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## A COMPARATIVE STUDY OF THE DEVELOPMENT PATTERN OF BREAST-FED AND FORMULA-FED INFANTS IN RIVERS STATE: STUDYING THE ADVANTAGES AND DISADVANTAGES OF EACH

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By

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### ABSTRACT

*A comparative study on the development pattern of breast-fed and formula-fed infants in Rivers State was carried out studying the advantages and disadvantages of each. The study revealed that Breast milk is uniquely tailored to meet the nutritional needs of infants. It contains an ideal balance of proteins, fats, carbohydrates, vitamins, and minerals, ensuring proper growth and development. The study found out that breastfeeding has a positive impact on cognitive development. Certain nutrients in breast milk, such as omega-3 fatty acids, have been linked to improved brain development and cognitive function. Formula milk is formulated to mimic the nutritional composition of breast milk. It typically contains a mix of proteins, fats, carbohydrates, vitamins, and minerals to support the baby's growth. While breast milk is a natural source of nutrition, its composition can vary based on the mother's diet and health status: Formula milk might be harder for infants to digest compared to breast milk. It can lead to issues such as constipation or diarrhea. The study concluded that while breastfeeding offers unique immunological benefits and fosters maternal-infant bonding, formula feeding provides a practical alternative for mothers facing challenges. The findings underscore the importance of informed decision-making, recognizing that individual circumstances may influence the choice between breast milk and formula. The study recommended that comprehensive and accessible education on the benefits of breastfeeding, should be encouraged addressing common concerns and misconceptions. This can empower mothers to make informed choices and foster a supportive environment for breastfeeding.*

**KEYWORDS:** Development Pattern, Breast-Fed Infants, Formula-Fed Infants, Advantages, Disadvantages and Rivers State.

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### INTRODUCTION

The early stages of infant development are crucial, laying the foundation for lifelong health and well-being. One of the pivotal decisions parents face is whether to breastfeed or formula-feed their infants. The choice between breast milk and formula has far-reaching implications for the child's growth, immunity, and cognitive development. This comparative study seeks to delve into the distinct developmental patterns of breast-fed and formula-fed infants, examining the advantages and disadvantages associated with each feeding method.

Breastfeeding has long been acknowledged as the gold standard for infant nutrition, offering a myriad of benefits. Breast milk is a complex fluid containing a perfect balance of nutrients, antibodies, and hormones tailored to meet the specific needs of a growing infant. Numerous studies highlight the immunological advantages of breastfeeding, providing infants with passive immunity and protection against infections and chronic diseases (Victoria et al., 2016). Moreover, breastfeeding fosters a unique bonding experience between mother and child, enhancing emotional and psychological development (World Health Organization, 2021).

On the contrary, formula feeding provides an alternative for mothers who may face challenges with breastfeeding. Infant formula has evolved to closely mimic the nutritional composition of breast milk, yet subtle differences persist. This study aims to investigate the potential disparities in developmental outcomes between breast-fed and formula-fed infants, considering factors such as growth milestones,



cognitive abilities, and susceptibility to infections. While breast milk offers numerous advantages, it is essential to acknowledge that not all mothers can or choose to breastfeed. Formula feeding has its merits, providing a practical solution for mothers who face medical, personal, or logistical challenges associated with breastfeeding. Understanding the developmental consequences of both feeding methods is critical for informed decision-making among parents and healthcare providers.

By synthesizing existing research, this study will contribute to a comprehensive understanding of the developmental patterns associated with breastfeeding and formula feeding. Recognizing the advantages and disadvantages of each feeding method is crucial for parents and healthcare professionals to make informed decisions that prioritize the well-being of infants. As society continues to evolve, so too should our understanding of infant nutrition and its implications for early childhood development.

## STATEMENT OF PROBLEM

There has been debates on method of feeding infants are more appropriate, whether the breast milk or formula milk. It is factual that the two methods play a very important role in the he life of the children. By examining various developmental markers, including cognitive, physical, and immunological aspects, this research seeks to provide a comprehensive understanding of how different feeding practices impact infant growth and well-being in this specific geographical context. For this reason, this study aims to compare the developmental pattern trajectories of breast-fed and formula-fed infants in Rivers State, exploring the multifaceted advantages and disadvantages associated with each feeding method.

## OBJECTIVES OF THE STUDY

- To find out the development pattern advantages of breast milk to breast-fed infants.
- To examine the development pattern advantages of formula milk to formula milk-fed infants.
- To determine the development pattern disadvantages of breast milk to breast-fed infants.
- To assess the development pattern disadvantages of formula milk to formula milk-fed infants.

## RESEARCH QUESTIONS

- What are the development pattern advantages of breast milk to breast-fed infants?
- What are the development pattern advantages of formula milk to formula milk-fed infants?
- What are the development pattern disadvantages of breast milk to breast-fed infants?
- What are the development pattern disadvantages of formula milk to formula milk-fed infants?

## LITERATURE REVIEW

### CONCEPT OF DEVELOPMENT PATTERN

The development pattern of infants is significantly influenced by their nutrition, whether they are fed breast milk or formula milk. Both breast milk and formula milk are designed to provide essential nutrients for an infant's growth and development. Infancy is a remarkable period of rapid growth and development, laying the foundation for a child's lifelong capabilities. According to Wikipedia (2023), infant development involves the biological, psychological, and emotional changes that occur between birth and the conclusion of adolescence.

There are key aspects of development patterns in infants, encompassing physical, cognitive, and socio-emotional domains. The physical growth of infants follows a predictable pattern, although individual variations exist. From birth, infants undergo rapid changes in size, weight, length, height, and motor skills. Gross motor skills, such as rolling over, sitting, crawling, and walking, typically unfold in a sequence over the first year of life. Fine motor skills, like grasping objects and manipulating them, also progress gradually (Berk, 2018). Cognitive development in infants involves the acquisition of knowledge and the ability to understand the world around them. Infant milk contains essential fatty acids, including docosahexaenoic acid (DHA), which is crucial for brain development. Early cognitive milestones include the development of object permanence and the initiation of simple problem-solving behaviors.



Another notable aspect of the development pattern that occurs in infants is the development of emotional bonds. This begins forming in the earliest moments of life. Attachment theory, developed by John Bowlby, emphasizes the importance of establishing emotional connections with caregivers. The development of trust, as proposed by Erik Erikson, is a fundamental aspect of socio-emotional growth during infancy. Several factors influence the developmental trajectory of infants. Nutrition plays an important role in determining a child's inherent traits. Responsive caregiving, characterized by consistent and emotionally attuned interactions, fosters a secure attachment and positively influences developmental outcomes (Shonkoff et al., 2012).

Recognizing developmental patterns in infants is not only about tracking milestones but also identifying potential challenges. Early intervention and support for developmental delays or concerns are crucial. Regular pediatric check-ups, developmental screenings, and parental education programs play a vital role in ensuring that infants receive appropriate support when needed (American Academy of Pediatrics, 2021).

### **CONCEPT OF BREAST-MILK**

Breastmilk is a naturally flowing milk from the breast of an adult female mother. Wikipedia (2023) defined breast milk, or mother's milk, as milk produced by mammary glands located in the breast of a human female. Breast milk is the primary source of nutrition for newborns, containing fat, protein, carbohydrates (lactose and human milk oligosaccharides), and variable minerals and vitamins. Breastmilk is the ideal food for infants. It is safe, clean, and contains antibodies, which help protect against many common childhood illnesses. Breastmilk provides all the energy and nutrients that the infant needs for the first months of life, and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year and up to one third during the second year of life. Breastfed children perform better on intelligence tests, are less likely to be overweight or obese, and are less likely to develop diabetes later in life. Women who breastfeed also have a reduced risk of breast and ovarian cancer.

The World Health Organization (WHO) recommends that breastfeeding should begin within the first hour of a baby's life and continue as often and as much as the baby wants. Health organizations, including the WHO, recommend breastfeeding exclusively for six months, followed by continued breastfeeding with appropriate complementary foods for up to two years and beyond. This means that no other foods or drinks, other than vitamin D, are typically given.

Breastfeeding has a number of benefits for both mother and baby that infant formula lacks. Increased breastfeeding in low and medium-income countries could prevent approximately 820,000 deaths of children under the age of five annually (Victora et al. 2016). Breastfeeding decreases the risk of respiratory tract infections, ear infections, sudden infant death syndrome (SIDS), and diarrhea for the baby, both in developing and developed countries (Eglash & Leeper 2020). Other benefits have been proposed to include lower risks of asthma, food allergies, and diabetes. Breastfeeding may also improve cognitive development and decrease the risk of obesity in adulthood. Benefits for the mother include less blood loss following delivery, better contraction of the uterus, and a decreased risk of postpartum depression. Breastfeeding delays the return of menstruation and, in very specific circumstances, fertility, a phenomenon known as lactational amenorrhea. Long-term benefits for the mother include decreased risk of breast cancer, cardiovascular disease, diabetes, metabolic syndrome, and rheumatoid arthritis. Breastfeeding is less expensive than infant formula, but its impact on mothers' ability to earn an income is not usually factored into calculations comparing the two feeding methods (Momigliano, 2019).



## CONCEPT OF FORMULA-MILK

According to Happe and Gambelli (2015), infant formulas are foods designed to feed babies and infants less than 12 months of age. Formula milk, also known as baby formula or infant formula, is usually made from cow and goat milk that has been treated to make it more suitable for babies. Formula milk is a specially designed alternative to breast milk, intended to provide adequate nutrition to infants who are not breastfed. These milks are normally prepared for bottle-feeding and are in a powdered form that is mixed with water or another liquid and is usually considered a substitute for breast milk. The manufacturers of infant formulas claim that the composition of these formulas is almost the same as that of the mother's milk.

Formula milk is a manufactured product that attempts to mimic the nutritional composition of breast milk, offering a balance of essential nutrients crucial for the healthy growth and development of infants. The formulation of infant formula involves combining various ingredients to match the nutritional profile of breast milk as closely as possible. These ingredients typically include proteins, carbohydrates, fats, vitamins, and minerals. The composition of formula milk is carefully regulated to meet the specific nutritional needs of infants at different stages of development. One of the primary sources of protein in formula milk is often derived from cow's milk, but it undergoes extensive processing to make it suitable for infants. Additionally, certain formulas may use soy protein or other protein sources for infants with specific dietary requirements or allergies.

The carbohydrate component of formula milk usually consists of lactose, a sugar found in breast milk. However, some formula options may use alternative carbohydrates for infants who are lactose intolerant. Fats in formula milk are often derived from vegetable oils, such as palm oil, soybean oil, or coconut oil. These fats are chosen to provide a balance of essential fatty acids important for brain and eye development. Vitamins and minerals are added to formula milk to ensure that infants receive all the necessary nutrients for their overall health and well-being. The concentrations of these nutrients are carefully controlled to avoid deficiencies or excesses. For instance, the World Health Organization (2023) provides guidelines on the composition and marketing of formula milk to promote optimal infant health. The Food and Drug Administration (FDA) in the United States and similar regulatory bodies in other countries also establish standards for the production and labeling of infant formula to ensure its safety and nutritional adequacy. It is important to note that, while formula milk can be a suitable alternative for infants who cannot be breastfed, breastfeeding is generally considered the optimal source of nutrition for newborns due to its numerous health benefits. Mothers are encouraged to consult with healthcare professionals to make informed decisions about infant feeding based on their individual circumstances.

## CONCEPT OF BREAST-FED INFANT

Breast-fed infants are babies that are chest-fed. According to the World Health Organization (2023), breastfeeding is one of the most effective ways to ensure child health and survival. Breastmilk is the ideal food for infants. It is safe, clean, and contains antibodies, which help protect against many common childhood illnesses. Breastmilk provides all the energy and nutrients that the infant needs for the first months of life, and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year and up to one third during the second year of life. Breast milk is recognized as the gold standard for infant nutrition, offering a balanced mix of proteins, carbohydrates, fats, vitamins, and minerals. According to the World Health Organization (WHO), "exclusive breastfeeding for the first six months of life provides optimal health benefits for the infant" (WHO, 2020).

The composition of breast milk undergoes dynamic changes to adapt to the evolving needs of the infant, providing optimal nutrition at different stages of development. For instance, colostrum, the first milk produced after childbirth, is rich in antibodies and immune-boosting factors that provide essential protection to the newborn against infections and diseases. In addition to its nutritional content, breast milk contains bioactive compounds such as enzymes, hormones, and growth factors that contribute to the overall well-being of the infant. These bioactive components play a role in digestive function, cognitive development, and the establishment of a healthy microbiome in the infant's gastrointestinal tract.



The act of breastfeeding itself fosters a unique bond between the mother and the infant. Skin-to-skin contact during breastfeeding promotes emotional attachment, helps regulate the baby's body temperature, and supports the development of a secure emotional relationship between the mother and the child. Numerous health organizations, including the World Health Organization (WHO) and the American Academy of Pediatrics (AAP) (2012), strongly advocate for exclusive breastfeeding during the first six months of life, followed by the introduction of complementary foods while continuing breastfeeding for at least the first year of life. Research consistently demonstrates the short-term and long-term health benefits of breastfeeding for both the infant and the mother. Breast-fed infants tend to have lower rates of infections, allergies, and chronic diseases, and breastfeeding is associated with enhanced cognitive development and a reduced risk of obesity later in life.

### **CONCEPT OF FORMULA-FED INFANT**

Formula feeding refers to the practice of providing infants with commercially prepared infant formula as a substitute for breast milk. Infant formula is a nutritionally balanced product designed to mimic the composition of breast milk, providing essential nutrients crucial for a baby's growth and development. While breastfeeding is widely recommended due to its numerous health benefits, formula feeding becomes necessary in cases where breastfeeding is not feasible or preferred. Commercial infant formulas are carefully engineered to meet the nutritional needs of infants, containing a blend of proteins, carbohydrates, fats, vitamins, and minerals. They often include components such as iron to support the baby's developing brain and prevent anemia (American Academy of Pediatrics, 2012). The development of formulas has significantly advanced over the years, incorporating scientific research to closely resemble the nutritional profile of breast milk.

Formula feeding provides a viable option for mothers who face challenges with breastfeeding, such as medical conditions, insufficient milk supply, or personal preferences. It allows for greater flexibility in feeding, enabling both parents to participate in caring for the infant. However, it is crucial for caregivers to follow proper preparation and hygiene practices when using formula to ensure the infant's safety and well-being. While the benefits of breastfeeding are well-established, formula feeding has proven to be a suitable alternative, ensuring infants receive essential nutrients for healthy growth. It is essential for caregivers to make informed decisions based on individual circumstances, consulting healthcare professionals for guidance on the best feeding practices for their infants.

### **TYPES OF DEVELOPMENT IN CHILDREN**

According to Stanborough (2019), there are various types of development in children namely: physical development, cognitive development (thinking skills) and social-emotional development.

- **Physical development**

Physical development in children encompasses a dynamic interplay of various factors, including genetics, nutrition, and overall health. Growth during childhood involves changes in height, weight, and body proportions. Genetics largely determine the potential for growth, but nutritional factors and overall health also play significant roles. Proper nutrition, including a balanced diet rich in essential nutrients, is crucial for optimal growth and maturation. Nutrition plays a central role in physical development, influencing both the quantity and quality of growth. Malnutrition, whether due to inadequate intake or poor absorption of nutrients, can lead to stunted growth, delayed maturation, and compromised overall health (World Health Organization, 2017).

Adequate intake of macronutrients, micronutrients, and hydration is essential for supporting optimal physical development in children. Motor skills encompass both fine and gross motor skills and are fundamental to a child's physical development. Fine motor skills involve the coordination of small muscle movements, such as those required for grasping objects or writing, while gross motor skills involve larger muscle groups and coordination for activities like running or jumping (Clark, 2011). Motor skills development is influenced by factors such as genetics, sensory input, and environmental stimulation.



- **Cognitive development**

Cognitive development in children represents a multifaceted process involving the acquisition and refinement of mental abilities, encompassing aspects such as perception, memory, problem-solving, language, and reasoning. Cognitive development begins in infancy, with foundational processes such as sensory perception, motor coordination, and basic reflexes and mostly, could be enhanced by their nutrition. Research has it that children who are breast-fed have higher cognitive abilities. Jean Piaget's theory of cognitive development posits that children progress through distinct stages, including the sensorimotor, preoperational, concrete operational, and formal operational stages, each marked by unique cognitive achievements. As children mature, executive functions, such as working memory, inhibitory control, and cognitive flexibility, become increasingly sophisticated (Diamond, 2013). These functions play a crucial role in problem-solving, decision-making, and goal-directed behavior. Cognitive development involves the refinement of these executive functions, enabling children to navigate complex cognitive tasks.

- **Emotional development**

During the first few months of life, infants begin to form attachments to their primary caregivers, typically their parents. These attachments are essential for emotional security and the development of trust. According to Bowlby's attachment theory, a secure attachment to a caregiver provides a foundation for healthy emotional development. Breastfeeding, recognized as an optimal source of nutrition for infants, not only provides essential nutrients but also fosters emotional bonding between the infant and the mother. The act of breastfeeding involves physical closeness, eye contact, and skin-to-skin contact, all of which contribute to the emotional connection between the caregiver and the infant (Britton et al., 2006). This bonding experience can positively influence the development of a secure attachment, enhancing emotional well-being.

- **Social development**

Social development in children is a dynamic and interactive process influenced by various factors. Early attachments, family dynamics, peer interactions, educational experiences, media exposure, and cultural influences collectively shape a child's social skills and competencies. Understanding and supporting these interconnected aspects are crucial for fostering healthy social development in children. During infancy, the foundation of social development is laid through the formation of attachments to primary caregivers. According to attachment theory, a secure attachment fosters a sense of trust and security, providing a base for healthy social relationships later in life.

## **EFFECT OF BREAST ON DEVELOPMENT OF INFANTS**

Breast milk is widely recognized as the optimal source of nutrition for infants, and its effects on infant development are well-documented. The numerous benefits of breastfeeding extend beyond basic nutrition and have profound implications for the overall health and development of infants. Here are some key aspects of how breast milk influences infant development:

- **Nutritional Content**

Breast milk is uniquely tailored to meet the nutritional needs of infants. It contains an ideal balance of proteins, fats, carbohydrates, vitamins, and minerals, ensuring proper growth and development.

- **Immune System Support**

Breast milk is rich in antibodies, immune cells, and other bioactive components that help protect infants against infections and diseases. This immune support is especially crucial during the first few months of life when an infant's immune system is still developing.



➤ **Cognitive Development**

Some studies suggest that breastfeeding may have a positive impact on cognitive development. Certain nutrients in breast milk, such as omega-3 fatty acids, have been linked to improved brain development and cognitive function.

➤ **Digestive Health**

Breast milk contains probiotics and prebiotics that promote the growth of beneficial bacteria in the infant's gut. This helps establish a healthy gut micro biome, which is important for digestion, nutrient absorption, and immune function.

➤ **Emotional Bonding**

Breastfeeding fosters a strong emotional bond between the mother and the infant. The skin-to-skin contact, eye contact, and closeness during breastfeeding contribute to the development of a secure attachment, which is essential for emotional well-being.

➤ **Reduced Risk of Infections and Allergies**

Breastfed infants have a lower risk of respiratory infections, gastrointestinal infections, and allergies compared to formula-fed infants. The antibodies present in breast milk provide passive immunity, helping protect the infant during the vulnerable early months.

➤ **Optimal Growth and Weight Gain**

Breastfed infants tend to gain weight at an appropriate rate, reducing the risk of obesity later in life. Breast milk adapts to the changing nutritional needs of the growing infant.

➤ **Long-Term Health Benefits**

Breastfeeding has been associated with a lower risk of certain chronic diseases later in life, both for the infant and the mother. These include a decreased risk of obesity, diabetes, and certain types of cancers.

## **EFFECT OF FORMULA MILK ON DEVELOPMENT OF INFANT**

Formula milk, also known as infant formula, is a commercially prepared substitute for breast milk. It is designed to provide infants with the necessary nutrients for their growth and development. While formula milk can be a suitable alternative for babies who cannot be breastfed, it's important to note that breast milk is generally considered the best source of nutrition for infants.

➤ **Nutritional Content**

Formula milk is formulated to mimic the nutritional composition of breast milk. It typically contains a mix of proteins, fats, carbohydrates, vitamins, and minerals to support the baby's growth. However, the composition may not be an exact match, and there can be variations among different formula brands.

➤ **Convenience**

Formula feeding provides a convenient option for parents who are unable to breastfeed or choose not to. It allows for flexibility in feeding schedules and allows other caregivers to participate in feeding.

➤ **Allergies and Sensitivities**

Some infants may have allergies or sensitivities to certain components in formula milk, such as cow's milk protein. In such cases, specialized formulas, like hypoallergenic formulas, may be recommended.



### ➤ Immune System Benefits

Breast milk contains antibodies and other immune-boosting substances that help protect infants from infections. While formula milk is sterile and safe, it may not provide the same level of immune protection as breast milk.

### ➤ Digestive Differences

Formula-fed babies may have different stool patterns compared to breastfed babies. Formula milk is often more difficult to digest, and formula-fed infants may have firmer stools.

### ➤ Bonding and Emotional Connection

Breastfeeding fosters a unique bonding experience between a mother and her baby. While formula feeding can also be a bonding experience, it may not offer the same level of emotional connection.

### ➤ Cost

Formula feeding can be more expensive than breastfeeding because formula milk and feeding supplies can add up over time.

## DISADVANTAGE OF BREAST MILK OVER FORMULA MILK

The following are the disadvantages of breast milk over formula milk:

- **Inconvenience and Time Commitment**

Breastfeeding requires a significant time commitment from the mother, as infants need to feed frequently, especially during the first few months of life (Riordan & Wambach, 2010). This can be challenging for mothers who need to return to work or have busy schedules. Breastfed babies do need to eat more often than babies who take formula, because breast milk digests faster than formula. This means mom may find herself in demand every 2 or 3 hours (maybe more, maybe less) in the first few weeks.

- **Maternal Health Considerations**

Some mothers may face health issues or medical conditions that make breastfeeding challenging or contraindicated (American College of Obstetricians and Gynecologists, 2020). Medications taken by the mother can also transfer to breast milk, requiring careful consideration and consultation with healthcare providers.

- **Lack of Control Over Nutrient Content**

While breast milk is a natural source of nutrition, its composition can vary based on the mother's diet and health status. In certain situations, formula feeding may offer more precise control over the nutrient content to ensure the infant receives specific nutrients in recommended amounts (Agostoni et al., 2019).

## DISADVANTAGE OF FORMULA MILK OVER BREAST MILK

According to Llamas (2023), formula milk has the following disadvantages over breast milk:

- **Nutritional Differences**

Breast milk is a complex and dynamic fluid that changes in composition to meet the evolving needs of the infant. It contains antibodies, enzymes, and various nutrients that are not present in formula milk.

- **Immunological Benefits**

Breast milk provides passive immunity to infants through antibodies and immune cells, offering protection against infections and diseases. Formula milk lacks these immune-boosting properties.





- **Digestive Issues**

Formula milk might be harder for infants to digest compared to breast milk. It can lead to issues such as constipation or diarrhea.

- **Risk of Allergies and Sensitivities**

Breast milk helps in the development of the infant's immune system and may reduce the risk of allergies and sensitivities. Formula milk, on the other hand, may increase the likelihood of allergic reactions.

- **Lack of Bonding and Emotional Connection**

Breastfeeding fosters a unique bonding experience between the mother and infant. The physical closeness and skin-to-skin contact during breastfeeding contribute to the emotional well-being of both mother and baby. But this bond and emotional closeness is absent in formula milk.

- **Cost and more time/efforts**

Formula feeding can be more expensive than breastfeeding, considering the cost of formula, bottles, and sterilizing equipment. Additionally, formula preparation involves more time and effort than breastfeeding, which is readily available and at the right temperature.

- **Environmental Impact**

Formula feeding has an environmental impact due to the production, packaging, and transportation of formula products. Breastfeeding, being a natural and renewable resource, has a lower environmental footprint.

## **COMPARISON IN DEVELOPMENT OF INFANTS BETWEEN BREAST-MILK AND FORMULA-MILK**

The choice between breast milk and formula milk as the primary source of nutrition for infants has been a subject of significant interest and debate. Research has it that breastfed children perform better on intelligence tests, are less likely to be overweight or obese, and are less likely to develop diabetes later in life. Breastfeeding is a natural and fundamental practice that plays a crucial role in the health and development of infants. Anderson et al. (2019) posits that breast-fed infants may have a cognitive advantage compared to formula-fed infants.

Research by numerous scholars also suggests that breast milk plays a crucial role in cognitive development. The presence of essential fatty acids, particularly docosahexaenoic acid (DHA) and arachidonic acid (ARA), in breast milk has been associated with improved cognitive outcomes in infants (Colombo et al., 2011). Formula milk attempts to replicate these components, but studies by Bougle et al. (2018) and other scholars have shown that the bioavailability and composition of these nutrients in breast milk are superior.

Hanson and Korotkova (2016), mentioned that breast milk is also renowned for its immunological benefits, providing infants with antibodies, enzymes, and immune cells that contribute to enhanced immune system development. The unique composition of breast milk cannot be entirely replicated in formula milk, leading to potential differences in the development of the infant's immune system. Patel (2022), observed that the difference between breast milk and formula milk is due to the presence of oligosaccharides that help to nourish the baby, and build immunity. Growth patterns differ between breastfed and formula-fed infants, and by 12 month of age, formula-fed infants weigh, on average, 400–600 g more than breastfed infants (Gale et al. 2012).

While formula milk is formulated to meet the nutritional needs of infants, studies have indicated variations in growth patterns between breastfed and formula-fed infants. Breast milk contains growth factors, hormones, and enzymes that promote optimal growth and development (Kramer et al., 2001). The bioavailability and digestibility of nutrients in breast milk may differ from those in formula milk, influencing



growth outcomes. In addition to weight gain, the length and height of infants are critical parameters for assessing physical growth. Breast milk contains growth factors that contribute to linear growth and bone development. Research has suggested that breastfed infants may exhibit slightly greater length gain in the early months compared to formula-fed infants. However, the disparities in length and height between breastfed and formula-fed infants are often marginal and may not have long-term implications.

The nutritional content of breast milk and formula milk also influences the body composition of infants. Breast milk is known for its optimal balance of proteins, fats, and carbohydrates, promoting the development of lean body mass. Some studies have indicated differences in body composition between breastfed and formula-fed infants, with breastfed infants having a lower percentage of body fat.

## METHODOLOGY

In carrying out the study, a descriptive survey design was adopted for this study. The study was carried out in Rivers State. The targeted population for the study comprised of all mothers of the babies under the age of one year in Rivers State. A stratified random sampling technique was used to select 40 respondents each from the senatorial districts used which gave a total of 240 respondent used for the study. The instrument used for data collection was a structured questionnaire titled “Development Pattern of Breast-Fed and Formula-Fed Infants Questionnaire (DPBFIQ)”. Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.73, and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical techniques such descriptive analysis to answer research questions. The test for significance was done at 0.05 alpha levels.

## RESULTS AND DISCUSSIONS

### Research Questions 1

The research question sought to find out the development pattern advantages of breast milk to breast-fed infants. To answer the research question, percentage analysis was performed on the data, (see table 1).

**Table 1:**  
**Percentage analysis of the development pattern advantages of breast milk to breast-fed infants.**

ADVANTAGES	FREQUENCE	PERCENTAGE (%)
Nutritional Content	39	16.25**
Reduced Risk of Infections and Allergies	37	15.42
Optimal Growth and Weight Gain	35	14.53
Immune System Support	33	13.73
Digestive Health	27	11.25
Emotional Bonding	26	10.83
Cognitive Development	23	9.53
Long-Term Health Benefits	20	8.33*
<b>TOTAL</b>	<b>240</b>	<b>100%</b>

\*\* The highest percentage frequency

\* The least percentage frequency



**SOURCE: Field Survey**

The above table 1 presents the percentage analysis of the development pattern advantages of breast milk to breast-fed infants. From the result of the data analysis, it was observed that the advantage tagged “Nutritional Content” 39(16.25) was rated as the highest development pattern advantages of breast milk to breast-fed infants affirmed by the respondents, while “Long-Term Health Benefits” 20 (8.3) was rated the least development pattern advantages of breast milk to breast-fed infants.

**Research Questions 2**

The research question sought to find out the development pattern advantages of formula milk to formula milk-fed infants. To answer the research question, percentage analysis was performed on the data, (see table 2).

**Table 2:**  
**Percentage analysis of the development pattern advantages of formula milk to formula milk-fed infants.**

ADVANTAGES	FREQUENCE	PERCENTAGE (%)
Nutritional Content	45	18.75**
Convenience	39	16.25
Immune System Benefits	35	14.58
Allergies and Sensitivities	34	14.16
Digestive Differences	32	13.33
Bonding and Emotional Connection	31	12.92
Cost	24	10*
<b>TOTAL</b>	<b>240</b>	<b>100%</b>

\*\* The highest percentage frequency

\* The least percentage frequency

**SOURCE: Field Survey**

The above table 2 presents the percentage analysis of the development pattern advantages of formula milk to formula milk-fed infants. From the result of the data analysis, it was observed that the advantage tagged “Nutritional Content” 45(18.75) was rated as the highest development pattern advantages of formula milk to formula milk-fed infants affirmed by the respondents, while “Cost” 24(10) was rated the least development pattern advantages of breast milk to breast-fed infants.

**Research Questions 3**

The research question sought to find out the development pattern disadvantages of breast milk to breast-fed infants. To answer the research question, percentage analysis was performed on the data, (see table 3).

**Table 3: Percentage analysis of the development pattern disadvantages of breast milk to breast-fed infants.**

DISADVANTAGES	FREQUENCE	PERCENTAGE (%)
Maternal Health Considerations	89	37.08**
Lack of Control Over Nutrient Content	78	32.50
Inconvenience and Time Commitment	73	30.42*
<b>TOTAL</b>	<b>240</b>	<b>100%</b>

\*\* The highest percentage frequency

\* The least percentage frequency



**SOURCE: Field Survey**

The above table 3 presents the percentage analysis of the development pattern disadvantages of breast milk to breast-fed infants. From the result of the data analysis, it was observed that the disadvantage tagged “Maternal Health Considerations” 89(37.08) was rated as the highest development pattern disadvantages of breast milk to breast-fed infants affirmed by the respondents, while “Inconvenience and Time Commitment” 73(30.42) was rated the least development pattern disadvantages of breast milk to breast-fed infants.

**Research Questions 4**

The research question sought to find out the development pattern disadvantages of formula milk to formula milk-fed infants. To answer the research question, percentage analysis was performed on the data, (see table 4).

**Table 4**  
**Percentage analysis of the development pattern disadvantages of formula milk to formula milk-fed infants.**

<b>DISADVANTAGES</b>	<b>FREQUENCE</b>	<b>PERCENTAGE (%)</b>
Nutritional Differences	42	17.50**
Immunological Benefits	41	17.08
Environmental Impact	39	16.25
Digestive Issues	37	15.42
Lack of Bonding and Emotional Connection	36	15
Risk of Allergies and Sensitivities	31	12.92
Cost and more time/efforts:	14	5.83*
<b>TOTAL</b>	<b>240</b>	<b>100%</b>

\*\* The highest percentage frequency

\* The least percentage frequency

**SOURCE: Field Survey**

The above table 4 presents the percentage analysis of the development pattern disadvantages of formula milk to formula milk-fed infants. From the result of the data analysis, it was observed that the disadvantage tagged “Nutritional Differences” 42(17.5) was rated as the highest development pattern disadvantages of formula milk to formula milk-fed infants affirmed by the respondents, while “Cost and more time/efforts” 14(5.83) was rated the least development pattern disadvantages of formula milk to formula milk-fed infants.



## CONCLUSION

In conclusion, this comparative study sheds light on the nuanced developmental patterns of breast-fed and formula-fed infants, emphasizing the multifaceted advantages and disadvantages associated with each feeding method. While breastfeeding offers unique immunological benefits and fosters maternal-infant bonding, formula feeding provides a practical alternative for mothers facing challenges. The findings underscore the importance of informed decision-making, recognizing that individual circumstances may influence the choice between breast milk and formula. A holistic understanding of the developmental outcomes associated with each feeding method is vital for parents and healthcare providers to navigate the complex landscape of infant nutrition, promoting the optimal health and well-being of each child.

## RECOMMENDATIONS

- Encourage comprehensive and accessible education on the benefits of breastfeeding, addressing common concerns and misconceptions. This can empower mothers to make informed choices and foster a supportive environment for breastfeeding.
- Implement workplace policies that support breastfeeding mothers, such as designated nursing spaces and flexible schedules. This can facilitate continued breastfeeding and contribute to the overall well-being of both mothers and infants.
- Establish community-based support programs that connect new mothers with experienced breastfeeding mentors and healthcare professionals. Such programs can provide ongoing guidance and support, particularly for first-time mothers.

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