

Review

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[Magdalena Skowrońska](#), [Michał Pawłowski](#), [Robert Milewski](#)*

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Review

Evaluating the Reliability of Health Portals' Nutrition and Supplementation Advice for Pregnant Women: A Comprehensive Review

Magdalena Skowrońska ¹, Michał Pawłowski ² and Robert Milewski ^{2,*}

¹ Doctoral School, Medical University of Białystok, 15-276 Białystok, Poland

² Department of Biostatistics and Medical Informatics, Medical University of Białystok, 15-295 Białystok, Poland

* Correspondence: robert.milewski@umb.edu.pl

Abstract: This article evaluates the reliability and consistency of nutrition- and supplementation-related advice for pregnant women provided by ten selected health-related Internet portals. The portals were chosen based on their perceived reliability and prominence in Google searches, with representation from both English and Polish language sources. The evaluation criteria included the adherence of the presented information to official recommendations and its evidence-based character based on specific items representing dietary aspects important in pregnancy. While the overall reliability was deemed acceptable, significant variations existed both among the portals and specific evaluated items. Notably, HealthLine, Medline Plus, and NCEZ emerged as the most evidence-based, while WebMD and Medycyna Praktyczna were identified as less reliable. Despite a number of issues, the analysed portals remain valuable sources of nutritional information for pregnant women, offering user-friendly accessibility superior to alternatives such as social media, on the one hand, and scientific articles, on the other. Improved consistency and attention to detail, especially in relation to vitamin intake and supplementation, would improve the overall quality of health portals.

Keywords: pregnancy; nutrition; supplementation; health portals; evidence based medicine

1. Introduction

Pregnancy is a time in a woman's life when taking care of her (and the baby's) health becomes an exceptionally important issue. The responsibility for another human being often becomes overwhelming, while the fear of making mistakes makes pregnant women turn to specialist sources for reliable information. Such sources range from physicians and other health professionals to social media, with the notion of 'professionalism' not necessarily aligning with the actual quality of a source. Internet health portals are one of these and their accessibility is an obvious asset.

It cannot be overlooked that nowadays the Internet is the main source of medical information for the majority of people. Although General Practitioners and specialists are still considered the ultimate source, the phenomenon of Dr Google has largely made inroads into this once indisputable expertise. It should also be emphasized that a previous study performed by the authors [1] showed that medical professional largely lacks the necessary nutritional knowledge to be able to offer reliable and consistent advice in this area, also in relation to pregnancy. The quality of health-related information available on the Internet varies wildly, and although the recent years have seen some progress in both positioning of relatively reliable sources in browser searches and awareness of misinformation and harmful advice one can encounter on the Internet, it is still challenging for most people to devise strategies for coping with this issue [2], which is especially important in the case of life-changing events such as pregnancy.

Pregnant women, especially first-timers, are naturally very concerned about potential mistakes that may influence the baby's well-being. This state of mind may lead to overreliance on external information and a general approach that focuses on seeking advice in many different areas of life. The ability to employ critical thinking is an obvious issue in such situations and pregnant women may display both excessive gullibility and unhealthy scepticism when it comes to external sources of information. Ideally, any patient would be able to make use of open access articles in medical databases such as PubMed in looking for the most recent and reliable data. Obviously, such expectation is completely unattainable and even if it was, the language of scientific publications would be beyond the grasp of the average non-medical reader. Still, one can reasonably expect that pregnant women could be able to effectively use the easily available Internet health portals. It is also not too far-fetched to expect that sources of this kind should contain evidence-based, consistent data on the nutritional and supplementation-related aspects of pregnancy. As health portals occupy a relatively neutral position among Internet-based sources, i.e., they are neither sensationalist nor overly scientific, they could play a pivotal role in guiding women through the often-confusing period, provided that they contain reliable information presented in a clear and – ideally – concise manner.

As far as reliability of data is concerned, and thus also any advice based on it, it is worth noting that performing clinical studies in pregnant women is allowed only in exceptional situations. For this reason, studies whose evidence is less robust, i.e., observational and case studies, comprise the bulk of the available clinical data concerning nutrition and supplementation in pregnancy. For this reason, special attention must be paid to the robustness of the available results, so that the offered recommendations are as reliable as possible, which is the responsibility resting with policymakers such as the World Health Organization (WHO) or European Food Safety Authority (EFSA).

For the reasons specified above, the aim of this article is to review ten selected health-related Internet portals as to the reliability and consistency of their nutrition- and supplementation-related advice for pregnant women.

2. Materials and Methods

Ten leading Internet portals (seven in English and three in Polish), focused on health-related information and advice were chosen for the study. The specific portals were selected on the basis of their perceived reliability; they are also the most easily found websites of their kind in Google. Some of the portals are affiliated with renowned organizations, e.g., the Mayo Clinic or the John Hopkins Institute, and all of them are updated by professionals and semi-professionals, as opposed to journalism-based Internet websites. Another condition for the selection was the presentation of information, which had to be simple enough to be understood by the target group and displayed in a user-friendly manner. In general, the portals included in the study have been selected on the basis of their perceived reliability and comprise most of the available high-quality sources of their kind, thus constituting a representative sample.

The health portals included in the study were:

1. English-language portals: HealthLine, WebMD, NHS, Mayo Clinic, John Hopkins, Health.gov, Medline Plus;
2. Polish-language portals: 1000dni.pl, Medycyna Praktyczna, NCEZ.

The information published on the portals was analysed in the period from January to March 2024. The specific items to be analysed have been selected based on their relevance in pregnancy. Prior to browsing the portals, the authors made a list of all the important nutrients to be looked for (reflected in the tables in the "Results and discussion" section). The authors then analysed all available information concerning the aforementioned items found on the portals. Thorough searches of the websites were performed, e.g., if a given item was not discussed on pregnancy-related webpages of a given portal, its non-pregnancy-related ones, which might contain the relevant information, were browsed. The absence of data concerning a specific item was noted only after an exhaustive search of the relevant health portal had been performed.

The data was collected in a spreadsheet, grouped according to the analysed items (nutrient/ingredient/product/etc.) and collated with data available on each of the ten health portals. The contents of the portals were then compared with official recommendations issued by the relevant institutions and/or data available in peer-reviewed scientific articles. The recommendations were collected from the following sources:

1. World Health Organization (WHO);
2. European Food Safety Authority (EFSA);
3. Food and Agriculture Organization (FAO);
4. National Academy of Medicine (NAM);
5. American College of Obstetricians and Gynecologists (ACOG);
6. The German Nutrition Society (DGE);
7. Nordic Council of Ministers;
8. United States Department of Agriculture (USDA);
9. Department of Health & Human Services (HHS);
10. Health Council of the Netherlands;
11. French Food Safety Agency (AFSSA);
12. Polish Society of Gynecologists and Obstetricians (PTGiP);
13. Scientific articles from the PubMed database.

Data from scientific articles was used only if the two organizations listed above did not provide the necessary norms. The authors made sure that only the most recent norms were used.

The main purpose of the analysis of data was to decide whether Internet health portals as a whole provide reliable advice. In addition, in order to determine which individual health portals provide the most reliable and evidence-based information, the authors devised a simplified methodology consisting in giving each of the portals one point for each piece of information consistent with recommendations (it had to include dosages), and minus one point for each item that contradicted the official recommendations. The points were then summed for each portal, which would make it possible to rank the portals according to reliability of data. However, as the nature of the presented data and the very general character of some of the recommendations was not conducive to a clear-cut point-based analysis, the authors decided only to indicate those health portals that scored highest and lowest, without actually ranking them.

3. Results and Discussion

3.1. Generally Accepted Views

Some products are consistently contraindicated in pregnant women, both in official recommendations and by the analysed health portals. These include addictive substances such as cigarettes and alcohol [3, 4]. In this respect, information on all medical portals is in agreement with recommendations stating that these products should be completely avoided during pregnancy due to their obvious and well-documented health risks.

Another area of agreement are foodborne pathogens. The danger of microbial contamination pertains as much to pregnancy, as it does to the rest of society, it is therefore necessary to choose food products with due care to minimise the risk of infection and avoid the associated negative health effects. Among the products most commonly advised against for this reason are raw milk and other dairy products, meat (especially deli meats), eggs, fish (e.g., sushi) and seafood, salads (especially deli salads), refrigerated pâté and meat spreads, sprouts, and soft cheeses (although in Poland cheeses are produced mostly from pasteurized milk). In general, health portals agree that raw/undercooked and/or unpasteurized products should not be consumed during pregnancy.

While caffeine has traditionally been a topic of disagreement as to its health-related benefits or harms, there is in fact a greater scientific consensus in the area than the controversy would suggest. Fortunately, the analysed portals reflect the consensus. The safety assessment of caffeine published

by Health Canada in 2003 is one of the most often cited source in peer-reviewed literature [5], recommending the dose not associated with adverse effects in healthy pregnant women, i.e., 300 mg/day. The same dose has been adopted in the WHO recommendations [6]. The European Food Safety Authority issued a more conservative recommendation in 2021 which stated that regular consumption of up to 200 mg of caffeine a day by pregnant and breastfeeding women can be considered safe [7]. Nine out of the ten analysed portals adhere to the findings of either of the aforementioned sources, with most of them recommending the lower limit. The only exception is Medycyna Praktyczna, which recommends that pregnant women should avoid coffee altogether. It should also be noted that products other than coffee, such as black tea or chocolate, are also rich in caffeine and their consumption may lead to an accidental increase of daily caffeine intake.

In addition to the accurate intake recommendations, the fact that the portals do not recognize coffee merely as a disposable stimulant, but rather as a valid part of diet must be seen as a positive. Still, more detailed information on those products that contain caffeine would provide a broader perspective on the topic and increase nutritional awareness among pregnant women, especially when considering that the unit of coffee consumption used by the portals is usually 'a cup'. This may be unintentionally misleading unless a clear distinction between, e.g., espresso and black tea is made in terms of their caffeine content.

Adequate fluid intake is another key aspect of a pregnant woman's diet. According to EFSA, the total water intake in pregnancy should be 2300 ml/day [8]. However, data concerning the recommended water intake varies [9] and the available information is limited [10]. Similarly to the aforementioned situation, i.e., coffee not being the only product contributing to caffeine intake, it must be remembered that in the case of fluid intake in general, popular drinks such as coffee, tea, juices, drinks, and milk – as well as fruit and vegetables – also contribute to the overall fluid balance. This needs to be remembered in light of the fact that advice concerning fluid-rich products usually focuses on their other beneficial properties and thus the overall fluid intake may be in fact exceeded.

Fluid intake seems to be the most basic aspect of nutrition in general, and in pregnancy in particular. Yet, although "drink plenty of fluid" is indeed the advice consistently repeated on the analysed portals, fluid intake is not in fact subject to specific WHO recommendations. Granted, specific doses may not be as important in this case as a general emphasis on proper hydration; however, in the authors' opinion, specific WHO norms could hardly be regarded as detrimental, offering a concrete point of reference. Fortunately, EFSA fills this gap. Generally speaking, fluid intake is agreed to be crucial during pregnancy, as reflected in the data available on the analysed health portals. The recommendations concerning fluid and caffeine intake in pregnancy are presented in Table 1.

Table 1. Comparison between recommendations for pregnant women and information provided by the analysed portals concerning caffeine and fluid intake.

	Recommen ndations	Health Line	WebM D	NHS	Mayo Clinic	John Hopkin s	Health.g ov	Medlin e Plus	1000dni .pl	Medy cyna Prakt yczna	NC EZ
Caff eine	<300 mg/day [6]	<200 mg/day	<300 mg/day	<200 mg/d ay	<200 mg/day	<200 mg/day	General recomm endation to limit intake	<200 mg/day	300 mg/day	Caffe ine to be avoid ed	200 - 300 mg/ day

Fluid intake	2300 ml/day [8]	Recommended	Recommended	Not recommended	Recommended	Recommended	Plain water recommended	Recommended	Recommended	1-2.5 l/day (still, mineral, low sodium water)	>2 l/day (marginally still water)
)	

Most portals are also in agreement as to their advice against extreme (i.e., deficient, one-sided) diets in pregnancy. This is the correct approach as pregnant women are a special group in which the need for most nutrients is significantly increased. To ensure the proper development of the foetus, the diet should be as varied as possible and rich in all kinds of vitamins and minerals, which is impossible in the case of the popular extreme dieting regimens, e.g., keto or paleo.

Another area of general agreement throughout the analysed portals are those specific foods that universally described as excellent sources of nutrients. One such product are whole grains, presented as rich sources of proteins, carbohydrates, or iron, with the specific focus varying on different portals. Other widely recommended foods include legumes (e.g., beans or peas), cereal, rice, nuts, or pasta. It must be noted, though, that the analysed health portals are often inconsistent in their approach to data presentation. For instance, some of them focus on providing advice on the amounts, or portions, of various foods to be consumed during pregnancy. In contrast, others give examples of products to be consumed when mentioning a particular nutrient. Still other portals prioritize supplementation, as opposed to a balanced diet, whatever particular diet a woman decides to adhere to. In the latter case, most portals display a pronounced focus on precision, reflected in providing specific doses. A minor concern must be mentioned concerning USA-based portals – they tend to provide data in Imperial Units such as pounds or ounces, which is an obvious hindrance for non-American users.

3.2. Macronutrients

Due to the need to maintain maternal metabolism and tissue growth, and to support foetal growth and development, the demand for nutrients increases during pregnancy [11]. Inadequate intake or deficiencies of key macro- and micronutrients can therefore have a significant impact on pregnancy outcomes and neonatal health.

It is a well-established fact that protein demand increases during pregnancy. Although all of the analysed health portals agree, the recommended amounts of protein intake are provided in two different manners – if at all. Some of the portals quote the total amount of protein to be consumed per day, expressed in grams/day, while others provide information on the recommended amount of protein intake, expressed in grams per kilogram of body weight / day. Given the substantial individual differences in body weight among pregnant women, it seems that the more adequate way to provide the recommended amount of dietary protein intake would be the latter. This would make it easier for pregnant women to estimate their individual protein needs.

Half of the portals, i.e., Medline Plus, Health.gov, John Hopkins, NHS, and WebMD, only report the need for an increased daily protein intake during pregnancy, without giving any specific data. Medycyna Praktyczna, 1000dni.pl, and Mayo Clinic, on the other hand, report the range of recommended protein intake for pregnant women, i.e., from 54 to 96 g/day. Only NCEZ and HealthLine give recommendations for protein intake in terms of g/kg of body weight. Still, there is a slight difference between the data presented on the two portals as HealthLine's recommendation is 1.1 g/kg body weight, while NCEZ's recommendation is 1.2 g/kg body weight.

Scientific recommendations in this area are also inconclusive. The recommendations on protein requirements in pregnant women issued in 2005 by the Institute of Medicine (IOM) state that the EAR (Estimated Average Requirement) in pregnancy is 0.66g/kg bw/day in the first trimester. In the second and third trimesters, protein intake increases by an average of 21 g/day, resulting in an EAR of 0.88 g/kg bw/day. In contrast, the RDA (Dietary Reference Intake) is 0.8 g/kg bw/day in the first trimester and 1.1 g/kg bw/day in the second and third trimesters [12]. In 2001, EFSA identified protein needs of 1, 9, and 28 g/day in the respective trimesters of pregnancy [13]. The latest recommendations, issued in 2019 by D-A-CH (the nutrition societies of Germany, Austria, and Switzerland), set the requirements for protein intake at 0.8, 0.9, and 1.0 g/kg bw/day during the first, second, and third trimesters, respectively [14].

With regard to fat intake recommendations, there is no consensus among the portals. John Hopkins simply states that fats should be kept to a minimum. Health.gov recommends eating low-fat products, while the NHS recommends limiting fatty products. The WebMD recommends consuming fats at 30% or less of the daily requirement; the 1000dni.pl recommends consuming fats between 30-35% of the daily requirement; while the NCEZ gives recommendations in the form of recommended increases in the amount of fat, given in grams for a specific trimester, i.e., +8-14 g/day in the second trimester and +11-18 g/day in the third trimester. The other portals do not specify the recommended fat intake for pregnant women.

Official recommendations set by WHO do not specify the total fat intake in pregnancy. EFSA, on the other hand, indicates that fat supply during pregnancy may comprise 35% of the total energy intake [15]. This data is also reflected in the information provided by WebMD and 1000dni.pl.

An important issue that needs to be addressed in the context of fats are omega-3 polyunsaturated fatty acids (PUFAs). In the context of the human body, the most important omega-3 PUFAs are those sourced from fatty fish, i.e., long-chain omega-3 (LCn3) acids, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), and plants, i.e., alpha-linolenic acid (ALA) [16]. Health portals give fatty fish, nuts, seeds, or avocado as sources of healthy fats, which is the correct advice.

On the other hand, the analysed portals only mention EPA and DHA acids, omitting the topic of ALA acids altogether even though they are also an omega-3 fatty acid. EPA and DHA acids are extremely important components in the context of pregnancy [17, 18] and their only source in food are fatty fish and seafood. The John Hopkins portal lists nuts as a source of omega-3 acids, which contains a significant understatement, as nuts are a source of ALA acid only; they do not contain EPA or DHA acids.

Only the Polish portals provide the recommended intake of DHA. 1000dni.pl recommends consuming at least 200 mg of DHA per day, more if fish consumption is insufficient, and 1000 mg/day of DHA in case of increased risk of premature birth. Medycyna Praktyczna recommends consuming 600 mg/day from the 20th week of pregnancy and 1000 mg/day in case of increased risk of premature birth. On the other hand, NCEZ recommends consuming 200 mg/day of DHA and 1000 mg/day of DHA in case of increased risk of premature birth throughout the entire pregnancy.

In general, information concerning omega-3 acids presented by the analysed health portals largely lack consistence. As mentioned, only the Polish portals provide specific dosages, whereas the English-language portals only offer generic information on the sources of omega-3 acids, with example products differing between portals. Moreover, Mayo Clinic and – to some extent – Medline Plus recommend omega-3 supplementation only in case of deficiency, which is not strictly accurate. It is also worth noting that while the health portals make mention of fish oil, explicitly or implicitly, in relation to omega-3 supplementation, they fail to provide meaningful details, with recommendations ranging from inconclusive, through overly cautious, to very general, i.e., in the form of statements on the benefits of fish consumption.

Recommendations from 2007, developed through a collaboration between several scientific societies, state that fat consumption during pregnancy should align with recommendations for the general population. Moreover, pregnant women should aim to consume an additional 200 mg/day of DHA, e.g., in the form of oily sea fish once a week [19]. Most recommendations for pregnant women relate to the consumption of specific types of fats, such as trans fats or omega-3 fatty acids; however,

there is a lack of more comprehensive recommendations that would provide information regarding overall fat intake during pregnancy. These may be due to the fact that the fat requirement in pregnancy does not increase significantly and is similar to that of adults. However, clear recommendations would constitute a better reference for the development of recommendations for pregnant women, which would in turn facilitate women's access to reliable information.

Other FAO recommendations from 2010 suggest consuming 300 mg/day of EPA+DHA, of which 200 mg/day should be DHA [20]. On the other hand, EFSA recommendations from 2010 advise an additional 100-200 mg/day of DHA and over 250 mg/day of EPA+DHA [21]. Additionally, the World Association of Perinatal Medicine recommends 200 mg/day of DHA [19]. Recommendations also state that consuming long-lived predatory fish, which contain contaminants such as methylmercury and/or organic toxins, should be avoided [11]. Consumption of plant-derived alpha-linolenic acid is not recommended because humans poorly convert the omega-3 fatty acid into EPA and are unable to convert EPA into DHA in sufficient amounts [11].

In addition to PUFAs, evidence-based recommendations concerning saturated fatty acids and trans fatty acids are an important issue. Unfortunately, none of the analysed health portals referred to the recommended intake of saturated and trans fatty acids during pregnancy. Most drug societies recommend limiting the intake of saturated fatty acids to 10% [22, 23, 24] and trans fatty acids to 1% of daily energy requirements or as low as possible [22, 24, 15]. These recommendations apply to adults generally – there are no specific recommendations for pregnant women.

Although the analysed health portals pay considerable attention to fish and seafood – not only in relation to omega-3 acids – the advice they give is often both inconsistent and impractical. Due to their high nutritional value – especially in terms of macronutrients, particularly polyunsaturated fatty acids, including omega-3 acids – consumption of seafood is generally recommended. Considering this, the health portals generally recommend fish and seafood as products appropriate for pregnant women, if not consumed raw or undercooked, yet precise advice on which species it is safe or unsafe to consume varies. For example, the portals recommend avoiding products such as high-mercury seafood and fish, raw fish, or cold smoked fish, which is consistent with the scientific consensus, but some portals discourage the consumption of all smoked fish, which is an overgeneralization.

Mercury content is a problematic issue as far as the analysed portals are concerned. Nine out of ten (all except John Hopkins) advise against consuming high-mercury seafood and fish, yet only one (Mayo Clinic) proposes a useful heuristic, i.e., the bigger and older the fish, the more mercury it may contain. Such practical approach enables the consumer to actually distinguish between high- and low-mercury fish and seafood, which would otherwise remain a very unclear and impractical distinction. Moreover, two other portals (HealthLine and WebMD) provide examples of high-mercury fish, but none of high-mercury seafood. When low-mercury fish and seafood are described specifically, more examples are given of both, but despite the general consensus, i.e., a positive recommendation for their consumption, the details do not always align. For example, while WebMD classifies farmed salmon as a high-mercury fish, 1000dni.pl places it in the low-mercury category. Similarly, while 1000dni.pl recommends shrimp, NCEZ advises pregnant women to avoid it.

In terms of carbohydrates, the majority of the analysed portals do not provide precise information regarding the proportion of carbohydrates that would cover the needs of pregnant women. An important consideration in this context is that carbohydrates are always complementary to fats and proteins. It does not seem reasonable, however, to expect most women to be aware of this fact. For this reason, including information about this relationship on health portals would certainly prove beneficial and practical. Regarding food sources, the portals are rather consistent, recommending that the intake of simple sugars and highly processed products should be limited.

As far as recommendations issued by scientific societies are concerned, no specific guidelines regarding carbohydrate intake among pregnant women are given. However, in the case of recommendations for the entire adult population, according to the Nordic Nutrition Recommendations, carbohydrates (including energy obtained from dietary fibre) should comprise 50 to 60% of the total energy intake, while the intake of refined, added sugars should not exceed 10 E%

[23]. In addition, the Netherlands Health Council recommends an intake of 272 to 282 grams of carbohydrates per day, which is equivalent to approx. 40 E% [25]. In contrast, the German-Austrian-Swiss recommendations (D-A-CH, 2008) specify the level of carbohydrate intake at no less than 50 E% [22].

It would be useful to include information on the percentage of energy that should be provided by carbohydrates in the relevant recommendations, as exemplified by the recommendations quoted above. To make it easier for pregnant women to follow the advice and to understand the principles of healthy nutrition, such information should be included on health portals even if carbohydrates were to be obtained in the form of dietary supplements.

Another very important aspect regarding carbohydrates is dietary fibre. Unfortunately, none of the analysed health portal provides the recommended amounts of fibre to be consumed in pregnancy. There are also no official recommendations regarding dietary fibre intake for pregnant women. However, most scientific societies agree that the fibre content in the diet of adult women should be around 25-35 g/day [12, 23, 24, 26]. More concerning is the lack of WHO norms for pregnant women concerning macronutrients, including carbohydrates and fibre, as these are provided only for the general population. Such omissions are reflected in the data available on the analysed health portals as their advice is often vague and sometimes inconsistent. In the case of fibre, any mention is largely absent from the portals. Recommendations concerning macronutrients in pregnancy are presented in Table 2.

Table 2. Comparison between recommendations for pregnant women and information provided by the analysed portals concerning selected macronutrients.

	Recom mendat ions	Health Line	WebM D	NHS	Mayo Clinic	John Hopki ns	Health .gov	Medli ne Plus	1000 dni. pl	Medyc yna Prakty czna	NCE Z
Protei ns	0.8 g/kg bw/day in the first trimeste r; 1.1 g/kg bw/day [12] Additio nal protein needs of 1, 9, and 28 g/day [13] 0.8, 0.9, and 1.0	Increas ed to 1.1 g/kg	Genera l recom menda tion	Genera l recom menda tion	71 g/day	Genera l recom menda tion	Genera l recom menda tion	Genera l recom menda tion	54- 96 mg/ day	54-96 mg/da y	1.2 g/kg bw

	g/kg bw/day [14]										
Fats	Up to 35 E% of total dietary intake [21]	General 1 recom menda tion	Less than 30 E% recom menda tion	Limited consumption recom menda tion	General 1 recom menda tion	Limited consumption recom menda tion	Low-fat foods recom menda tion	General 1 recom menda tion	30-35 E% recom menda tion	General 1 recom menda tion	2nd trim ester : 8- 14 g/day; 3rd trim ester : 11- 18 g/day
Omega-3 fatty acids (DHA, EPA)	EPA + DHA: 300 mg/day [20] DHA: 100-200 mg/day; EPA + DHA: >250 mg/day [20] DHA: 200 mg/day [19]	General 1 recom menda tion	General 1 recom menda tion	General 1 recom menda tion	Recommended if deficient	General 1 recom menda tion	Not mentioned	Inconclusive	DHA: >200 mg/day; more if not pregnancy; fish consumption if d; if increased ease d risk: 1000 mg/day	DHA: 600 mg/day from the 20th week of pregnancy; 1000 mg if risk of premature birth, through pregnancy	DHA: 200 mg/day or 1000 mg/day; risk of premature birth, through pregnancy nancy

Carbo	No	Genera	Genera	Genera	Not	Keep	No	Genera	45-	Genera	>175
hydra	specific	l	l	l	mentio	to	specific	l	65	l	g/da
tes	informa	recom	recom	recom	ned	minim	data	recom	E%	recom	y;
	tion	menda	menda	menda		um		menda		menda	45-
		tion	tion	tion				tion		tion	60
											E%

3.3. Supplementation: Microelements and Herbs

The concept of supplementation is closely connected with the overreaching aim of pregnant women to focus on their health and do whatever is necessary to make sure the baby will thrive. For this reason, using dietary supplements is seen as a desirable activity – one that doubtlessly leads to the improvement of wellbeing. This often results in the following overgeneralization: any supplementation is beneficial. This reasoning is obviously fallacious, and even more so in the case of pregnant women. While suboptimal micronutrient intake during pregnancy can lead to maternal nutrient deficiencies, associated with poorer pregnancy outcomes and adverse foetal outcomes, such as poor foetal growth, preterm birth, decreased infant survival, and increased risk of chronic diseases later in life [27, 28, 29, 30], supplementation during pregnancy must be careful and based on actual recommendations.

The analysed health portals pay much attention to micronutrient supplementation, with varying levels of accuracy and consistency. Interestingly, almost none of the micronutrients is subject to stringent norms or recommendations, issued by WHO or other relevant organizations, with the notable exceptions of iron and calcium. The primary focus of research concerning micronutrient deficiencies during pregnancy is overwhelmingly on folate and vitamin D. Researchers corroborate this, also adding that deficiencies in iron, iodine, and zinc frequently escape adequate attention, despite their substantial repercussions on public health, while calcium, fluorine, selenium, and magnesium incur the most significant health-related expenses [31]. However, scientific studies rectify this gap to a certain extent by providing some relevant data [6, 31,32], reflected in recommendations presented on some of the analysed portals.

Iron is a micronutrient essential for the process of tissue respiration, red blood cell formation, DNA synthesis, and regulation of the immune system function. Iron deficiency leads to anaemia, immune disorders, poor concentration, and cardiac arrhythmias. During pregnancy, anaemia increases the risk of premature labour and low birth weight [33]. Calcium, on the other hand, is involved in neuromuscular conduction, blood clotting, and regulation of the heart and blood vessels. Calcium deficiency causes increased excitability of the body, tetany, blood clotting disorders, and may also lead to increased blood pressure [34, 35]. As far as iron and calcium are concerned, it can be noted that the analysed health portals generally recommend doses that are slightly below the WHO norms. This could be explained by the fact that the recommendations emphasize the fact that supplementation is necessary mainly in instances of deficiencies. In this context, the conservative approach does seem relevant. Even those portals that do not provide exact doses for iron and calcium recommend their supplementation, with the exception of Medycyna Praktyczna, which advises against calcium supplementation.

In the cases of zinc and magnesium, the health portals offer three types of information. These include providing general advice to supplement the mineral or pointing out its increased demand during pregnancy (4 portals); the same advice but with exact doses given (2 portals); or no specific mention of the microelement in the context of pregnancy (4 portals). Magnesium is involved in neuromuscular conduction, thermoregulation, blood pressure regulation, and bone mineral metabolism. Its deficiency in pregnant women most often manifests as muscle cramps [36]. All dosages given for magnesium on the analysed portals are consistent with recommendations – even if they do not match the recommended doses exactly. In the case of zinc, for which there are no clear recommendations, WebMD and Medline Plus do nevertheless give specifics, i.e., 11 mg/day (as part

of prenatal supplements) and <34-40 mg/day, respectively. It is impossible, however to ascertain the sources of such data and thus its reliability. In general, it can be concluded that the advice found on health portals for zinc and magnesium is inconsistent, but fortunately, not harmful.

In the case of potassium, four portals view its supplementation as beneficial, another four do not mention it at all, while the rest advise against potassium in pregnancy supplementation beyond normal needs. As no official recommendations for the mineral exist, it is difficult to find such imprecise and inconsistent information reliable. The situation is similar with selenium. Some sources [32] suggest that the dosage determined for the general population, i.e., 45-75 µg/day, applies to pregnant women as well, which is indeed reflected on HealthLine, WebMD, and Medline Plus, albeit with some level of tolerance. In addition, Medycyna Praktyczna mentions an increased demand of the element, in contrast with 1000dni.pl, which states otherwise. None of the other portals makes a mention of selenium in the context of pregnancy.

Iodine is an element essential for proper thyroid function. An insufficient supply of iodine in a pregnant woman's diet can lead to the formation of thyroid goitre in the mother and mental underdevelopment in the child [33, 37]. Out of the analysed microelements, iodine is the one which is described the most accurately by the analysed portals, the majority of which (six out of ten) provide recommendations falling closely within the recommended dose range of <220 µg/day. Three other portals recommend iodine supplementation without providing specific doses, while John Hopkins advises pregnant women not to supplement iodine.

While it is true that scientific sources fail to provide consistent data concerning the demand and/or supplementation needs of microelements during pregnancy – as reflected in the imprecise data available on the portals – more concerning are the omissions of certain microelements as part of the advice and the lack of clarity concerning the sources used for some of the specific data. On the other hand, it is worth emphasizing that the former problem may be due to a certain amount of caution on the part of the content creators, who try to avoid inaccuracies and prefer to err on the side of caution. Still, although the information concerning microelements provided by the analysed portals can hardly be regarded as potentially harmful, more openness in cases when scientific consensus is tentative or non-existent could be helpful.

A concerning aspect of pregnancy-related supplementation is advice concerning herbs. It is a common phenomenon, not only in the public perception but also among some medical practitioners, to perceive herbs as a safe alternative to pharmaceutical drugs [1]. This is obviously fallacious reasoning, as the differing potencies of substances are not a consequence of their origin (i.e., a plant or a laboratory). This leads to pregnant women who wish to avoid medicines altogether to turn to a safer – in their estimation – alternative, i.e., herbs. Fortunately, the analysed health portals generally recommend caution when it comes to the consumption of herbs, yet some of them make the proviso that 'safe' herbs can be consumed, seemingly disregarding the fact that scientific evidence on the safety of herbs, especially concerning pregnancy, is extremely scarce. For example, Medycyna Praktyczna informs that herbal teas made from those herbs that are safe can be drunk during pregnancy. Yet, as concrete data on the safety of particular herbs may be unavailable, it is virtually impossible to apply this seemingly sound advice in practice.

One of the herbs that is commonly advised against is black cohosh (*Cimifuga racemose*) used in supplements alleviating the symptoms of menopause [38]. Indeed, the plant has been known for its labour-inducing properties, increasing the risk of miscarriage [39]. A related plant, i.e., blue cohosh (*Caulophyllum thalictroides*) has similar properties, in addition to a number of potentially lethal effects such as perinatal stroke, acute myocardial infarction, profound congestive heart failure and shock, and severe multi-organ hypoxic injury [40]. Scientific data concerning other herbs is exceptionally limited, especially considering their potential practical applications. As far as certain popular herbs used in supplements and as spices are concerned – data concerning ginseng is conflicting [41], while goldenseal and yarrow have been studied as part as a single pre-clinical trial, with yarrow proven to cause reduced foetal and placental mass [42]. Mugwort (*Artemisia Vulgaris*) [43] has been the subject of a meta-analysis, yet the study's methodology is not robust enough to consider the results reliable [43]. In addition, ginkgo balboa has been found to induce perinatal bleeding due to its antithrombotic

properties [44]. Linseed oil, on the other hand, has not been found to possess harmful properties. Wormwood (*Artemisia absinthium*) has not been tested in any scientific studies.

Interestingly, an herb often ingested as a measure to counteract nausea and vomiting, i.e., ginger, has indeed been found to be a safe and effective remedy in scientific studies [45, 46]. A study performed by Boltman-Binkowski [45] showed that pregnant mothers who refrained from consuming ginger did not exhibit a notably higher incidence of congenital abnormalities compared to those in the group who consumed ginger. Despite the scientific evidence and the popularity of ginger as a spice, only half of the analysed portals recommend its use, with a further one (Medline Plus) advising caution. In addition, WebMD provides a recommended dose, i.e., 350 mg four times a day. Such precise data, however, seems cherry-picked, as various studies tested differing doses, which are indeed roughly in the quoted area [46], but no single dose has been indicated as the most accurate. In general, the example of ginger reflects the general lack of consistency of recommendations as far as herbs are concerned.

In general, herbs and herbal supplements need much more attention from health portals than they currently receive. Generally speaking, the haphazard information the portals provide seems to reflect the lack of research concerning herbal supplementation during pregnancy. Obviously, prospective studies of this kind would raise numerous ethical concerns, yet due to the fact that herbs themselves (e.g., spices) and herbal supplements are consumed widely and without much concern for their safety on the part of their users, pregnancy-related retrospective studies would provide the much-needed insight into the problem. As of the time of the writing of this article, pregnant women cannot expect to be given any useful advice concerning the herbs.

Overall, considering the huge number of herbs available as both dietary supplements and spices, the lack of evidence on their impact on pregnancy is troubling, with only two portals (HealthLine and Mayo Clinic) specifically mentioning lack of research in the area as the reason for vague or inexistent recommendations. Still, the fact that health portals adopt a mostly very cautious approach to the consumption of herbs during pregnancy must be seen as positive. Recommendations concerning the supplementation of micronutrients and herbs in pregnancy are presented in Table 3.

Table 3. Comparison between recommendations for pregnant women and information provided by the analysed portals concerning supplementation of micronutrients and herbs.

	Recom mendat ions	Health Line	WebM D	NHS	Mayo Clinic	John Hopki ns	Health .gov	Medli ne Plus	1000dn i.pl	Medyc yna Prakty czna	NCEZ
Iron	30-60 mg/day [6] (iron is not include d in Polish recomm endatio ns)	27 mg/da y	27 mg/da y	Genera l recom menda tion	27 mg/da y	Genera l recom mendat ion	Genera l recom menda tion	27 mg/da y	<30 mg/da y	Genera l recom menda tion	Genera l recom menda tion

Calcium	1500-2000 mg/day (in populations with low dietary calcium intake) [6, 31]	General recommendation	1000-1300 mg/day	General recommendation	1000-1300 mg/day	1000-1300 mg/day	General recommendation	1000-1300 mg/day	1200 mg/day	No recommendation	General recommendation
Zinc	Supplementation only in case of deficiencies [6]	General recommendation	11 mg/day	No specific information	General recommendation	No specific information	No specific information	<34-40 mg/day	No recommendation	General recommendation	General recommendation
Magnesium	360-400 mg/day [31]	General recommendation	General recommendation	No specific information	No specific information	No specific information	Not mentioned	350-400 mg/day	200-1000 mg/day	Increased demand	Increased demand
Potassium	No specific information	General recommendation	General recommendation	No specific information	No specific information	General recommendation	General recommendation	No recommendation	No specific information	No specific information	No increased demand
Iodine	<220 µg/day [31]	220 µg/day	220 µg/day (safe limit: 1100 µg/day)	General recommendation	General recommendation	Recommendation to avoid	General recommendation	220 µg/day	150-200 µg/day	150 µg/day	150-200 µg/day

Sele niu m	45-75 $\mu\text{g}/\text{day}$ (varies accordi ng to numero us factors; no specific recomm endatio n for pregnan t women) [32]	<70 $\mu\text{g}/\text{day}$	60-100 $\mu\text{g}/\text{day}$	No specifi c inform ation	No specifi c inform ation	No specific inform ation	Not mentio ned	60 $\mu\text{g}/\text{day}$	No extra supple mentat ion needed	Increas ed deman d	Not mentio ned
Herb s	No specific informa tion	Avoid (lack of researc h)	Small doses safe	If deficie nt (?)	Not enoug h scientif ic data; herbal tea not allowe d	Not mentio ned	Not mentio ned	Cautio n recom mende d	Herbal tea allowe d	Avoid	Not mentio ned

3.4. Vitamins

In terms of vitamin supplementation, few are subject to WHO or other organizations' standards. The only two officially recommended vitamins for supplementation are folic acid and vitamin D.

All the analysed portals' recommendations follow the WHO guidelines [6]. This means that in the case of folic acid, supplementation with 400 $\mu\text{g}/\text{day}$ is consistently recommended, starting before pregnancy. However, portals such as HealthLine, WebMD, and MedlinePlus recommend that pregnant women should take up to 600 $\mu\text{g}/\text{day}$ of folic acid. This does not follow from the WHO recommendations; however, EFSA does indeed state that the Adequate Intake (AI) of folic acid for pregnant women is 600 $\mu\text{g}/\text{day}$ [47]. The Polish portals, namely Medycyna Praktyczna, NCEZ, and 1000dni.pl, provide in their recommendations dosages that vary according to the risk of neural tube defects (NTDs). They recommend 800 $\mu\text{g}/\text{day}$ of folic acid in the case of a moderate risk of neural tube defects and 4-5mg/day in the case of a high risk. This data is supported by a 1991 study, whose results showed that a dose of 4000 μg of supplemental folic acid significantly reduced the incidence of births with neural tube defects [48].

Probably the most unexpected problem occurs in the case of B complex vitamins. In spite of the fact that the norms for B complex vitamins are widely-accepted and easy to find, no portals apart from WebMD use the data in their recommendations. The other portals only gave general recommendations to supplement them, without providing and specific data, i.e., dosages. In the case of foods rich in these vitamins, recommended for consumption in pregnancy, most health portals only specify a general pool of foods rich in B vitamins; only the aforementioned WebMD list foods

rich in specific B vitamins and gives values for B vitamins similar to the EFSA recommendations [47]. When taking into consideration the easy access to recommendations concerning the B vitamin complex, this situation is rather curious. In the case of English-language portals, this could be explained by their focus on ready-made OTC vitamin supplements available from pharmacies, i.e., a belief may be prevailing that the doses they contain are consistent with the recommended ones. However, all the analysed Polish-language portals also have the same issue, and as they do not focus on bulk supplementation, there must be additional causes of such an approach. Whatever the reason, the authors feel that such information should be updated with specific numbers based on the latest evidence and recommendations.

Choline is a nutrient essential for the proper functioning of the human body. Preclinical studies have shown that high choline intake during pregnancy or the perinatal period has neuroprotective effects on the foetus [49, 50, 51]. Yet, most health portals only provide general recommendations for choline intake. No recommended doses are given. In contrast, the NHS portal does not mention choline at all in the context of the diet of pregnant women. The only portal that provides recommendations for choline requirements in pregnant women is HealthLine, with the recommended intake quoted as 450-930 mg/day, compared to the 480 mg/day recommended by EFSA [47]. Its extra-diet supplementation is not advised. The dietary sources of choline recommended by the different health portals are consistent with each other.

Vitamin C is a nutrient that is widely distributed in food. Although its demand during pregnancy does increase, up to 105 mg/day [47], additional supplementation is not recommended. Yet, only two health portals, i.e., Medline Plus and 1000dni.pl, mention this fact. Another portal, WebMD, states that the demand for vitamin C is 80-85 mg/day for pregnant women, which agrees with the recommendations issued by EFSA concerning the level of Vitamin C in the diet that meets the daily requirements of half of the people in a typical healthy population, i.e., the average requirement (AR).

Vitamin A intake is a crucial issue as far as dangers in pregnancy are concerned. Health portals should mention the dangers of excessive vitamin A consumption and its effects on the development of foetal defects more frequently and unambiguously. The requirement has been set by EFSA at 700 µg RE/day [47], with additional supplementation not recommended except in areas of widespread vitamin A deficiency [6]. Only the WebMD portal provides accurate recommendations for vitamin A intake during pregnancy, consistent with the EFSA guidelines. Importantly, it also includes information that vitamin A supplementation is not recommended for pregnant women, as does HealthLine. NCEZ and Medline Plus also warn against excessive vitamin A intake, mentioning that it can cause foetal defects, as confirmed both by WHO and in scientific studies [52, 53, 54]. Other portals provide only general recommendations, without specific data. However, a list of specific foods rich in vitamin A, to be avoided or at least consumed in moderation, would be a very beneficial piece of information for pregnant women.

Vitamin D is one of the two vitamins widely recommended for supplementation during pregnancy. Compared to the clarity of advice in the case of folic acid, the situation with vitamin D is more complicated. The WHO recommends supplementation only in cases of confirmed deficiency, while the requirement set by EFSA is 600 IU/day (15 µg/day). Furthermore, the WHO recommends vitamin D supplementation for pregnant women at 200 IU/day (5 µg/day) in cases of vitamin D insufficiency [6]. Most portals, however, recommend vitamin D supplementation at 600 IU/day. NHS recommends vitamin D supplementation of 400 IU/d from September to March, due to the reduced solar radiation during these months, which is associated with reduced vitamin D synthesis. The Polish portals, i.e., 1000dni.pl, Medycyna Praktyczna, and NCEZ, recommend vitamin D supplementation at much higher doses of 1500-2000 IU/day, with the dose increased to 4000 IU/day in cases of obesity. Although much different from the international recommendations, the data provided by the Polish portals is in fact consistent with the recommendations of the Polish Society of Gynecologists and Obstetricians [55]. This wide discrepancy in recommendations between international and Polish bodies is rather puzzling and it would be interesting to know the reasons, as they are unclear.

According to the WHO and EFSA, the requirement for vitamin E during pregnancy is 11 mg/day [6, 47]. Only WebMD indicates the need for this ingredient, yet the recommended amount differs slightly from the official recommendations of 13 mg/day. Only three portals, i.e., HealthLine, Medline Plus, and 1000dni.pl, report that regular vitamin E supplementation is not recommended. The other portals only give general or vague recommendations.

In the case of vitamin K, the requirement for pregnant women set by EFSA is 70 µg/day [47], i.e., the same as for the general adult population. As for the analysed health portals, the information they provide on vitamin K is very general. WebMD, MayoClinic, and JohnHopkins report that regular vitamin K supplementation is not recommended during pregnancy, while the others make very general recommendations or do not mention vitamin K in the context of pregnancy at all.

Due to the relatively large focus of the analysed portals on OTC multivitamin supplements, the authors treated them a separate issue. Although the WHO only recommends multivitamin supplementation for pregnant women in middle-income countries [56], all English-language portals recommend supplementation with OTC multivitamin preparations. In contrast, two Polish portals, i.e., 1000dni.pl and NCEZ, advise against supplementation with such preparations, while Medycyna Praktyczna has no clear recommendations on this issue. In general, it can be concluded that this issue has more in common with the easy availability of pre-prepared supplements in pharmacies than with their actual contents and their consistency with recommendations, with the analysed portals acting on the principle that officially approved products must be relatively well-prepared. This heuristic does not seem unreasonable, yet the authors feel that such ready-made solutions should be approached with a certain amount of caution, especially if they are not classified as medicinal products. Recommendations concerning the supplementation of vitamins in pregnancy are presented in Table 4. The data concerning multivitamin supplements, vitamins D and A, and folic acid concern the supplementation of these nutrients; in all the other cases the data concerns demand.

Table 4. Comparison between recommendations for pregnant women and information provided by the analysed portals concerning vitamins.

	Recommen dations	Health Line	WebM D	NHS	Mayo Clinic	John Hopki ns	Health .gov	Medli ne Plus	1000dn i.pl	Medyc yna Prakty czna	NCEZ
Folic acid	400 µg/day (supplement ation; recommend ed start before pregnancy) [6]	400 (dose recom mende d for all wome n of childbe aring age)- 600 µg/day	400 (dose recom mende d for all wome n of childbe aring age)- 600 µg/day	>400 µg/day	400 µg/day (recom mende d start before pregna ncy); 600- 1000 µg/day	400 µg/day	400- 800 µg/day (recom mende d start before pregna ncy)	400 recom mende d for all wome n of childbe aring age)- 600 µg/day	400- 800 µg/day	400 µg/day	400 (dose recom mende d for all wome n of childbe aring age)- 800 µg/day

<p>Vitamin BX</p>	<p>B1: 0.4 mg/1000 kcal (the same as for the whole population) [47] B2: 1.9 mg/day [47] B3: 6.6 mg/1000 kcal (the same as for the whole population) [47] B5: 5 mg/day (the same as for the whole population) [47] B6: 1.8 mg/day [47] B7: 40 µg/day (the same as for all adults) [47] B12: 4.5 µg/day [47]</p>	<p>General recommendation</p>	<p>Vitamins B1 and B2: 1.4 mg/day; vitamin B3: 18 mg/day; vitamin B12: 2.6 µg/day; vitamins B5, B6, B7, B12: 1.9 mg/day (all doses based on prenatal vitamin supplements)</p>	<p>General recommendation</p>	<p>General recommendation</p>	<p>Sceptical toward vitamin supplementation in general</p>	<p>General recommendation</p>	<p>Vitamins B1 and B12 recommended; supplementation of the other B complex vitamins not advised</p>	<p>General recommendation</p>	<p>Increased demand</p>	<p>General recommendation</p>
<p>Vitamin B4 (choline)</p>	<p>480 mg/day [47]</p>	<p>450-930 mg/day</p>	<p>General recommendation</p>	<p>Not mentioned</p>	<p>General recommendation</p>	<p>General recommendation</p>	<p>General recommendation</p>	<p>Not mentioned</p>	<p>General recommendation</p>	<p>General recommendation</p>	<p>General recommendation</p>

Vitamin C	AR: 80 mg/day PRI: 105 mg/day [47]	<p>Recommended but with some uncertainty</p> <p>General recommendation</p> <p>General recommendation</p> <p>General recommendation</p> <p>Not mentioned specifically</p> <p>Regular supplementation of vitamins not advised</p> <p>Not recommended</p> <p>General recommendation</p> <p>General recommendation</p>
Vitamin A	Only in situations where vitamin A deficiency is a widespread problem [6] 700 µg RE (retinol eq.)/day [47]	<p>Supplementation not recommended</p> <p>770 µg/day</p> <p>Supplementation of small doses recommended</p> <p>General recommendation</p> <p>General recommendation</p> <p>Warning against possible birth defects</p> <p>General recommendation</p> <p>General recommendation</p>
Vitamin D	200 IU (5 µg) /day if deficient [6] 600 IU/day (15 µg) (the same as for all adults) (demand) [47]	<p>400IU (10 µg) /day</p> <p>between March and September; no more than 4000 IU/day</p> <p>600 IU/day</p> <p>600 IU/day</p> <p>600 IU/day</p> <p>600 IU/day</p> <p>General recommendation</p> <p>1500-2000 IU/day, if BMI>30 --> 4000 IU/day</p> <p>1500-2000 IU/day, BMI>30-4000IU/day</p>

Vitamin E	11 mg/day [6, 47]	Not recommended	15 mg/day	Not mentioned specifically	Recommended	Inconclusive	When taken with iron	Regular supplementation of vitamins not advised	Not recommended	General recommendation	General recommendation
Vitamin K	70 µg/day (the same as for all adults) [47]	General recommendation	Supplementation recommended only when needed	Not mentioned specifically	Not recommended	Sceptical toward vitamin supplementation in general	General recommendation	Inconclusive	Not mentioned	No increased demand	Not mentioned
Multivitamins	Recommended for women in medium-income countries [56]	Recommended	Recommended	Recommended	Recommended as additional source	Yes	Yes (daily)	Yes	No recommendation	Inconclusive	No recommendation

3.5. Pseudoscience

Unfortunately, pseudoscientific content can be found on the analysed health portals, especially WebMD, which promotes a variety of unproven practices such as acupuncture, acupressure, chiropractic practices, and traditional Chinese medicine treatments, in particular burning incense-like substance on the fifth toe. Acupressure (using bracelets or other methods) and acupuncture are also recommended by NCEZ. Acupuncture is endorsed by Mayo Clinic and HealthLine, which also promotes homeopathy. On the contrary, NHS correctly advises against all pseudoscientific practices, while the other five portals make no mention of them. Despite the fact that fewer than half of the studied portals display positive attitudes towards pseudoscience, it is a deeply disturbing phenomenon, especially in the case of the wide acceptance of acupuncture as a valid form of treatment [57]. Table 5 summarizes the presence of pseudoscientific content on the analysed portals.

It should also be mentioned that in the case of acupuncture and acupressure, the situation is blurred by the popular lack of understanding of the scientific consensus, i.e., the practices are not based on sound principles and lack evidence as to their efficacy [1]. Despite this, a case can be made as to their usefulness as relaxation practices. This implementation, however, and its positive results do not actually stem from the fallacious theoretical principles of the practices; they are rather an unintended consequence of the general massage-like character of acupuncture and acupressure. In other words, a pregnant woman may indeed find them relaxing and thus helpful, but if she does, this

would not be the result of a proper application of the aforementioned unsound principles, but of being subjected to the simple massage-like procedure. This distinction is not made sufficiently clear on the analysed health portals, nor in other similar sources.

The authors' stance on the topic of pseudoscience is clear, i.e., no mention of it should be made on any health-related outlet, unless it consists in advising against such practices. This is one of the key principles of modern science [57], and one that needs to be strictly adhered to. Although pseudoscientific methods are recommended by the minority of the analysed portals, i.e., 40%, and despite the fact that the two practices mentioned the most are acupuncture and acupressure, namely, the fairly 'safe' ones, health portals should still refrain from recommending anything that is not a scientifically proven intervention. There are several reasons for such a rigid stance. First of all, including unproven therapies within scientific content gives them undeserved legitimacy. Moreover, this may be seen as yielding under the pressure of women who are not aware that some practices are not evidence-based and expect them to be mentioned. In any case, pseudoscientific content does not reflect favourably on the portal publishing it, with WebMD being especially prone to this error.

Table 5. Pseudoscientific content mentioned on the analysed portals in relation to pregnancy.

	Recommendations	Health Line	WebMD	NHS	Mayo Clinic	Johns Hopkins	Health.gov	Medline Plus	1000dani.pl	Medycyna Praktyczna	NCEZ
Pseudoscience	No mention whatsoever or strong advice against	Acupuncture, homeopathy	Acupuncture, practice, traditional Chinese medicine	Advice against pseudoscience	No	No	No	No	No	No	Acupuncture, acupressure

4. Conclusion

As far as the reliability of information provided by the analysed health portals is concerned in terms of its adherence to official recommendations, it varies quite substantially among the portals as well as in relation to the individual items. Generally speaking, although it can be stated that the overall level of accuracy is acceptable, there are still areas that need improvement in light of evidence-based provision of information and advice.

The three health portals that have been found to be the most evidence-based and reliable are HealthLine, Medline Plus, and NCEZ. On the other hand, the two least evidence-based and reliable ones are WebMD and Medycyna Praktyczna. No discernible differences in quality were found between English- and Polish-language portals, even though they do differ in the particular aspects of pregnancy where they are more or less likely to err or offer insufficient advice. In addition, it should be noted that the difference between the highest and lowest scoring portals was small enough to conclude that if a particular user prefers one portal over another due to certain secondary factors, e.g., the specific language used, presentation of information, website layout, interface, etc., and their

choice happens to be one of the lowest ranked portals, they are still unlikely to find extremely inaccurate or harmful data.

Various unintended inconsistencies could be avoided if certain dietary pieces of advice were expressed with a greater attention to nuances, especially considering that the said nuances are indeed present on the portals but often in a completely unrelated context. This makes it difficult, especially for a casual user, to have the full picture of an issue. An example are the recommendations concerning the consumption of dairy as a source of protein. Such pieces of advice may lack the crucial clarification concerning raw, undercooked, or unpasteurized products, a distinction which is nevertheless mentioned when milk itself is discussed, on a different webpage of the same portal. Similarly, the related topics of fish, omega-3 acids, and fats in general may be described from different points of view on different webpages of the same portal without an overreaching depiction of all the relevant nuances in relation to one another.

Despite the discussed problems, inconsistencies, and outright errors, on the whole the analysed portals constitute a useful and sufficiently reliable source of nutritional information for pregnant women. It needs to be remembered that such sources are not peer-reviewed and thus are not subject to rigorous content-editing processes. It also needs to be remembered that many of their problems stem from the lack scientific data or inconsistency of the research/evidence that they base their recommendations on. Despite this, a fair number of issues found in the provided data rest with the portals themselves and in order to be fully reliable, they need to address them in a proper and consistent manner.

In conclusion, considering that it is not typical behaviour on the part of pregnant women to seek advice in scientific databases, the analysed health portals provide a user-friendly and reliably enough source of recommendations, much more useful and reliable than other options, e.g., social media.

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