

**Proposal Title:** The Association between Vegan Dietary Lifestyle, Non-Modified Diets, and Elevated Cortisol Levels in Primigravida African American Women

**Group Members:** James C.  
Montes C.  
Morgan S.  
Nesbeth M.  
Richmond D.

**Class/Section:** HSC 4730 – 0005

**Class Semester (Year):** Spring (2024)

**Group Number:** 3

## Comparison of Veganism and Cortisol Levels in Primigravida African American Women

### **Abstract**

**Introduction/Background:** Veganism is the practice of abstaining from the use and consumption of animal meat and their byproducts. Cortisol is a hormone found naturally in the body produced by the adrenal glands that contribute to functions relating to stress, metabolism, and immune response.<sup>5</sup> According to the CDC, African American women have the highest maternal mortality rate among all ethnicities.<sup>7</sup>

**Purpose statement:** This study aims to determine an association between a vegan dietary lifestyle and decreased cortisol levels in primigravida African-American women.

**Methods:** An experimental study that is conducted with 100 primigravida African-American women, 50 women will be partaking in a vegan diet, and 50 women will be partaking in a non-modified diet. If there are women in the group who could not get pregnant within a specific time, they will be moved into a third group. Each group will go through a series of blood tests to measure serum cortisol levels throughout their pregnancy until they give birth. Participants will also be partaking in de-stressing activities to promote wellness and mitigate the effects of psychosocial stressors.

**Hypothesis/Hypotheses:** It is expected to find lower cortisol levels among the primigravida African-American women who partake in the vegan dietary lifestyle during gestation.

**Future Implications:** High levels of cortisol during pregnancy can lead to disruption in fetal development which can negatively impact the child as they grow and mature.

**Keywords:** veganism; primigravida; cortisol; african-american; dietary lifestyle

## Introduction

Many physiologic changes occur in a woman's body during pregnancy, such as the release of hormones, milk production, and much more. However, there are certain hormones that should be limited when pregnant, such as cortisol, which can lead to negative health impacts on fetal and maternal health.<sup>1</sup> Because of this, it is important for us to understand other factors that could potentially lead to an increase in these cortisol levels among primigravida women or first-time pregnancy.<sup>2</sup> One such example is the influence of diet on maternal cortisol levels.

## Background

Cortisol is a glucocorticoid hormone that is produced and released by the adrenal glands.<sup>3</sup> It is crucial for homeostasis and levels can vary throughout the day. Cortisol is most commonly related to traumatic instances and has therefore been nicknamed, "the stress hormone."<sup>4</sup>

Veganism is the theory or practice of abstaining from the consumption and use of animal meat and its byproducts. This means that along with not eating the meat of the animal, products such as milk, eggs, gelatin, etc., are also not consumed. Studies have shown that animal products could nearly double serum cortisol levels, while a vegan meal had an inverse result.<sup>5</sup> It is important to note that because vegan diets lack meat, there are specific vitamins and minerals associated with protein that are not naturally ingested and need to be supplemented: calcium, iron, omega-3 fatty acids, choline, vitamin D, vitamin B-12, zinc, and protein.<sup>6</sup>

## Conceptual Model

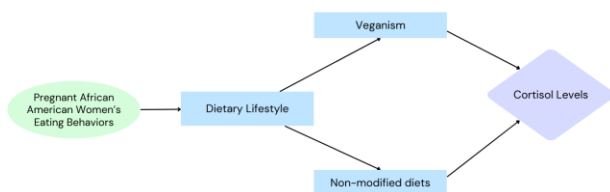


Figure 1: Conceptual Model.

It has been proven that African American women have an increased mortality risk than other races. According to the CDC, African American women are over three times likelier to die from pregnancy-related causes than Caucasian women.<sup>7</sup> There are possible reasons for this such as variations in quality health care, underlying chronic conditions, structural racism, and implicit bias.<sup>7</sup>

The current state of evidence reveals that African American women have the highest prenatal cortisol levels among all races.<sup>8</sup> Cortisol studies have been conducted but did not take into account the number of pregnancies that the test subjects have had prior to that specific study. Women may feel less anxious if they have had multiple pregnancies as compared to a woman who is pregnant for the first time. In addition, screening for other health conditions, which could affect cortisol levels, was not conducted. Lastly, psychosocial stressors throughout the pregnancy were not documented nor considered which could have unknowingly skewed cortisol levels.<sup>1</sup>

Alongside this, evidence also reveals that veganism is associated with reduced cortisol levels.<sup>9</sup> Studies have been done with pregnant women who have implemented a vegan diet, however, supplementation of vital

## Comparison of Veganism and Cortisol Levels in Primigravida African American Women

nutrients that can only be found in meat products, failed to be included in their diets.<sup>10</sup> This can shine a negative light on the possible benefits of a vegan lifestyle for pregnant women. To summarize the content, *Figure 1* was created to highlight the prospective flow of the study.

### **Aims**

The primary aim of this experimental study is to evaluate the differences between vegan and non-modified dietary lifestyles on cortisol levels in primigravida African American women. These values will also be compared to another group of women who are encouraged to maintain a vegan diet but did not become pregnant during the specific time frame aforementioned. It is hoped to see a decrease in cortisol levels when the participants implement a vegan dietary lifestyle compared to a non-modified diet. The correlation will provide insight on cortisol levels for healthcare providers which will allow them to make proper suggestions or adjustments when providing prenatal care. To combat the holes mentioned in the background, all of the participants will be first-time mothers only, screened for pre-existing conditions using an eligibility questionnaire/ medical records, participating in weekly de-stressing activities, as well as given daily prenatal vitamins.

### **METHODS**

#### **Design**

This is an experimental study. The intent is to figure out the relationship between fluctuations in cortisol levels and vegan diets.

#### **Setting**

The target population will be recruited from The Women's Center of Orlando. If women of the target population come into the office with an interest in becoming pregnant and participating in the study, the physician will then have them sign a consent form and fill out an eligibility questionnaire.

#### **Sample**

This population will include one hundred women 18-34 years of age who identify as African-American and who have yet to become pregnant.

#### **Groups**

A simple random sampling method will be used to determine who will be included in the non-modified vs. vegan dietary group. There are three main groups in this study. Group A is the individuals who are pregnant and partaking in a vegan diet. Group B consists of participants who are pregnant and partaking in a non-modified diet. Lastly, Group C are individuals who did not initially conceive during the first month of the study.

#### **Protocol**

Once the consent form and eligibility questionnaire have been received, eligible applicants will be determined and they will be able to sign a records release to cross reference and ensure that the data that they have given is indeed accurate. Group A will have blood work done before they start their vegan diet. The control groups will also have their blood work drawn at the same time.

## Comparison of Veganism and Cortisol Levels in Primigravida African American Women

Group A will follow a vegan dietary lifestyle for at least 1 week before trying to conceive naturally. If participants in Group A cannot get pregnant within one month of starting the vegan diet, they will be moved to Group C. If a participant in Group B cannot get pregnant within 1 month of the initial blood work, they will be moved to Group C containing both vegan and non-modified diets. A recommended vegan meal plan will be given to those moving from Group A to ensure they are maintaining a vegan diet for this study.

Once participants are pregnant, they will go through an initial questionnaire regarding stress levels and give a blood sample to test serum cortisol levels. The blood test will be taken every trimester, so a total of four blood samples before they give birth, to test for potential changes in cortisol levels throughout their pregnancy.

Group A will be given the option between four different de-stressing activities to be completed once weekly at a given time and day. These activities include yoga, meditation, swimming, and general exercise. Groups B and C will also complete de-stressing activities once a week, at different times from Group A to prevent potential bias. Groups A and B will be provided prenatal supplementation, including essential vitamins and minerals, throughout their pregnancy to reduce the risk of neural tube defects in the fetus and to ensure that the participants are given equal opportunities for normal development. A stipend of \$50 biweekly will be given to groups A and C, to help offset potential cost increases associated with a vegan dietary lifestyle. To encourage completion of the study, an incentive will be given. The remaining participants will receive a visa gift card of \$250.

### **Measures**

All groups will receive a blood test to measure their serum cortisol levels once every trimester (months 1, 4, and 7). This test will show the potential association between following a vegan dietary lifestyle and how their cortisol levels may decrease throughout their pregnancy. In a nonpregnant adult, cortisol levels are typically between 0-25 µg/dL.<sup>11</sup> In the first trimester it can range from 7-19 µg/dL, in the second trimester 10-42 µg/dL, and in the third trimester 12-50 µg/dL.<sup>11</sup>

Before conceiving and during the first month of every trimester (months 1, 4, and 7), all groups will fill out *The Perceived Stress Scale*.<sup>12</sup> This will demonstrate any possible contribution to elevated cortisol levels that isn't due to changes in diet. *The Perceived Stress Scale* is a five-point Likert scale with ten questions. Participants have the option of answering with: never, almost never, sometimes, fairly often, and very often which corresponds to a number 0-4 respectively. At the end of the questionnaire, participants and researchers are able to add up their scores which allows them to measure their level of stress.

### **Data Handling Procedures**

Overall, the aim of this experiment is to increase awareness of the importance of measuring cortisol levels in pregnant African American women and how significant changes in these levels can negatively affect fetal development. For each group, the results will be trichotomized with numbers 1-3. For group A, one (1) would signify that there is a decrease in cortisol levels when engaging in a vegan dietary lifestyle. Two (2) would indicate that there was no change in cortisol levels when engaging in a vegan dietary lifestyle. Three (3) would show an increase in cortisol levels when partaking in the vegan dietary lifestyle. The three groups will have their own trichotomy of results to promote organization and easier comparison among other groups.

### **Analytic Plan**

The plan is to use repeated measures of Analysis of Variance (ANOVA) to account for the association between intervention group A, control groups B and C, as well as the multiple time points of data collection in each trimester. The main outcome of interest within this study is to assess a potential decrease in serum cortisol levels, due to a vegan diet, starting from conception to delivery of the baby. The dependent variable in this study is serum cortisol levels (e.g. increased, decreased, or remained the same).

The possible confounders encountered within this study were socioeconomic status and excessive consumption of processed foods. The plan is to address socioeconomic status by providing delivered groceries and virtual de-stressing activities for women without transportation due to lowered socioeconomic status. It is also planned to combat excessive consumption of processed foods among the exposure group by providing a recommended meal plan.

### **Expected Results**

Based on findings of elevated cortisol secretion in both meat and dairy consumption, it is hypothesized that participants who incorporated a vegan diet during their pregnancy would experience lower serum cortisol levels compared to those who did not modify their diets. After reviewing numerous peer-reviewed articles, it was determined that maternal diets high in meat contributed to elevated blood pressure and hypersecretion of cortisol.<sup>13</sup> These effects would coincide with findings of elevated serum cortisol levels. Similarly, in another study, it was found that food sources containing  $\gamma$ -aminobutyric acid (GABA) lead to the secretion of cortisol by the adrenal cortex.<sup>14</sup> Fermented milk is known to be a natural source of GABA.

### **Study Limitations**

Three different study limitations were identified which include external influences, participant compliance, and dietary assessment. Other factors beyond diet, such as physical activity levels, sleep quality, and psychosocial stressors, could influence cortisol levels. Controlling these external influences is important in isolating the effects of the vegan dietary lifestyle. Ensuring participant compliance with assigned dietary interventions for the study may be challenging. Factors such as dietary preferences, cultural influences, and social support networks could affect adherence to the assigned vegan diet, potentially confounding the results. Accurately assessing dietary intake in a research setting can be difficult, particularly when relying on self-report measures. Participants may underreport or misreport their dietary intake, which could affect the validity of the dietary data collected.

### **Ethical Principles**

The research will be performed safely through the use of informed consent which would be provided by the physician for the use of their health information and records. After informed consent, the participant will be given the choice to continue the experimental process if desired. Records will be kept confidential to promote patient privacy within the study. If the participant has any concerns, the physician may refer them to the researchers to ensure they are fully aware of the expectations of the study.

### **Future Implications**

The results of this study can help doctors provide better prenatal care to primigravida African-American women. The findings of this study can be sourced into the pamphlet that all pregnant women will receive at the beginning of their pregnancy. This newfound information can help these women decide whether or not this dietary lifestyle is beneficial for them. The results of this study can also be used to make meal plans for pregnant women so they can be able to easily implement the vegan diet into their daily routine. Although this study focuses on African-American women who are pregnant for the first time, the findings of this study can encourage research to be done on other races/ethnicities to evaluate their stress levels during pregnancy.

## Comparison of Veganism and Cortisol Levels in Primigravida African American Women

### **Works Cited**

1. Nath A, Murthy GVS, Babu GR, Di Renzo GC. Effect of prenatal exposure to maternal cortisol and psychological distress on infant development in Bengaluru, southern India: a prospective cohort study. *BMC Psychiatry*. 2017;17(1). doi:<https://doi.org/10.1186/s12888-017-1424-x>
2. Danish N, Nasreen A, Fawad A, Nasreen A, Fawad A. Assessment of pregnancy outcome in primigravida: Comparison between booked and un-booked patients. *Journal of Ayub Medical College, Abbottabad : JAMC*. Accessed April 14, 2024. <https://pubmed.ncbi.nlm.nih.gov/21702258/>.
3. Cleveland Clinic. Cortisol: What It Is, Function, Symptoms & Levels. Cleveland Clinic. Published October 12, 2021. <https://my.clevelandclinic.org/health/articles/22187-cortisol>
4. Mayo Clinic. Chronic stress puts your health at risk. Mayo Clinic. Published March 19, 2019. <https://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/stress/art-20046037#:~:text=Cortisol%2C%20the%20primary%20stress%20hormone>
5. Cortisol | Health Topics | NutritionFacts.org. nutritionfacts.org. Accessed April 14, 2024. <https://nutritionfacts.org/topics/cortisol/#:~:text=A%20single%20meal%20containing%20animal>
6. American College of Obstetricians and Gynecologists. Nutrition During Pregnancy. www.acog.org. Published 2022. <https://www.acog.org/womens-health/faqs/nutrition-during-pregnancy>
7. Centers for Disease Control and Prevention. Working together to reduce black maternal mortality. www.cdc.gov. Published April 3, 2023. <https://www.cdc.gov/healthequity/features/maternal-mortality/index.html>
8. Suglia SF, Staudenmayer J, Cohen S, Enlow MB, Rich-Edwards JW, Wright RJ. Cumulative stress and cortisol disruption among Black and Hispanic pregnant women in an urban cohort. *Psychological Trauma: Theory, Research, Practice, and Policy*. 2010;2(4):326-334. doi:<https://doi.org/10.1037/a0018953>
9. Cosgrove K. The impact of adherence to a vegan diet on acid-base balance: : a randomized controlled trial in healthy college students. <https://keep.lib.asu.edu/items/153749>
10. Bali A, Naik R. The Impact of a Vegan Diet on Many Aspects of Health: The Overlooked Side of Veganism. *Cureus*. 2023;15(2). doi:<https://doi.org/10.7759/cureus.35148>
11. Perinatology.com. Published 2024. Accessed April 05, 2024. <https://perinatology.com/Reference/Reference%20Ranges/Cortisol.htm>
12. State of New Hampshire Employee Assistance Program. *Perceived Stress Scale*.; 1983. <https://www.das.nh.gov/wellness/docs/percieved%20stress%20scale.pdf>
13. Lowensohn RI, Stadler DD, Naze C. Current Concepts of Maternal Nutrition. *Obstetrical & Gynecological Survey*. 2016;71(7):413-426. doi:<https://doi.org/10.1097/ogx.0000000000000329>
14. Stachowicz M, Lebedzińska A. The Effect of Diet Components on the Level of Cortisol. *European Food Research and Technology*. 2016;242(12):2001-2009. doi:<https://doi.org/10.1007/s00217-016-2772-3>