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NFSC 360, Nutrition Throughout the Life Cycle

Pregnancy Project

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Assessing a 24-hour Dietary Recall of a Pregnant Woman, Are DRIs Being Met?

Introduction:

Proper nutrition during pregnancy is a major determinant for both a fetus and a child's health outcomes throughout their lifespan. Poor maternal nutrition has been linked to neonatal mortality, impaired development, chronic diseases, neural tube defects, and abnormal neonatal birth weights. Neural tube defects are not that common in developed countries, but globally, 15 - 20% of births are deemed underweight.[1] Consequently, low birthweights have a higher risk of mortality and have also been associated with an increased risk of diabetes, hypertension, intellectual disabilities, and obesity later in life where a healthy maternal diet can help prevent these complications.

Healthy diets characterized as including vegetables, fruits, whole grains, low-fat dairy, and lean protein foods have been associated with a reduced risk of preterm deliveries.[1] Unhealthy maternal diets including Western diets, high refined grain intake, high saturated fat intake, high sugar intake and diets with processed foods have been associated with significantly lower infant birth weights ($P<0.05$).[1] This illustrates the importance of proper maternal nutrition to help prevent low birth weights and preterm deliveries.

Folate:

Some of the most important nutrients that impact fetal health include folic acid, iron, and vitamin D. Maternal folic acid deficiencies have been associated with causing neural tube, brain, and spine defects where folate plays a role in regulating nucleotide biosynthesis and methylation processes. In women with a previous pregnancy with a neural tube defect, folic acid supplementation has been associated with a 70% reduction of recurrence and a 62% reduction in

first occurrence.[2] The mechanism of how folic acid helps prevent neural tube defects is unknown, but it is crucial for the development of the brain and spinal cord. Neural tube defects are a lot less common in the United States after the 1998 folic acid fortification act which supports the benefits of folic acid consumption in pregnant women.

Iron:

Increased maternal dietary needs poses a higher risk of iron deficiency anemia in the mother and poses a threat to adversely affect neonatal health. Iron deficiency anemia has been associated with significantly higher risks of low birth weights, preterm births, perinatal mortality, and neonatal mortality ($P<0.05$)[3]. The recommended iron intake during pregnancy is around 27 mg/day which is difficult to meet through diet alone and iron supplements are often used. Prenatal iron consumption decreases the risk of low birth weights by 3% and has been shown to increase birth weight by 15.1 grams for every 10 mg increase in daily iron doses up to 66 mg per day.[4] It is recommended to take iron supplements during pregnancy where the Institute of Medicine sets an upper limit of 45 mg/day and the WHO sets it at 60 mg/day.

Vitamin D:

Vitamin D plays an important role in calcium absorption, bone health, and hormone production where maternal deficiencies can have an impact on fetal health. Vitamin D supplementation at 2000 IU/day significantly lowers the risk of small for gestational age and significantly increases birth weight ($P<0.05$).[5] Vitamin D insufficiency is very common in the United States where supplementation/fortification can be an option to help meet the needs of pregnant mothers and help reduce the risk of small for gestational age.

Previous literature expresses the importance of proper overall diet and nutrient intake to reduce the incidence of pregnancy complications. This study will assess a pregnant participant's current diet and help make dietary changes to meet increased nutrient needs. This study will demonstrate how common nutrient deficiencies are in the average pregnant person which exemplifies the need of increasing nutrition counseling access to decrease the risks of pregnancy complications.

Methods:

A pregnant woman was consciously selected to participate in this study. A 24-hour dietary recall was used to collect information about what the participant eats in a typical day. The participant was interviewed and asked questions about the foods/beverages she consumed, the time she consumed them, the brand of the product (if applicable), and an estimate of the serving sizes she consumed. Physical serving size sets such as measuring cups, tablespoons and teaspoons were used to help the participant visualize what a typical serving size looks like. The participant was also asked to provide their pre pregnancy weight, current weight, age, height, activity level, and what week of pregnancy she is in.

The data from the 24-hour dietary recall was entered into the diet analysis software, Cronometer, where the participant's age, height, current weight, pregnancy status, and consumed foods/beverages were entered. The Cronometer software tracks macronutrient, calorie, mineral, and vitamin intake based on the foods/beverages consumed and compares the amount consumed to the daily recommended intake (DRI) individualized to her age, height, and pregnancy status. After areas of deficiencies were identified, a new dietary plan was created to help meet some the

participant's nutritional needs. The food/beverage changes made were entered into the Cronometer software and diet was reassessed.

Results:

Energy and Macronutrient Intake:

Consumption of minerals, vitamins, energy, and macronutrient intakes were compared to DRIs in relation to the participant's height, weight, and pregnancy status. Initially, the participant was consuming 64% of her recommended energy needs, 53% of her protein needs, 55% of her carb needs, and 75% of her fat needs (figure 1). After a diet adjustment the participant would be consuming 97% of her recommended energy needs, 99% of her protein needs, 77% of her carb needs, and 111% of her fat needs (figure 2).

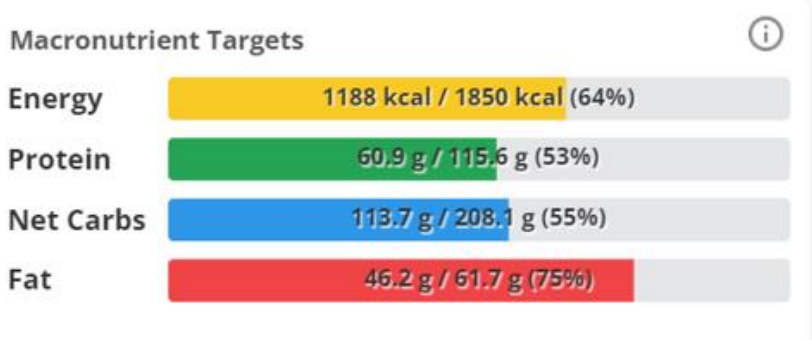


Figure 1: **Initial Energy and Macronutrient Intake.** Food reported from the 24-hour dietary recall was entered into Cronometer. Energy, protein, carb, and fat intakes are displayed as percentages of the DRIs met.

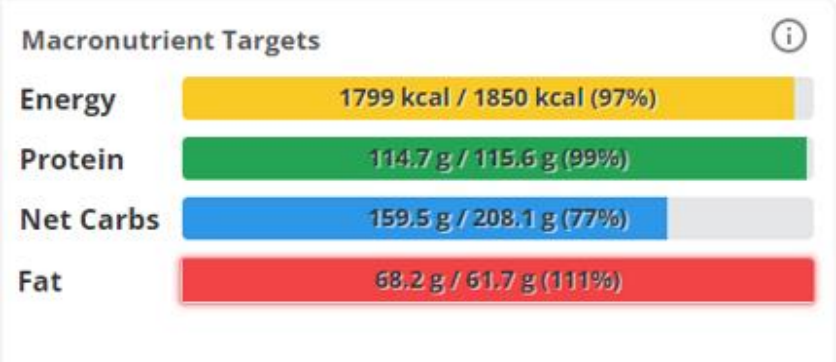


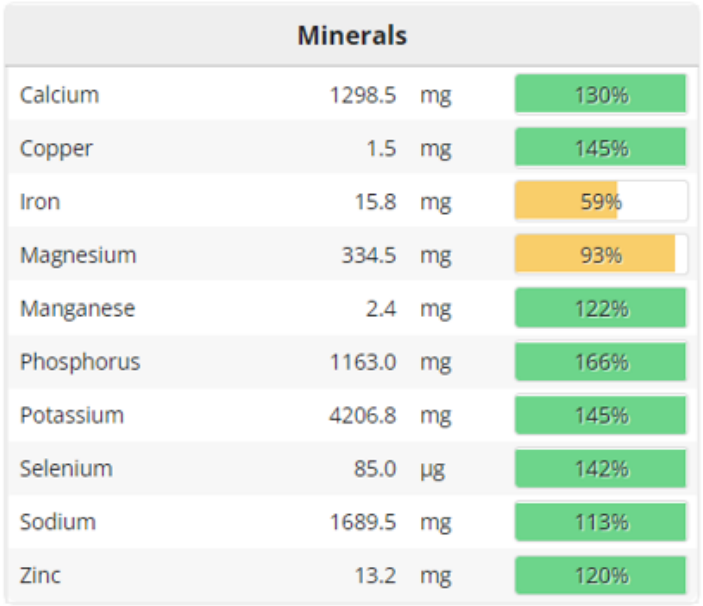
Figure 2: **New Energy and Macronutrient Intake After Diet Adjustment.** The proposed diet changes were entered into Cronometer. Energy, protein, carb, and fat intakes are displayed as percentages of the DRIs met.

Mineral Intake:

Initially, the participant was deficient in calcium, copper, magnesium, iron, manganese, sodium, and zinc and was only meeting the DRIs for phosphorus, potassium, and selenium (figure 3). After the proposed diet adjustment, the participant would still be deficient in iron and magnesium, but will meet the needs of all other minerals (figure 4).

Minerals			
Calcium	792.3	mg	79%
Copper	0.9	mg	93%
Iron	8.8	mg	33%
Magnesium	222.1	mg	62%
Manganese	1.1	mg	54%
Phosphorus	864.3	mg	123%
Potassium	3022.6	mg	104%
Selenium	77.8	µg	130%
Sodium	1274.7	mg	85%
Zinc	6.9	mg	63%

Figure 3: **Initial Mineral Intake**. Food reported from the 24-hour dietary recall was entered into Cronometer. Mineral intakes are displayed as percentages of the DRIs met.



Minerals			
Calcium	1298.5	mg	130%
Copper	1.5	mg	145%
Iron	15.8	mg	59%
Magnesium	334.5	mg	93%
Manganese	2.4	mg	122%
Phosphorus	1163.0	mg	166%
Potassium	4206.8	mg	145%
Selenium	85.0	µg	142%
Sodium	1689.5	mg	113%
Zinc	13.2	mg	120%

Figure 4: **New Mineral Intake After Diet Adjustment**. The proposed diet changes were entered into Cronometer. Mineral intakes are displayed as the percentages of the DRI met.

Vitamin Intake:

Initially, the participant was deficient in Vitamins B3, B5, B6, B12, folate, vitamin D and vitamin E (figure 5). All other vitamin DRIs were sufficiently met. After the proposed diet adjustment, the participant would be deficient in vitamins B5, D and E but all other vitamin DRIs would be met (figure 6).

Vitamins			
B1 (Thiamine)	1.7	mg	121%
B2 (Riboflavin)	1.6	mg	112%
B3 (Niacin)	13.7	mg	76%
B5 (Pantothenic Acid)	4.2	mg	71%
B6 (Pyridoxine)	1.3	mg	66%
B12 (Cobalamin)	2.2	µg	84%
Folate	443.7	µg	74%
Vitamin A	6798.7	IU	265%
Vitamin C	182.1	mg	214%
Vitamin D	196.8	IU	33%
Vitamin E	3.3	mg	22%
Vitamin K	90.0	µg	100%

Figure 5: **Initial Vitamin Intake.** Food reported from the 24-hour dietary recall was entered into Cronometer. Vitamin intakes are displayed as the percentages of the DRIs met.

Vitamins			
B1 (Thiamine)	2.3	mg	164%
B2 (Riboflavin)	2.3	mg	163%
B3 (Niacin)	27.8	mg	154%
B5 (Pantothenic Acid)	5.0	mg	84%
B6 (Pyridoxine)	2.3	mg	123%
B12 (Cobalamin)	4.4	µg	168%
Folate	744.0	µg	124%
Vitamin A	8000.1	IU	312%
Vitamin C	211.8	mg	249%
Vitamin D	236.7	IU	39%
Vitamin E	7.7	mg	52%
Vitamin K	91.3	µg	101%

Figure 6: **New Vitamin Intake After Diet Adjustment.** The proposed diet changes were entered into Cronometer. Vitamin intakes are displayed as the percentages of the DRI met.

Discussion:

Results from the 24-hour dietary recall reveal that the participant is undereating calories, macronutrients, vitamins and minerals. Previously, the participant was just not eating enough food and not enough variety of food to meet her DRIs. Our main goal when creating a new dietary plan was to ensure the participant is consuming vegetables, fruits, whole grains, low-fat dairy, and lean protein foods to decrease the risk of premature births and low birth weights.[1] We

also wanted to focus on adding more vitamin and mineral sources to the participant's diet to help reduce the risk of pregnancy complications.

Macronutrient and Energy Consumption:

Initially, the participant was deficient in calories, protein, carbs, and fats (figure 1). To help meet her caloric needs, adding foods higher in healthy fats to the participant's diet would likely be an effective strategy since they are more calorically dense than carbs and fats. We proposed adding walnuts and almonds to her diet to help increase her caloric intake while also adding some protein, omega 3, and omega 6 fatty acids. Greek yogurt and a serving of chicken breast were added as a lean protein source to increase her protein needs while also providing more minerals. We decided to swap out her refined bread with 100% whole wheat bread to help increase her fiber intake and help meat meet the dietary guideline recommended intake of whole grains. Lastly, we added Honey Nut Cheerios to her breakfast to help increase her carbs, fiber, and aid in meeting vitamin and mineral requirements.

We were able to roughly meet her protein, fat, and calorie requirements but this diet adjustment did not meet the carbohydrate DRI. However, we did go over the DRI for fat by 11% so we can possibly exchange the pork cutlet in her diet for a leaner meat and more carbs. We wanted to ensure that the participant was meeting her protein and calorie needs to support her anabolic needs where carb intake was not much of a concern. Overall, adherence to the new diet plan would be a better alternative than her previous diet since she is meeting her macronutrient and energy needs more efficiently.

Mineral Intake:

Initially, the participant was deficient in calcium, copper, magnesium, iron, manganese, sodium, and zinc (figure 3). Adding Greek yogurt to the participant's diet helped meet her calcium needs. Adding walnuts and almonds helped meet her copper and manganese requirements and 93% of her magnesium requirements. Adding fortified Honey Nut Cheerios greatly contributed to her zinc, manganese, and iron intakes and also helped meet her needs in 7 other minerals. After a diet adjustment our participant was slightly deficient in magnesium and still 40% deficient in iron.

We were not worried about the slight magnesium deficiency since there is no evidence to support magnesium supplementation to improve maternal and neonatal/infant health outcomes.[6] However, we were concerned about her iron deficiency since the participant is at risk of iron deficiency anemia which can significantly increase risks of low birth weights, preterm births, perinatal mortality, and neonatal mortality ($P<0.05$).[3] We recommend the participant to take iron supplements where up to 66 mg/day can be safe for pregnant women without any underlying conditions.

Vitamin Intake:

Initially, the participant was deficient in Vitamins B3, B5, B6, B12, folate, vitamin D and vitamin E (figure 5). Adding chicken breast to the participant's diet helped meet her vitamin B3 and vitamin B6 levels. Adding fortified Honey Nut Cheerios to her diet helped her meet her vitamin B6, B12, and folate levels. However, the participant was still not meeting her vitamin B5, vitamin D and vitamin E levels with the new diet plan. Her prior diet was meeting 22% of her vitamin E needs and adding almonds to her diet will increase her intake to 52%.

Vitamin E supplementation has been associated with a deceased risk of placental disruption but was not associated with stillbirths, neonatal deaths, pre-eclampsia, and preterm births.[7] Vitamin E supplementation might want to be considered for overall health and to reduce her chances of pregnancy complications. With her new diet, the participant is consuming 84% of her vitamin B5 DRI. We are not too concerned about this since there is no evidence of vitamin B5 deficiencies causing any pregnancy complications and she is only deficient by 16% compared to 29% in her previous diet. Her vitamin D deficiency is concerning, and we were only able to increase her intake by 6% with our new diet adjustment. Getting vitamin D directly from the sunlight is an option to help meet her needs while supplementing up to 2000 IU/day is effective at significantly reducing the risk of small for gestational age and significantly increasing birth weight ($P<0.05$).[5]

Conclusion:

In conclusion, our pregnant participant's previous dietary intake revealed that she was deficient in protein, carbs, fats, calories, calcium, copper, magnesium, iron, manganese, sodium, zinc, vitamins B3, B5, B6, B12, folate, vitamin D and vitamin E. After the proposed diet changes our participant would meet most of her dietary needs except for carbs, iron, magnesium, vitamin B5, E and D. This is a huge improvement, but supplementation is still recommended, especially for iron. This study demonstrates how important it is for pregnant women to meet with a health care professional for nutrition counseling to help prevent nutrition-related pregnancy complications. Limitations in this study include the self-reported 24-hour dietary recall where the participant may not want to share some foods/beverages she consumed to avoid any stigma. Serving sizes reported will vary compared to the actual amounts consumed and will likely vary day to day. We are also assuming that the participant will be compliant to the new proposed diet.

Further research can focus on the efficacy of nutrition counseling to help express its importance at reducing pregnancy complications.

References:

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NFSC 360

Actual

24-Hour Dietary Recall

First Name: Madoka
Age: 33 years old
Ht: 166 cm (5.5 ft)
Wt: 64.5 kg (141.9 lb)
Prepreg Wt: 53 kg (116.6 lb)

Date: March 9th, 2021
Day of week of recall: Tuesday
Is this a typical day? yes.
Week of pregnancy: 36th weeks
Activity level: 1.3 (light active)

Time	Amount	Food/Drink	Details: Brand, Recipe, Preparation, etc.
7 am	8 oz	raspberry tea	yogi, prepared with tap water
7:15 am	1 cup	milk	whole milk
	100 g	yogurt	plain, whole milk
	1 thick slice (½)	white bread	store bought, toasted, served with cream cheese
	½ tbsp	cream cheese	
10 am	8 oz	black tea	starbucks, prepared with distilled water
12 pm	1 tbsp	Bagna Cauda	store bought, served with fresh vegetables
	3 each	baby carrots	fresh
	2 sticks (4" long)	cucumber	fresh
	3 sticks (4" long)	daikon	fresh
	2 small leaves	cabbage	fresh
	2 pieces	Pork cutlet sandwich	homemade
	1 thick cut (½ cup)	pork cutlet	deep fried, store bought
	2 slices	white sandwich bread	thin slice
	1 tbsp	katsu sauce	spread on bread, Otafuku
	10 oz	barley tea	prepared with tap water
3 pm	1	Mandarin	fresh, small size
	10 oz	barley tea	prepared with tap water
7:30 pm	1.5 cups	Ratatouille	homemade
	2 tsp	olive oil	
	¼ cup	eggplant	slice all vegetables and bake with olive oil, bay leaf, consomme powder, salt and pepper
	¼ cup	zucchini	
	¼ cup	bell peppers	
	¼ cup	tomato	
	1 leaf	bay leaf	

NFSC 360

24-Hour Dietary Recall

First Name: Madoka
Age: 33 Years
Ht: 166 cm
Wt: 64.5 kg
Prepreg Wt: 53 kg

Date:
Day of week of recall:
Is this a typical day?
Week of pregnancy:
Activity level: 1.3 (light activity)

Time	Amount	Food/Drink	Details: Brand, Recipe, Preparation, etc.
7:00 AM	12 oz	rasberry tea	Yogi
7:15 AM	1 cup	Milk	Whole milk
	100 g	Yogurt	Plain, whole milk
	1 Cup	Honey Nut Cheerios	General Mills
	2 slices	100% whole wheat bread	Winco
	1/2 tbsp	Cream cheese	
10 am	12 oz	Black tea	Starbucks
	1/4 cup	Walnuts and almonds mix	Winco
12 pm	1 tbsp	Bogna Couda	Store bought
	3	Baby carrots	Fresh
	Two 4" sticks	Cucumber	Fresh
	Three 4" sticks	Daikon	Fresh
	2 small leaves	Cabbage	Fresh
	1/2 cup	Pork cutlet	Store bought
	2 slices	100% whole wheat bread	Winco
	1 tbsp	katsu sauce	Ozajoy
	12 oz	Barley tea	Prepared with tap water
3 pm	200 g	Greek yogurt	Winco
	2	Mandarin	
	12 oz	Barley tea	Prepared with tap water
7:30 pm	2 tsb	Olive oil	
	1/4 cup	Eggplant	Fresh
	1/4 cup	Zucchini	Fresh
	1/4 cup	Bell peppers	Fresh
	1/4 cup	Tomatoes	Fresh

NFSC 360

Time	Amount	Food/Drink	Details: Brand, Recipe, Preparation, etc.
	1 leaf	Bay leaf	Fresh
	50 grams	Chicken breast	Homemade
9:00 PM	12 oz	Sleepytime tea	Celestial Seasonings

Rubric for Pregnancy Project (ATTACH THIS TO FINAL WORK)

Category	Excellent work	Good work	Under-developed work	Lacking
TITLE: Appropriate, concise and specific enough to describe the content of the paper	5 4	3	2	≤ 1
INTRODUCTION: Make a case and effectively convinces the reader why the project is important. Concise literature review. State the objective(s) of the project.	10 9	8	7	≤ 6
METHODS AND MATERIALS: Provides sufficient detail in a logical fashion. Be specific with the names of instruments or tools used for data collection.	15 14	13 12	11 10	≤ 9
RESULTS: • Include filled-out 24-hour dietary recall questionnaires of current and improved diet • Effectively summarize the results for current and revised diet in tables, graphs or text. Table and graphs are appropriate. Title is presented for each table and graph. • All information are present in the 24-hour recall page. Precision: contains specific dietary detail • Include bar graphs of current diet, and new and improved menu. Precision: contains the appropriate RDA/AI for pregnant woman • New menu realistic and not too different from usual diet. Nutrient quality improved in the new diet.	25 24 23	22 21	20 19 18	≤ 17
DISCUSSION: • Reasonable and insightful arguments. • Discusses nutritional adequacy and justifies food substitutions. Include discussion of weight and kcal intake if needed. • Accuracy: all statements are factually correct and/or supported by evidence. • Precision: contains specific information on nutritional adequacy. • Depth: explains reasons for recommendations, acknowledges the complexity of nutrient analyses and limitations of this project. • Generally, interprets results well without ambiguity.	25 24 23	22 21	20 19 18	≤ 17
CONCLUSION: Effectively summarizes main findings and relevance of study.	5 4	3	2	≤ 1
REFERENCES: Follow the Journal of the Academy of Nutrition and Dietetics reference format. Minimum of 5 references. Provide in text citation and corresponding reference list. Statement of fact backed with references.	5 4	3	2	≤ 1
WRITING QUALITY: Follow all the guidelines. Provide cover page, logical flow of thought- the line of reasoning makes sense and follows from the facts. Use of transitions effectively, readability, headings/sub-headings, makes few or no typographical, spelling, and/or grammatical errors. Pay attention to grammar. Blank evaluation rubric (this page) attached to final work.	10 9	8 7	6	≤ 5
Total points: **Out of 100**				