Factors Influencing Gastrointestinal Microbiota during Pregnancy

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INTRODUCTION

- Pregnancy is a period characterized by changes in the maternal hormonal and metabolic systems necessary to maintain the pregnancy and meet the demands of the developing fetus.¹
- Inadequate physiologic adjustments can lead to adverse pregnancy outcomes that have implications for the short- and long-term health of the mother and the baby.²-⁶
- The gastrointestinal (GI) microbiota is increasingly studied to be involved in maintaining physiologic homeostasis.⁷-⁸

PURPOSE

- To present the state of the current evidence related to factors that are associated with the structure, and subsequently function
- To suggest the use of GI microbiota as a therapeutic target to improve pregnancy outcomes.

GASTROINTESTINAL (GI) MICROBIOTA

GI Microbiota

- 100 trillions of microbes, rich and diverse.⁹-¹¹
- Regulate inflammatory pathways, glucose metabolism, insulin resistance, adiposity.¹²,¹³
- Contribute to synthesizing vitamins and antioxidants.¹⁴-¹⁷

GI Microbiota during Pregnancy

- Functions of GI microbiota are relevant to pregnancy outcomes.²-⁴
- Microbial composition shift from one that is similar to normal adults to those found in patients with metabolic syndrome.¹⁸-²⁰
- Alpha-diversity drops, Beta-diversity increases.¹⁹

FACTORS INFLUENCING GI MICROBIOTA

Demographics

- **Age**: Alpha-diversity is “n” shaped—high in adulthood and low in childhood and old age. Beta-diversity is “u” shaped.¹⁴,²¹
- **Race/Ethnicity**: Microbial distribution differs across Asian, Black, Mexican, Puerto Rican, and White in U.S.²²-²⁴
- **Geographical location**: Microbial composition differs across adults in Columbia, Venezuela and Malawi, U.S., Europe, and Asia.¹⁴,²³,²⁵,²⁶

Health Characteristics

- **Diet**: Fat in maternal diet prior to and during pregnancy modulates microbial structure, to one that favors lipid and glucose metabolism.¹⁹
- **BMI**: Alters diversity and relative abundance of specific types of microbiota.²⁷-²⁹ Pre-pregnancy BMI correlates with differences in density.¹⁸
- **Dietary supplements**: Probiotics and Fe₂ supplementation changes the microbial composition to one that is more pathogenic.³⁰-³²
- **Antibiotic use**: Type and duration are associated with decreased diversity.³³-³⁸

Genetics and Genomics

- Monozygotic twins have similar GI microbial composition compared to dizygotic twins.³⁹

Environmental Factors

- Microbiota coat all organic and inorganic surfaces (e.g. indoors/outdoors environments and animals/pets).⁴⁰,⁴¹

FUTURE IMPLICATIONS

Clinical

- Understand the implications that GI microbiota has for disease and wellness to clinically address them
- Consider factors that can adversely influence GI microbiota when taking care of pregnant women
- Pursue opportunities to learn more about structure and function of GI microbiota

Research

- Use multi-omics approach to study the functions of GI microbiota
- Collaborate across disciplines
- Use larger cohort study to increase power
- Cautiously implement interventions

Education

- Incorporate information regarding implications of human genome and human microbiome on human health to nursing curriculum

GLOSSARY

- **Microbiota**: Micro-organisms, such as bacteria, virus, fungi, archaea, protozoa. Majority of microbiota found on human body is bacteria
- **Microbiome**: Collective microbiota from different parts of the body or collective genome of microbiota (microbial genes)
- **Composition of GI microbiota**: Types of microbiota that comprise a fecal sample
- **Diversity of GI microbiota**: Abundance and proportionality of different types of microbiota
  - **Alpha-diversity**: within sample or subjects
  - **Beta-diversity**: between sample or subjects

This study was supported by the National Institute of Nursing Research (1R01NR014826).