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Research Article

Impact and Repercussion of a Plant-Based Diet During Pregnancy and Lactation

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Abstract

Mothers are maintaining this lifestyle during all their life stages, including motherhood. Gestation is a demanding nutritional stage, where an imbalance in certain components can lead to serious health problems for both mother and fetus. For this reason, it is necessary to pay attention to diets that restrict nutrients of animal origin. Objectives: To describe the impact and repercussion of a plant-based diet during pregnancy and lactation Methodology: Systematic review of 15 articles obtained from the following databases: Scopus, Pubmed (Medline), ScienceDirect, Cochrane Library and EBSCO using the Keywords: Plant-based diet, vegan, vegetarian, gestation, lactation, pregnant. Results: After the study of the selected research, B12 deficiencies were observed in non-supplemented mothers and a lower birth weight in neonates of vegan/vegetarian mothers Conclusions: A plant-based diet with inadequate planning and supplementation can lead to health problems during gestation and lactation.

Abbreviations: Plant-Based Diet; Vegan; Vegetarian; Gestation; Lactation; Pregnant

Introduction

In the last decades, people who decide to maintain a plant-based diet have increased exponentially [1]; At the moment plant-based diet are widely used and are adopted for cultural, religious reasons, or motivated by the supposed benefits perceived for health or concern for animal welfare [2]. There are many definitions for the concept of a plant-based diet; Some authors consider these diets as the complete exclusion of any animal origin´s product, others authors also include those diets based on vegetables, fruits, legumes and cereals, including animal products such as milk, cheese, or occasionally meat or fish [3].

Plant-Based Diets can be Classified According to the Type of Food Allowed:

a) Semi-vegetarian diets are characterized by including small portions and/or less frequently of animal products,

b) Pescatarian diets include seafood and dairy products,

c) Ovo-dairy-vegetarian diets include eggs and dairy products, it is the diet that we commonly know as vegetarian, and

d) Vegans are diets that completely exclude any product of animal origin or derivatives [3,4].

Plant-based diets by excluding or restricting the consumption of animal products may carry a risk of causing possible nutritional deficits; This happens especially when the exact intake and optimal amounts of each food product necessary to cover the nutritional requirements of the body are not known [5-8]. For example, a vegan person will do without a large intake of protein and vitamins present in meat and fish, special attention should be paid to these deficiencies [6,7]. However, nutritional deficiencies can also occur

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in any other type of diet, including the omnivorous one. In addition, the nutritional needs of each person must be taken into account depending on their lifestyle and the vital moment in which they are. The normal growth and development of a fetus depends of maternal, fetal, and environmental genetic factors. Among these factors we find the diet followed by the mother of the baby, during her pregnancy and lactation [9] Inadequate nutrition during pregnancy is a global health problem. Deficiencies of certain micronutrients are associated with adverse developmental outcomes in children, including neurocognitive and immune deficits, and health status problems in general.

The consumption of plant-based diets during pregnancy or child development could produce deficits in different nutrients such as iron, zinc, vitamin D, vitamin B12, iodine, protein, and N-34 fatty acids. Folic acid deficiency is related to neural tube defects, also associated with deficits fetal growth and adverse neurodevelopmental outcomes. Thiamine stimulates the brain development of the baby and allows the conversion of carbohydrates into energy. Iodine deficits is related to congenital hypothyroidism and neurocognitive deficits. Failure of iron causes anemia and increases the risk of low birth weight, preterm birth, and perinatal (and maternal) mortality. Vitamin A participates in various functions such as vision, reproduction, immune function, growth and cell differentiation. Vitamin D allows the strengthening of bones, muscles and teeth through to the regulation of calcium and phosphate in mother and child. Zinc during pregnancy helps to slightly reduce premature births, in addition to playing an important role in cell division and brain development. Low levels of vitamin B12 (present in meat) have a negative impact on the cognitive development, motor skills and general growth of the baby [10-12].

It is necessary that the ingested doses of these micronutrients be adequate, a deficiency as well as an excess can lead to negative consequences for the mother and the child. For all these reasons, it is interesting to study the impact of plant-based diets on pregnant women or those who breastfeed their babies A competence of health professionals is to provide the necessary nutritional education to ensure the maintenance and improvement of patients´s health. Nutritional care is attended by different health professions such as: medicine, nursing and dietetics personal. But the role of each professional is not always clearly defined [13]. One of the main functions of nursing staff is health education in which nutrition has a great impact; Midwives, pediatric and obstetric nursing staff has a continuous and close contact with pregnant and lactating women [13]. Adequate nutritional education of pregnant women is associated with positive pregnancy outcomes [14]. Nursing staff are in a privileged position to provide information on healthy eating to pregnant and lactating women. A systematic bibliographic review is proposed to synthesize scientific evidence on the effects of the plant-based diet in pregnant women and lactation period; The possible risks or benefits at the physiological level in mother and child will be analyzed, as well as the effectiveness of the use of dietary supplements in plant-based diets during pregnancy and lactation. Finally, we will focus on reviewing articles that assess the knowledge that nursing staff have in relation to plant-based diets in this context.

Materials and Methods

Study Design

A systematic bibliographic review was carried out whose research question in PICO format (P: Problem or patient, I: Intervention, C: Comparison and O: Results) was: "What implication does a plant-based diet have on the health of the child and the mother during pregnancy and lactation compared to a diet that includes all kinds of nutrients with proteins from the animal kingdom".

Search Strategy

We used the following Medical Subject Headings (MeSH): Plant-based diet, vegan, vegetarian, gestation, lactation, and pregnant combined with the booleans and/or, to search in the following databases: Pubmed/Medline, Cochrane library, and ScienceDirect.

Inclusion / Exclusión and Quality Criteria

Articles were selected according to their title and abstract, using the eligibility criteria. The inclusion criteria were: -Articles published in English or Spanish languages, and time filter: 10 years. The target population was pregnant or lactating women who maintain a vegan or vegetarian diet, fetuses and newborns of these mothers and health personnel. The CASPe (Critical Appraisal Skills Programme) critical reading grid was used as a quality criterion; Studies with a score lower than 8 out of 10 in the CASPE grid were excluded. The exclusion criteria were based on the type of study: editorial, case report, expert opinion and others reviews. Exceptionally, two systematic reviews with meta-analysis were included due to their value. After reading the articles, we carried out a secondary search with the selection of articles from the bibliography contained in the primary search respecting the inclusion criteria. Figure 1 summarizes the steps of article selection we used for our review PRISMA format.

Results

Risks or Benefits that Different Plant-Based Diets can Produce During Pregnancy and Lactation at a Physiological Level

Table 1 shows the most important results of the studies that address the question of identifying possible risks and/or benefits of plant-based diets during pregnancy and lactation. As can be seen, the increased probability of having a fetus small for gestational age or risks in the development of the fetus related to inadequate levels of vitamin B12.

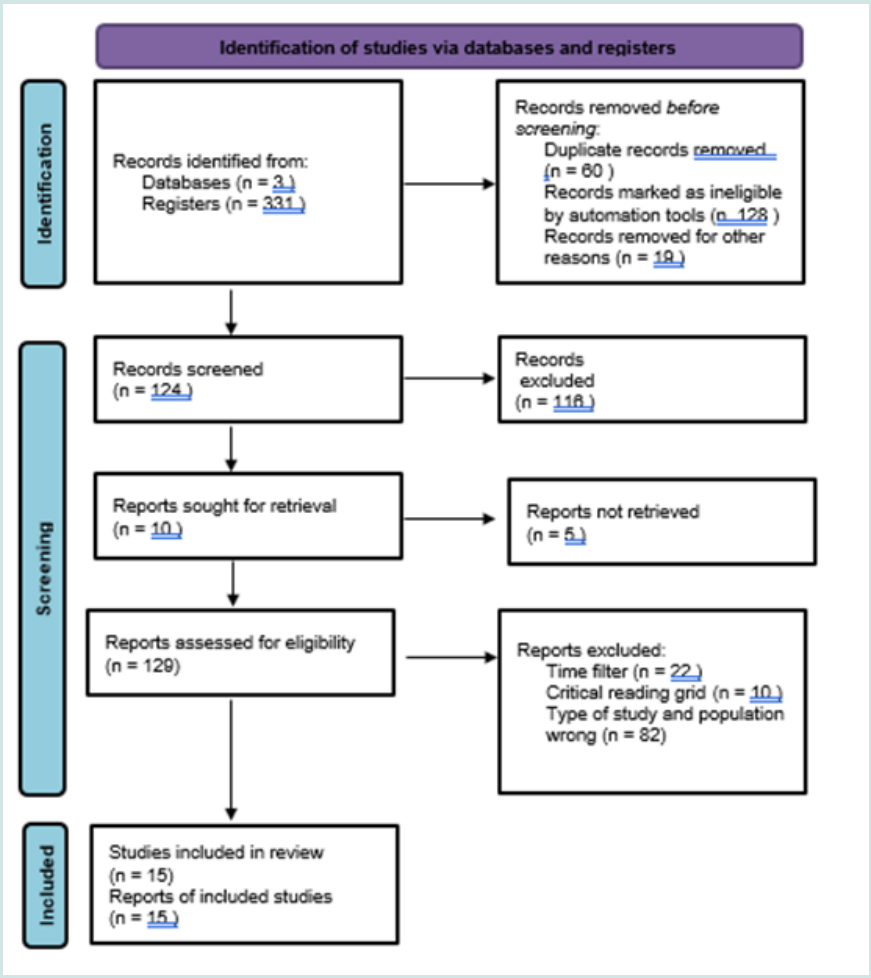

Figure 1: Article search flow.

Biochemical Level Alterations Produced by Plant-Based Diets During Pregnancy and Lactation

Table 2 compiles articles focused exclusively on showing biochemical findings by analyzing stool, breast milk, and blood samples. In addition, the articles described previously and published by Chandoy R et al., Yisahak S et al, Crozier S et al., and Foster M et al., also provide some results on biochemical alterations (Table 1).

Table 1: Risks or benefits that different plant-based diets can produce during pregnancy and lactation at a physiological level.

AUTHOR:	Aguirre J., et al [15]
AIM STUDY	To check if there is severe neuronal compromise associated with a B12 deficiency in infants of vegan mothers.
METHOD	**TYPE OF STUDY:** Cases and controls
	PARTICIPANTS: 7 vegan children and mothers were observed between 2016 and 2018, presented symptoms of neuronal deterioration such as seizures and apnea.
	PROCEDURE: Magnetic Resonances were performed to infants and analytical tests to children and mothers to confirm the B12 deficiency. Infants were treated with intramuscular B12 and a complementary diet to lactation, and mothers with oral B12.
RESULTS	Improvements in all patients; In infants, severe neuronal complications such as apnea and convultios disappeared. Partial recovery of neuronal development was observed in infants
AUTHOR:	Crozier S., et al [16]
AIM STUDY	To investigate the relationship between a vegan-vegetarian diet during pregnancy and nutritional status of the mother with the subsequent cognitive development of children.

METHOD	**TYPE OF STUDY:** Prospective observational study
	PARTICIPANTS: Women (24 to 34 years old) between 1998 and 2002. A total of 2525 omnivores and 92 vegetarians are studied.
	PROCEDURE: Nutritional status of the mother: Was evaluated with standardized nutritional interview and blood analysis at 11 weeks of gestation.
	Cognitive state of the children: Was evaluated at 7-8 years old. For t IQ was use the abbreviated Wechsler Intelligence Scale. To assess cognitive functions was use Cambridge Automated Battery of Neuropsychological Tests
RESULTS	Interview results: Vegetarians were less likely to smoke and were more adherent to supplement therapy and breastfed longer
	Analytical results: Vegetarians had lower levels of fatty acids, especially DHA, B12 and hemoglobin 0.3g/l.
	Cognitive level: no notable differences were obtained.
AUTHOR:	**Foster M. et al [17]**
AIM STUDY	To compare the amount of zinc intake during pregnancy in vegetarian mothers versus omnivorous mothers and see if there is a relationship with low birth weight early deliveries
METHOD	**TYPE OF STUDY:** Meta-analysis review
	PARTICIPANTS: 614 pregnant women and their babies were extracted
	PROCEDURE: The women were classified according to diet in Lacto-vegetarian, Lacto-ovo-vegetarian, Indefinite vegetarian, low meat consumption, and omnivorous.
	Measurements were taken of: -Gestational period, -Weight at birth and -Zinc levels.
RESULTS	The 2 groups of pregnant women with plant-based diets showed lower levels of Zinc than recommended (1.4 mg less of ingestion than non-vegetarians). Regarding the gestation period at the time of delivery and low birth weight, lower values were only obtained in Asian vegetarian mothers.
AUTHOR:	**Zulyniak M. et al [18]**
AIM STUDY	To determine the impact of a plant-based diet and ethnicity during pregnancy on newborn weight.
METHOD	**TYPE OF STUDY:** Cohort study
	PARTICIPANTS: 3.997 pregnant women and their babies
	PROCEDURE: According to the feeding frequency register, the mothers were categorized into an "omnivorous" "plant-based" and "healthy omnivorous" diet. The study was completed by obtaining the weight of the newborn from the birth certificates.
RESULTS	Plant-based diets were inversely associated with birth weight. The newborn was more likely to be small for gestational age.
AUTHOR:	**Tan C. et al[19]**
AIM STUDY	Investigate the risks of a vegetarian diet during pregnancy
METHOD	**TYPE OF STUDY:** Meta-analysis review
	PARTICIPANTS: 19 observational studies and 19,027 participants were extracted
	PROCEDURE: The participants were classified according to ethnicity, age, BMI together with the diet and it was related to the birth weight of their children.
RESULTS	Due to the heterogeneity of studies obtained with little quality evidence, conclusive results are not achieved. The clearest evidence was that Asian vegetarian pregnant women have a higher risk of having low birth weight babies compared to omnivorous pregnant women.
AUTHOR:	**Attini R. et al [20]**
AIM STUDY	To study the influence of vegetarian and low-protein diets in pregnant women with chronic kidney disease.
METHOD	**TYPE OF STUDY:** Descriptive cross-sectional study
	PARTICIPANTS: 83 pregnant women; 36 vegetarian and 47 omnivars
	PROCEDURE: Renal failure and proteinuria in the mothers were evaluated, as well as low birth weight.
RESULTS	There were more diabetic nephropathies in vegetarian patients, while in controls lupus nephropathies were significantly higher. The percentages of premature births were similar without statistical significance (77.4% Vs 71.4% in controls). The incidence of babies small for gestational age and/or extremely premature (<28 weeks) was lower in the only children of vegetarian mothers compared to omnivorous mothers.
AUTHOR:	**Chandyo R. et al[6]**
AIM STUDY	To evaluate possible B12 deficiencies in nursing infants of mothers with plant-based diet
METHOD	**TYPE OF STUDY:** Randomized clinical trial
	PARTICIPANTS: 316 infants of vegetarian or semi-vegetarian mothers of low socioeconomic
	PROCEDURE: : Folic acid, B12, methylmalonic acid and homocysteine levels were measured in blood test. In addition to socioeconomic and lactation information, they also collected details on the use of micronutrient supplements.

RESULTS	53% and 75% of the infants showed total levels of Homocysteine and methylmalonic acid below 10 and 0.28 µmol/L, respectively, indicating that they had functional B12 deficiency.
AUTHOR:	**Gómez Roig MD et. al [9]**
AIM STUDY	To determine differences between lifestyles and dietary patterns in pregnant women with fetuses small for their gestational age versus fetuses with normal weight
METHOD	**TYPE OF STUDY;** Prospective cross-sectional study
	PARTICIPANTS; 46 women with fetuses small for their gestational age. 81 with fetuses of an appropriate size for their gestational age (2 are vegetarians)
	PROCEDURE: The size of the fetuses was measured through the routine examination of 3º trimester. In addition, they were given a questionnaire to determine their lifestyle and nutritional habits.
RESULTS	Women who followed an omnivorous Mediterranean diet were more likely to have a fetus of adequate weight. Vegetarian women were just as likely to have a small or adequate size fetus
AUTHOR:	**Yisahak, Samrawit et. al [21]**
AIM STUDY	To assess the association between different plant-based diets and pregnancy and neonatal outcomes.
METHOD	**TYPE OF STUDY:** Prospective cohort study
	PARTICIPANTS: 1948 low-risk pregnant women
	PROCEDURE: The sample was classified the following food patterns: vegetarians, semi-vegetarians and "pescetarians". Diet information was obtained through self-reports and data from the Newborn Fetal Growth Studies–Singletons, from the Eunice Kennedy Shriver National Institute of Child Health and Human Development.
RESULTS	8.2% of sample was identified as vegetarians, 0.6% as "pescatarian" and 17.6% as semi-vegetarian. In terms of data for neonates, those of vegetarian mothers were more likely to be small for gestational age, but not small for postnatal comorbidity.

Table 2: Biochemical changes produced by plant-based diets during pregnancy and lactation.

AUTHOR:	**Barrett L et. al [22]**
AUTHOR:	To evaluate the impact of vegan and vegetarian diet on the microbiota of pregnant women.
AUTHOR:	**TYPE OF STUDY:** Randomized clinical trial
	PARTICIPANTS: 27 pregnant women; 9 plant-based diets and 18 omnívors
	PROCEDURE: At the beginning of the study ≤16 weeks of gestation a fecal sample was taken. During the course of the investigation, new fecal samples and blood tests were taken and analyzed.
RESULTS	Differences were found in the microbiota of vegetarian mothers compared to omnivores; A decrease in Collinsella sp. was found in vegetarians and was associated with lower insulin levels compared to omnivores.
RESULTS	**Perrin MT et. al [23]**
AIM STUDY	Compare the concentrations of fatty acids in breast milk depending on the type of diet.
METHOD	**TYPE OF STUDY:** Descriptive cross-sectional study
	PARTICIPANTS: 74 lactating women from EEUU; 26 vegan, 22 vegetarian and 26 omnívors
	PROCEDURE: Analysis of breast milk samples
RESULTS	The following percentages were obtained: -Unsaturated fatty acids: 66% in vegans; 57% in vegetarians and 18% in omnivores. -Omega-3: 2.29% vegans, 1.55% vegetarians and 1.46% omnivores.
RESULTS	**Avnon et. al [24]**
METHOD	Determine the differences in a blood test according to dietary pattern; vegan, vegetarian, "pescatarian" or omnivore
	TYPE OF STUDY: Prospective observational study
	PARTICIPANTS: 273 pregnant women, over 18 years; 112 omnivares , 60 vegans, 64 vegetarians , 37 "pescetarians"
	PROCEDURE: Diets were controlled 3 months before pregnancy until its term. Three analytics were taken to determine the levels of folic acid, B12 and ferritin; One at the beginning of pregnancy, another at week 20, and another of umbilical cord in postpartum
RESULTS	The vegan diet did not affect the levels of B12, folic acid and hemoglobin. Ferritin levels were detected with lower values in the "peketarians" but within the adequate physiological range. Vegan women supplemented with B12 had higher levels than non-supplemented vegans
	No differential values of any of the 3 components under study were found in the umbilical cord sample.

Effectiveness the Use of Dietary Supplements in Plant-Based Diets During Pregnancy and Lactation

Table 3 summarizes the information obtained in 2 articles, first analyzes the effectiveness of enriching eggs with omega-3 compared to non-enriched eggs. This information is especially valid for vegetarian mothers because eggs, together with dairy products and honey, are the only animal´s origin products that they consume. The last article discusses the dose of vitamin B12 supplementation needed for mothers on plant-based diets. Two other works described in the previous tables, provide some information on dietary supplements in this context (see Aguirre et al., in Table 1 and Avno et al., in Table 2)

Table 3: Effectiveness the use of dietary supplements in plant-based diets during pregnancy and lactation.

AUTHOR:	West AA et. al [7]
AIM STUDY	To determine if the consumption of eggs by women of childbearing age influences the levels of choline (a nutrient necessary for the synthesis of the cell wall).
AIM STUDY	**TYPE OF STUDY:** Randomized clinical trial
	PARTICIPANTS: 15 lacto-ovo-vegetarians women in reproductive age
	PROCEDURE: Experiment in 4 phases; Before and after each phase Choline metabolites were quantified in fasting plasma: Pre-Phase of the experiment; 2 weeks restricted consumption of eggs and nuts. Phase-1; 6 eggs per week, for 2 weeks ,enriched with omega-3. Control Phase-2; without egg consumption for 4 weeks. Phase-3; 6 common eggs per week for 2 weeks.
RESULTS	Similar values were obtained in choline metabolites in phases 1 and 3, but differences with respect to free choline and betaine metabolite were higher in phases with omega-3 enriched eggs versus phases with non-enriched eggs. It seems that egg consumption does not increase the risk of cardiovascular disease.
AUTOR:	Pawlak et. al[8]
AIM STUDY	To analyze the concentration of vitamin B12 in breast milk and its relationship with B12 supplementation according to different dietary patterns: vegan, vegetarian and omnivore.
METHOD	**TYPE OF STUDY:** Descriptive cross-sectional study
	PARTICIPANTS: 74 pregnant women; 22 vegetarian, 26 vegans and 26 omnivars. Some women used vitamin B12 supplements and others did not it.
	PROCEDURE: A sample of breast milk was taken between the first and the second feeding, extracting the entire content of a breast Defining low B12 levels when they are less than 310pmol/L
	Vitamin B12 levels according to the diet: Proportions without statistically significant differences according to diet (p-value:1) -Vegans: 558 pmol/L -Vegetarians: 509pmol/L -Non-vegetarians: 444 pmol/L B12- Supplements: 63% of the total sample were vegan/vegetarian mothers supplemented with vitamin B12. The use of individual vitamin B-12 supplements was higher in vegans (46.2%) than in vegetarians (27.3%) and nonvegetarians (3.9%) (p-value:0.001).
RESULTS	The study establishes a direct relationship between taking B12 supplementation and the concentration collected in the sample

Knowledge that Nursing Professionals have in Relation to Plant-Based Diets during Pregnancy and Lactation

Table 4: Knowledge that nursing professionals have in relation to plant-based diets during pregnancy and lactation.

AIM STUDY:	Betinelli, M et. al [4]
AIM STUDY	To assess the knowledge that healthcare personnel have about vegan diets during pregnancy and/or adolescence
RESULTS	**TYPE OF STUDY:** Descriptive cross-sectional study
	PARTICIPANTS: 418 healthcare personnel; 317 with nursing degree
	PROCEDURE: A questionnaire was used based on the recommendations of the most up-to-date guidelines. Participants were screened for socioeconomic and professional profiles. Later they analyzed the knowledge they had about vegetarian diets through ad hoc questionnaire

RESULTS	75% of those surveyed had not attended any training course in the last 5 years Knowledge about nutrients: 20% correct questions Vegan diet benefits/harms 45% correct answers

Finally, Table 4 shows the result of article that explores the knowledge possessed by healthcare personnel, and specifically nursing. Information collected through surveys carried out in hospitals in the Milan metropolitan area.

Discussion

Risks or Benefits that Different Plant-Based Diets can Produce during Pregnancy and Lactation at a Physiological Level

Low weight to Gestational Age:

Most authors indicate that a vegan or vegetarian diet can negatively affect the weight of the fetus and newborn, as shown by Zulyniak et al., [18]. in their study and Yisahak S et al., [21], who found that neonates of vegetarian mothers were smaller than neonates of non-vegetarian mothers, although without relation to pathological changes in children Gómez Roig et al., [9] found the same probability that a vegetarian mother would have a child with low weight for gestational age or mother's age compared to omnivarous mothers, although we are talking about a study with a very small sample, so caution must be exercised [9]. Foster M et al., [9] focused on analyzing zinc levels in vegetarian women but also demonstrated that women of Asian ethnicity with plant-based diets have a higher risk of preterm and low birth weight infants. In the same way, Tan C et al., [19], also demonstrates the existence of a higher probability of having low-weight children in Asian women who consume a plant-based diet compared to their omnivorous counterparts. Despite this, there is no absolute truth to the fact that Asian ethnicity is more affected by such a diet, since omnivorous Asian women were also found to have lower percentile infants compared to other ethnicities [19]. Surprisingly the work of Attini R et al., shows that mothers with planned vegetarian diets have babies with a higher birth weight than the control group, but taking into account that the mothers in the control group followed unplanned omnivorous diets [20].

Cognitive Decline

As observed in the study by Aguirre J et al., [15], a vegan or vegetarian diet that is poorly planned by the mother can cause serious problems in infants who exclusively feed on breast milk. 7 cases were reported in which there was a deficiency of vitamin B12 in the mother, which led to a deficiency of this vitamin in infants who even suffered episodes of convultions and apnea possibly caused by neuronal compromise due to this deficiency [15].

On the other hand; Crozier S. et al16 compared Cognitive test scores in 7–8-year-old children of vegetarian and vegan mothers who breastfed their children against omnivorous mothers, obtaining similar data in both groups. The two pieces of information are not contradictory, since the difference between the Crozier S et al., [16] study and Aguirre et al., [16] is that the latter points to inadequate diet planning and B12 deficiency as the cause of cognitive deterioration. Benefits of a plant-based diet versus an omnivorous diet. No results have been found that provide a beneficial outcome of plant-based diets versus an omnivorous diet [21]. It should be noted that although there is no direct benefit from plant-based diets, Crozier SR et al., [16] indicates that vegetarian mothers have a lower incidence of unhealthy habits such as smoking, drinking alcohol, consuming sugary drinks or ultra-processed foods during pregnancy and also maintain breastfeeding for more weeks than omnivorous mothers [16].

Biochemical Level Alterations produced by Plant-Based Diets during Pregnancy and Lactation

At this point we will discuss the results obtained in blood samples, stool samples or breast milk.

Blood Samples:

Regarding vitamin B12, we highlight that Aguirre J et al., [15] determined that in the study context, levels below 200pg/ml produced neuronal compromise in the children described in their cases. Compiling the data provided by the authors Auvon et al., [24], Crozier SR et al., [18] and Chandyo R et al., [6]. It can be affirmed that plant-based diets produce a vitamin B12 deficit compared to omnivorous diets. In relation to zinc levels an according to the findings of Foster M et al., [17], samples obtained from both vegetarians and non-vegetarians mothers are deficient in zinc and vegan mothers consume 1.4 mg/d less zinc than omnivorous mothers, that is 13% of the required daily amount. which is 11mg/d [22]. Yisahak S et al., [21], observed the same deficiency; an intake of 9.4mg/d in plant-based diets compared to 13.5mg/d [15] in omivaras.

Breast Milk Samples:

Perrin M et al., [23], obtained that the content of unsaturated fatty acids is higher in samples from vegetarian and vegan mothers versus in omnivorous mothers. But in contrast the DHA was lower than omnivores. It is also noteworthy that only 1/3 of the women who based their diet on plants took a DHA supplement [23].

Microbiota Samples:

Barret H et al., [22], using stool showed that samples from vegan and vegetarian mothers, had greater richness and variability of intestinal flora involved in the degradation of fatty acids compared to samples from ommivaras. In addition, they established a relationship between the consumption of dietary fiber, consumed

in greater quantity by vegans and vegetarians, and a decrease in *Collinsella bacterium*, which in turn is associated with a lower level of insulin [22].

Effectiveness the Use of Dietary Supplements in Plant-Based Diets during Pregnancy and Lactation

Fortified Foods:

The results obtained by West et al7 indicated the effect of enriching eggs with omega-3 gives off positive data on the influence of choline metabolism; The author states that both normal and enriched eggs increase choline metabolism, but by enriching eggs with omega-3 we get more free choline.

Vitamin B12 Supplements:

The case-control study published by Aguirre J et., [15] details how they were able to reverse episodes of apnea and convultions through intramuscular administration of B12 vitamin. Moreover, with supplementation of vitamin B12, the levels are maintained in adequate physiological ranges in mother and child. On the other side, Pawlak R et al., [8] observed that concentration of vitamin B12 in breast milk of mothers with plant-based diets was higher than in omnivorous mothers. It should be noted 63% of vegans to vetetarians participants took vitamina B12 supplements [8]. In the same line, Avno T et al., [24], showed that there were vegetarian women who, without supplements, had lower values than participants on the same diet taking vitamin B12 supplements [24].

Knowledge that Nursing Professionals have in Relation to Plant-Based Diets during Pregnancy and Lactation

Bettinelli M et., al [4] demonstrated that nursing health personnel had knowledge gaps regarding the effects of plant-based diets; It was especially alarming that only 55.7% of the participants were aware of the risk of not supplementing with vitamin B12 and 79.9% of the participants had not received training in nutrition in the last 5 years [4]; This data is worrying because plant-based diets have had a boom in recent years. One of the main limitations of this review has been the limited number of articles that discuss this issue.

The most Relevant Conclusions of this Systematic Review are the Following.

During pregnancy or lactation, plant-based diets are no more beneficial to fetuses and infants than omnivorous diets. Vitamin B12 supplementation in women who follow plant-based diets is effective in compensating for deficiencies of this vitamin, therefore it is essential to do. It is also advisable to supplement mothers' plant-based diets with omega-3 fatty acid DHA and Zinc. A poorly planned, plant-based diet increases the risk of a small-for-gestational-age fetus. In this context, it is necessary to prepare a dietary plan by nutrition professionals to increase the probability that the fetus will have an adequate weight for its gestational age.

In the future, it would be interesting to develop research work on the knowledge that nursing health professionals have about the effects of plant-based diets.

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