając, 2015 [22]. Although higher doses of this micronutrient were provided, they should not be toxic — it is generally accepted that a safe dose of vitamin C does not exceed 1000 mg/day [31].

Menus provided adequate amounts of vitamin B1. However, in the case of vitamin B2, excessive intake was found. The results for both of these micronutrients are contrary to what was observed in the study by Całyniuk *et al.*, 2011 [25], which showed inadequate intake of both thiamine and riboflavin. Excessive intake of vitamin B2, however, is not associated with negative health effects, as any surplus is excreted through urine [13].

It is worth noting that this study took into account the vitamin content in food before its thermal processing. During food preparation — such as cooking, baking, frying, grilling, etc. — significant vitamin losses can occur, particularly affecting vitamins C, A and the B group, especially vitamin B1 [32]. Therefore, it can be expected that the menus offered to breastfeeding women in maternity wards provided lower amounts of these micronutrients than the study results suggest.

All menus provided excessive amounts of iron. Other studies assessing the quantity of hospital diets showed either too low (during the summer) in Tymoszuk and Orkusz, 2015 [23], and regardless of the season in Tymoszuk and Orkusz, 2016 [24] and Całyniuk *et al.* [25] or too high iron intake (depending on the season) in Orkusz and Zając, 2015 [22]. No toxicity is observed from the iron naturally occurring in food, so its excess in the menus could be beneficial, as some of the iron may not be effectively absorbed [13].

Only one hospital (B) met the dietary standards for calcium. The other hospitals provided either excessive (hospitals A and D) or insufficient amounts (hospital C) of this micronutrient. These results contradict other studies evaluating the quantity of hospital diets, which showed inadequate calcium intake in patients' diets [22–25]. High calcium intake through diet does not lead to excess calcium in the body [13]. On the other hand, calcium deficiencies can negatively affect bones, leading to osteoporosis [33].

Similar to calcium, only one hospital (A) met the dietary standards for zinc, while the others provided either excessive (hospitals B and D) or insufficient amounts (hospital C) of this micronutrient. Chronic insufficient intake of this element may be associated with an increased risk of developing chronic kidney disease, kidney stones, or colorectal cancer [34–36]. On the other hand, the amounts of zinc present in food do not lead to excessive intake, so excessive zinc consumption in breastfeeding women's diets will not negatively affect the woman's body [13].

The study conducted by Bzikowska-Jura *et al.*, 2021 [37], showed that the diet of breastfeeding mothers influences the content of iron and zinc in breast milk. Therefore, it is necessary to introduce proper meal plans in maternity wards, ensuring adequate or slightly higher amounts of these micronutrients due to their limited absorption in the gastrointestinal tract [13].

All meal plans provided significantly lower amounts of iodine than recommended in the nutrition standards. Other studies assessing nutrient intake in breastfeeding women showed that the intake of this micronutrient is insufficient in this group [18, 20]. Low intake of this element in breastfeeding women does not affect its content in breast milk, but it does deplete mother's body reserves, hence the need to replenish nutritional deficiencies [13].

Only one hospital met the nutrition standards for water intake in breastfeeding women (Hospital B). The others provided excessive (Hospital A and D) or insufficient (Hospital C) amounts of this nutrient. A greater amount of water offered in the meal plans is not considered detrimental, as the total fluid intake did not necessarily have to be consumed by the patients and any excess was excreted in the urine. On the other hand, insufficient water intake could lead to dehydration in patients due to milk secretion [38].

In a study conducted by Wang *et al.*, 2021 [20], it was found that breastfeeding women consumed adequate amounts of protein and fats according to the reference intake values set by the European Food Safety Authority (EFSA). However, their intake of folic acid, vitamin C, vitamin A, vitamin D, and iodine was insufficient. These results are partially consistent with the current study, except for the intake of vitamins A and C, which was higher than the recommendations.

This study is an example of a qualitative assessment of meal plans for breastfeeding women in obstetric wards in Poland, based on selected hospitals in Cracow. There are few publications addressing the qualitative evaluation of hospital diets. This work is an attempt to fill this research gap.

The use of the Starzyńska scoring method enabled the assessment of the rationality of food rations. However, none of the hospitals involved in the study offered a nutritionally balanced meal plan. This was likely due to both the number and nature of the meals provided, which were designed to meet the increased energy requirements of breastfeeding women. The additional meals — particularly the night meal and the afternoon snack — primarily consisted of light options such as rice cakes with milk, fruit with natural yogurt, or fruit purées. As a result, the meal plans lost points for the insufficient number of meals containing sources of animal protein.

This method distinguishes between animal protein derived from meat and that from dairy products. Including dairy products as sources of animal protein could add up to 2 points to all meal plans. Additional point deductions were noted due to the low frequency of whole grain bread, groats, and/or legumes. Only Hospital B provided whole grain bread on a daily basis. This issue could be easily addressed by selecting different types of bread for breakfast, second breakfast, and supper, or by replacing potatoes with groats on certain days during dinner.

The second method of qualitative assessment was the Bielinska test, modified by Kulesza *et al.* All hospitals offered rational main meals, i.e., breakfast, dinner, and most suppers. These meals

are typically the most calorie-dense, so their appropriate balance in hospitals is satisfactory and should be maintained.

There were significant differences between hospitals regarding the types of second breakfasts, afternoon snacks, and night meals. The best approach would be to compose all meals according to the Healthy Eating Plate prepared by the National Center for Nutritional Education.

A very positive aspect is the high frequency of vegetables and fruits, including raw forms. There is evidence suggesting that high consumption of vegetables and fruits during lactation may influence increased consumption of these products in older children [39].

Additionally, dairy products were offered with high frequency. Most hospitals provided at least three meals containing dairy products, including fermented and low-fat varieties. This is consistent with the recommendations of the National Center for Nutritional Education [40].

The nutrition of breastfeeding women during their hospital stay in the early postpartum period may significantly influence the course of lactation in the following weeks and months. Therefore, women in maternity wards should receive nutritionally adequate meals along with appropriate dietary support. Such measures may help prevent dietary errors and the development of nutritional deficiencies. Similar conclusions were drawn by the authors of a 2021 study, which demonstrated that women in the first month of lactation exhibited several dietary inadequacies and low levels of physical activity, both of which had a negative impact on their anthropometric parameters [41]. A study conducted by Nurek *et al.*, 2022 [40], showed that women during lactation did not follow nutritional recommendations and authors emphasized the need for proper nutritional education for postpartum patients. Another study evaluating the nutritional knowledge of breastfeeding women found that mothers had low level of knowledge and that proper education on correct nutritional practices by healthcare personnel was necessary [41].

The main limitation of the study was the lack of access to some recipes, which required recreating them. Future researchers should pay particular attention to this issue before starting a similar study.

Conclusions

The diets intended for breastfeeding women should be better developed both quantitatively and qualitatively. Special attention should be given to ensuring appropriate levels of protein, saturated fatty acids, vitamin A, calcium, iodine, and water in the meal plans. Ensuring an adequate amount of fluids on maternity wards is crucial due to the increased demand arising from milk secretion.

A number of quality errors identified in this publication can be easily eliminated for the benefit of patients, such as choosing whole grain bread or groats instead of potatoes. The basis for creating meal plans should always be the Healthy Eating Plate.

It seems crucial to place greater emphasis on the quality of diets intended for breastfeeding women, not only in terms of nutrition but also to support women during the postpartum period through nutritional education. Introducing dietary counselling for women in maternity wards in Poland would be beneficial.

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Conflict of interest

None declared.

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