Effect of Postpartum Maternal Antibiotics On Colonization of Gastrointestinal Flora in Breast Fed Infants

Thesis

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إِنَّمَا يَخْشَى اللَّهَ مِنْ عِبَادِهِ الْعُلَمَاءُ إِنَّ اللَّهَ عَزِيزٌ غَفُورٌ

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Essam Saad

I dedicate this work

To

My Mother, Wife, Daughters and My Family.

Content

List Of Abbreviation

AAD	*Antibiotic-Associated Diarrhea*
AAP	*American Academy of Pediatrics*
B. bifidum	*bifidobacteria bifidum*
B. fragilis	*Bifidobacteria fragilis*
B. infantis	*bifidobacteria infantis*
BHIA-	*brain-heart infusion agar*
C. difficile	*Clostridia difficile*
C. perfringens	*Clostridia perfringens*
Cfu	*colony flowing unit.*
ELBW	*extremely low birth weight*
F6PPK	*Fructose-6-phosphate phosphoketolase*
G6PD	*glucose-6-phosphate deficiency*
GAC	*germfree animal characteristics*
GPW	*glucose-phosphate peptone water*
HIV	*human immunodeficiency virus*
Ig	*immunoglobulin*
KOH	*potassium hydroxide*
LBS Agar	*Lactobacillus Selection Agar*
M/P	*(milk to plasma)*
MACs	*microflora associated characteristics*
MR	*Methyl- Red*
MRS	*De Man Rosa Sharpe*
NaCl	*sodium chloride*
NEC	*neonatal necrotizing enterocolitis*
P. morgani	*proteus morgani*
P. vulgaris	*proteus vulgaris*
Pg	*Pico gram*
pps	*peptone physiological saline*
sp.	*species*
TB	*tuberculosis*
TPY	*trypticasephytone- yeast*
TSI agar	*triple sugar iron agar*
VLBW	*very low birth weight*
WHO	*World Health Organization*

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Introduction

Antibiotic usage is fairly common among breastfeeding mothers and there is potential for transfer to infants through breast milk. While most medicines taken by lactating women cause no harm to their babies, at times, it can result in serious consequences ***(Mathew, 2004).***

For various reasons, antibiotics are one of the commonest groups of drugs prescribed to postpartum mothers. This trend is noticeable both in the developing and developed countries ***(Thomas, 1994).***

The majority of breast milk components act similar to plasma components and theoretically all drugs have the potential of crossing over from maternal plasma into breast milk. Molecular transfer depends on the usual mechanisms; passive diffusion, active transport against a concentration gradient and transcellular diffusion ***(Chung et al., 2002).***

The fetal gastrointestinal tract is sterile until birth when microbes colonize the gastrointestinal tract, and a dense complex microbiota are develops ***(De la Cochetier et al., 2004)***.

In general, infants initially colonized by *enterobacteria* and gram-positive cocci, which are thought to create a reduced environment that is favorable for the establishment of *Bacteroides, Bifidobacterium,* and *Clostridium* by day seven ***(Favier, 2002).***

A full term breast-fed infant has an intestine microbiota in which *bifidobacteria* and *lactobacillus* predominate over potentially harmful bacteria. A diet of breast milk induces the development of a flora rich in *Bifidobacterium* ***(Dia and Walker, 1999).***

Loss of normal GIT flora and GIT colonization is associated with the use of antibiotics particularly third generation cephalosporin ***(Saiman et al., 2001).***

All antibiotics can cause three potential problems for nursing infants. Firstly, they can modify the bowel flora and alter gut defense mechanisms; this can result in diarrhea and mal absorption of nutrients. Secondly, they may have direct effects that may or may not be dose related. Lastly, and often ignored, is that antibiotics can alter and interfere with microbiological culture resulting in babies being investigated for sepsis ***(American Academy of Pediatrics, 1994)***.

Aim of The Work

The aim of this study was determine the effects of postpartum maternal intake of systemic antibiotics on type of flora colonizing the GIT in breast fed infants and to trace such colonization pattern for the 1st 6 months of life.

Also, we aimed at detecting the effect of postpartum maternal antibiotics intake on the incidence and duration of oral moniliasis in their breast fed babies.

Chapter 1
INFANT GIT

Intestinal Microbiota in Neonates:

The fetal gastrointestinal tract is sterile until birth when microbes colonize the gastrointestinal tract, and a dense, complex microbiota develops. This enormous cell mass performs a variety of activities that affect both the intestinal and systemic physiology. The microbiota provides nutritional, metabolic, immunological, and protective functions. The neonatal gastrointestinal tract is an organ at risk. Increasing awareness that the human flora is a major factor in both health and disease has led to different strategies to manipulate the flora ***(Fanaro et al., 2003a).***

During the birth Process and shortly thereafter, microbes from the mother and the surrounding environment colonize the gastrointestinal Tract of the infant until a dense, complex micro biota Develops. The establishment of the gut microbial population is not strictly a succession in the ecological sense rather, this colonization is a complex process influenced by microbial and host interactions as well as by internal and

External factors. The climax intestinal flora is attained in successive stages ***(Favier et al., 2002).***

Primary portals of entry for these bacteria include the birth canal during delivery and contact with other humans and the surrounding environment. After birth, many factors influence the types and quantities of intestinal micro flora of the infant. Besides extrinsic factors such as the mother's dietary intake or use of probiotics, type of birth (vaginal or surgical), gestational age, and primary source of nutrition (bottle or breast fed), intrinsic factors including underlying neonatal health, immunologic status, gastrointestinal transit time, pH, and stress all affect the process of colonization and the types of organisms established ***(Hooper, 2004).***

Intestinal microflora in early infancy: composition and development:

The neonatal intestinal microbiota is a complex ecosystem composed of numerous genera, species and strains of bacteria. This enormous cell mass performs a variety of unique activities that affect both the colonic and systemic physiology. Its primary activities include nutritive, metabolic, immunological and protective functions ***(Fanaro et al., 2005).***

The intestinal microflora is estimated to harbour about 400 different microbial species, mostly bacteria. More than 99% of

the cultivable fecal microbiota is represented by 30–40 bacterial species ***(Tannock, 2001).***

Other numerical predominant groups are bifidobacteria, eubacteria, clostridia and lactobacilli and the population level of each species appears to be directly regulated by the competition for nutrients and by physical space. On the other hand, some bacteria do not adhere to the intestinal mucosa and prefer different microhabitats ***(Schrezenmeir and de Vrese, 2001).***

Four distinct bacterial microhabitats can be identified in the intestinal tract: ***(Penders et al., 2006a)***

a) The surface of the epithelium cells,

b) The crypts,

c) The mucous gel layer, and

d) The intestinal lumen.

The components of the bacterial ecosystem have a high degree of heterogeneity and compete to occupy the receptors of the different adhesion sites ***(Schrezenmeir and de Vrese, 2001).***

The normal microflora represents the first line of defense against several potential pathogens by direct interference with the settlement of newly arrived species and is in close contact and balance with the defense system of the host ***(Edwads and Parrett, 2002).***

The different bacterial strains present an important immunological challenge to the whole immune system and may influence immunological challenges as well as immunological tolerance. The normal host resident organisms enhance humeral immune response, activate non-specific host resistance to pathogens, modulate the host immune response to potential harmful antigens and down-regulate hypersensitivity reactions ***(Isolauri et al., 2001).***

It is increasingly clear that the gut-associated lymphoid tissue, which constitutes one of the most important elements in the total immunological capacity of the host, is crucial for the recognition of several kinds of bacterial, and non-bacterial, antigens and for the subsequent immune response or tolerance ***(Forchilli and Walker, 2005).***

Physiological Colonization of Microflora:

In general, infants are initially colonized by enterobacteria and gram-positive cocci, which are thought to create a reduced environment that is favorable for the establishment of Bacteroides,Bifidobacterium, and Clostridium by day seven ***(Park et al., 2005).***

In full-term infants, a diet of breast milk induces the development of a flora rich in Bifidobacteria and Lactobacillus.