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Pregnancy Outcome and Breastfeeding Pattern among Vegans, Vegetarians and Non-Vegetarians.

Pawlak Roman[1], Ding Qin[2], and Sovyanhadi Marta[3]

[1]Department of Nutrition Science, East Carolina University, Rivers West 337, Greenville

[2]Department of Computer Science, East Carolina University

[3]The Department of Health Science and Human Ecology, The College of Extended Education Learning, California State University, San Bernardino

*Corresponding author: Dr. Pawlak Roman, Department of Nutrition Science, East Carolina University, Rivers West 337, Greenville, NC 27858, Tel: 252-328-2350; Fax: 252-328-4276; E-mail: pawlakr@ecu.edu

Received Date: 18th September 2014
Accepted Date: 29th October 2014
Published Date: 04th November 2014

Citation: Roman P, Qin D, Marta S, (2014) Pregnancy Outcome and Breastfeeding Pattern Among Vegans, Vegetarians and Non-Vegetarians. Enliven: J Diet Res Nutr 1(1): 004.

Introduction

Vegetarian diets are associated with lower risk of several chronic health conditions including heart disease, type 2 diabetes, obesity and some cancers, compared to western diets. However, vegetarians, especially vegans, are at a high risk for developing some nutrient deficiencies, especially vitamin B12 and iron. These nutrients play critical role in pregnancy and thus may impact fetal development and neonatal birth weight. To date, very few studies assessed birth weight among children born to mothers adhering to vegetarian diets [1,2].

Breastfeeding is the most desirable feeding pattern for infants. Breastfeeding is especially important in the first 6 months of life. Breastfed children have lower risk of some health conditions such as otitis media, asthma or atopic dermatitis [3]. Data on breastfeeding patterns among vegetarian mothers are almost non-existent.

The goal of the current study was to: 1) assess any birth weight difference among infants born to women who adhered to different dietary pattern (vegan, vegetarian including lacto-, ovo-, and lacto-ovo-, and non-vegetarian); 2) to assess the prevalence of low birth weight (weight < 2,500 g) among these three group of infants; and 3) to assess the rate of breastfeeding at different time periods of infant development;

Methods and Materials

Data Collection

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Institutional Review Board at East Carolina University. Permission from the North American Division of the Seventh-Day Adventist Church to contact its institutions requesting participation was received. Requests to different Seventh-Day Adventist Church schools and churches were sent via an e-mail, requesting participation in the research study. Surveys along with letters that explained the goal and the protocol of the study, along with consent forms for parents and ascent forms for children were mailed to those institutions that indicated willingness to participate. Surveys were subsequently distributed by school/church officials with a request to distribute them to parents via students. Completed surveys were either mailed directly to the researchers or were returned to schools/churches that subsequently mailed them to the researchers. In order to include more vegan parents/children in the study, an announcement about the study on one web-based blog for vegans was placed. Surveys were subsequently collected from parents who replied to this advertisement. Children and their parents were asked to complete the surveys together. They were informed that their participation was completely voluntary. No compensation of any kind was offered to study participants. Data collection took place between the fall of 2011 and late summer 2012.

Survey

The survey consisted of questions related to socioeconomic and anthropometric data (e.g. age, height, weight) of both children and parents. Also, questions regarding mothers' dietary adherence during pregnancy were included. The dietary options included six categories: 1) all foods including meats such as pork, lobster, and catfish; 2) biblically "clean" meat such as beef and chicken; 3) lacto-ovo-vegetarian diet; 4) lacto-vegetarian diet; 5) ovo-vegetarian diet and 6) only plant foods (vegan). For the analyses presented in this manuscript, these categories were merged into three variables: vegan, vegetarian (including lacto-, ovo- and lacto-ovo-vegetarian) and non-vegetarian. Lastly, the survey included questions regarding children' birth weight and whether a child was breastfed and if so, for how long. The breastfeeding question did not specify whether it was exclusive breastfeeding or breastfeeding with complementary foods.

Statistical Analysis

Frequency count and percentage of children born with low weight status were calculated for three diet groups: vegan, vegetarian and non-vegetarian. Mean and standard deviation (SD) of birth weight and length of breastfeeding were calculated. Mean number of months children were breast fed and the prevalence of breast feeding for each of the diet groups were assessed. One-way ANOVA was used to assess whether there was a statistically significant difference in the mean birth weight among infants born to women who adhered to different diets. The same method was utilized to compare the mean breastfeeding length among individuals in the respective diet group. Chi-square analysis was used to test whether there was statistically significant difference among different diet groups regarding percentage of infants born with low birth weight, those born prematurely and those born post-term. Similarly, Chi-square analysis was used to test whether there was statistically significant difference among different diet groups regarding percentage of breastfed infants at initiation, 6-month, and 12-month. The confidence level was set at 0.05.

Results and Discussion

Demographics

A total of 613 surveys were collected of which 555 were used in the analyses of the birth weight and 579 surveys were used in the assessment of breastfeeding prevalence. Surveys were excluded from analyses if data on both birth weight and breastfeeding duration was missing. A total of 47, 199 and 350 infants were born to vegan, vegetarian and non-vegetarian mothers (7 missing). The sample included 172 African American, 152 Hispanic, 142 Caucasian, 10 Asian and 122 infants of other or mixed ethnic background (5 missing). Among children born to vegan mothers 6.4% were born prematurely and 12.8 percent were born post-term. For children born to vegetarian and non-vegetarian mothers the percentage of those born prematurely was 11.6 and 10.3, respectively and 10.6% and 9.1%, respectively, were born post-term. These differences were not statistically significant (Chi-square = 1.1, df = 2, p-value = 0.5769, for the prematurity and Chi-square = 0.94, df = 2, p-value = 0.625, for post-term).

Birth Weight

The mean (SD) birth weight of infants born to women who followed a vegan diet during pregnancy (n = 47) was 3.54 (0.51) kg. None of these children was born with low birth weight. The mean (SD) birth weight of infants born to vegetarian mothers (n = 199) was 3.38 (0.59) kg. The prevalence of children with low birth weight born to these mothers was 4.7%. For women who consumed meat during pregnancy (n = 350) the mean (SD) weight of their newborns was 3.32 (0.63) kg and 7.1% of these infants were born with low birth weights. The difference between the mean weight among infants from the different diet groups was not statistically significant (F (df) = 2) = 2.68; p = 0.069). Similarly, the difference between the percentages of infants born with low birth weight was not statistically significant (Chi-square (df=2) = 4.13, p = 0.127).

Prevalence of Breastfeeding

Vegan children had the highest self-reported prevalence of initiation of being breastfed 93.3%, followed by vegetarians, 89.1%, and children whose mother ate meat, 72.4%. Figure 1 shows a comparison of the percentage of breastfed infants of mothers in different diet groups during different time periods and to the national data. The mean (SD) length of breastfeeding of vegan children was 12.8 (10.2), ranging from 2 to 36 months. Vegetarian children were breastfed on average for 8.6 (6.9) months, ranging from 1 to 30 months and the mean (SD) length for children whose diets included meat was 6.6 (8.6) months, range of 1 to 49 months. One-way ANOVA test shows that there was a statistically significant difference regarding the mean breastfeeding length among the three diet groups (F(df) = 12.86; p= 0.000). A post hoc analysis confirmed a statistically significant difference in the length of breastfeeding in infants from each of the three diet groups (p = 0.000). Similarly, there was statistically significant difference among the three diet groups in terms of percentage of breastfed infants at all stages, including initiation (Chi-square = 15.7, p = 0.0004), 6-month (Chi-square = 33.39, p = 0.0001), and 12-month (chi-square = 19.46, p = 0.0001).

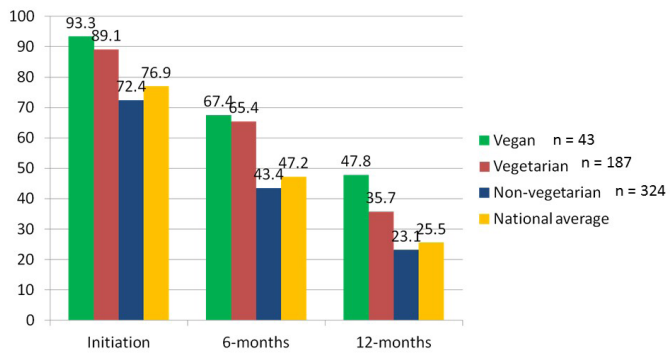

Figure 1. Percentage of breastfed children born to women with different dietary pattern

Discussion

This study compared the prevalence of low birth weight, and breastfeeding pattern in three diet groups: vegan, vegetarian and non-vegetarian. The results showed that newborns born to both vegan and vegetarian mothers attained adequate fetal weight. In fact, in addition to having the highest mean birth weight, none of the infants born to vegan mothers was born with a low birth weight compared to 4.7% among newborns born to vegetarian mothers and 7.1% among those born to non-vegetarian mothers.

Data on birth weight among infants born to vegan and/or vegetarian women are old and scarce. The findings of this study are consisted with those reported by Drake et al. [1]. In their study, the mean birth weight among lacto-ovo-vegetarians (n=34), fish eaters (n=17) and meat eaters (n=81) was 3.5kg, 3.5kg and 3.4kg, respectively. Similarly, the mean birth weight of infants born to vegetarian women was higher than for infants born to non-vegetarian women in a study by King et al. (3.51 kg vs. 3.3kg) [4]. In a study by Shull et al, the mean birth weights of infants born to vegetarian women were comparable with birth weights of offspring of non-vegetarians (3.39kg vs. 3.37kg for boys and 3.18kg vs. 3.27 for girls) [5].

The mean weight of vegan children included in the Farm study was comparable to the mean weight of children born to vegan mothers in our study (3.39kg in the Farm study vs. 3.54kg in our study) [2]. Five percent of children included in the Farm Study had low birth weight compared to none in the current study. In comparison, the national low birth weight rate is 8.15% [6]. Children born to vegetarian mothers had close to two times lower rate of low birth weight compared to the national average. This rate among non-vegetarians was somewhat close to the national rate (7.1% vs. 8.15%)[6].

Approximately three quarters of children born in the U.S. are breastfed, but this number drastically declines over time, such that only slightly more than 40% of mothers still breastfeed at 6 months and only about 21% at 12 month [7]. Compared to the national data, children born to mothers who consumed both vegan and vegetarian diets had considerably higher rate of breastfeeding at any stage of their infants' life (Figure 1). In contrast, the rate of breastfed children born to mothers who consumed meat at 6 and 12 months was actually slightly lower than the national data (Figure 1).

These results are consistent with other research on vegetarians. For example, 95% of children included in the Farm Study were breastfed. The rate of breastfeeding reached 90% for vegetarian children compared to 64% among non-vegetarians in a study by Nathan et al. based on a sample from North-West England [8]. Consistent with our findings, Nathan et al reported that vegetarian children were more likely to be breastfed compared to non-vegetarian children.

The findings are unlikely to be explained by the differences in the percentage of individuals of different ethnic background in different diet groups. Caucasian individuals comprised approximately 50% of vegans while only 17.4% of vegans were African Americans. Similarly, a little over one third of non-vegetarians were African Americans compared to just slightly over 9% of Caucasian. National data shows much higher prevalence of low birth weight among African Americans compared to Caucasian (13.97% vs. 7.14%) [6]. However, Hispanic Americans have a lower rate of birth weight than Caucasian Americans (6.97) and more of them were found in the non-vegetarian diet category (30.8%) compared to the vegan group (6.5%) [6].

Limitation

Neonate's weight may be affected by several factors including mother's age and parity. We did not collect these data and thus, we were unable to adjust our results for these confounders. The findings described in this manuscript are largely based on members of the Seventh-Day Adventist church. The findings may not reflect all vegans and vegetarians. Although we made an effort to recruit more vegans, the number of mothers who adhered to a vegan diet was much smaller than the number of women in the other diet group (n= 47).

Conclusions

Findings of this study show that both vegan and vegetarian diets are associated with healthy pregnancy outcomes. In fact, our data suggest that infants born to women who avoid meat during pregnancy may have lower prevalence of low birth weight. Our findings also highlight the fact that vegetarian mothers exhibit more desirable breastfeeding pattern. This is especially true for vegan pregnant and lactating women.

The above-highlighted findings have important implications for physicians and other healthcare practitioners. Several studies documented some adverse health impact of ingesting meat during pregnancy. Meat intake during pregnancy exposes the mother and the fetus to polycyclic aromatic hydrocarbons associated with fetal growth retardation [9,10]. Furthermore, meat intake during pregnancy is associated with several adverse health outcomes for infants and children including developing brain tumors, allergies, rhinoconjuctivitis, and eczema [11-14]. Vegetarians, especially vegans, may have a higher risk for some nutrients including vitamin B12 and iron. If such deficiencies are developed in pregnancy, they may increase the risk of a low birth weight in neonates. Thus, health professionals should educate pregnant vegetarian women about the best ways to prevent these deficiencies from developing.

Acknowledgments

The author would like to thank all school and church officials in helping with data collection. We also would like to thank parents and children for participating in this research.

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