

Impact of Breastfeeding on the incidence of pneumonia

Thesis submitted for fulfillment of master degree in pediatrics

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2012

ABSTRACT

Breastfeeding has been shown to reduce infections in children. Our aim is to assess if exclusive breast feeding protects against pneumonia. Candidates were in 2 groups: 100 children who had severe pneumonia and 100 children who did not develop pneumonia in the first 2 years.

12% were exclusively breastfed for the first 6 months in “pneumonia group” compared to 32% in the “control group”, (OR: 3.5). Exclusive breastfeeding for 6 months protects against severe pneumonia.

Key words

Exclusive Breastfeeding

Childhood pneumonia

ACKNOWLEDGMENTS

Thanks God, for answering my prayers for giving me the strength to finish this work.

I would like to express my gratitude for everyone who participated in the preparation and completion of this work.

Dr.Ragaa Maher for supervising this work. Her advice and her meticulous notes helped me all the time. She gave me a lot of her time and effort.

Dr Mervat Haroon for providing me with her kind care and advice. I learned from her experience and technical tips that guided me during my work.

Dr Eman Halawa for her great effort to make this work possible. This work was her idea. She helped me to handle all the obstacles.

My colleagues in pediatric department for their help in enrollment of cases in my thesis.

The mothers of patients who allowed me to take history from them and examine their children.

Last but not the least, my parents, my husband and my kids for their continuous support

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LIST OF ABBREVIATIONS

AA :	arachidonic acid
AAP :	American Academy of Pediatrics
ALRI :	acute lower respiratory infections
BF :	breastfeeding
BFHI	baby friendly hospital initiative
C.S. :	cesarian section
CAP :	community acquired pneumonia
CBC :	complete blood count
CCK :	cholecystokinin
CF:	complementary food
CI:	confidence interval
CRP :	C reactive protein
CXR:	chest X ray
DHA:	docosahexanoic acid
EBF :	exclusive breastfeeding
ESR :	erythrocyte sedimentation rate
GAPP:	global action plan for prevention and control of pneumonia
HIV:	human immunodeficiency virus
HSV-1:	herpes simplex virus type 1
IgA:	immunoglobulin A
IgG:	immunoglobulin G
IgM:	immunoglobulin M
IMCI :	integrated management of childhood illness
IPD:	invasive pneumococcal disease
IV:	intravenous

LC-PUFAs:	long-chain polyunsaturated fatty acids
LDL:	low density lipoproteins
LRTI :	lower respiratory tract infections
Mg:	magnesium
MCDS:	ministerial council on drug strategy
NTHI:	non-typable <i>H. influenzae</i>
NVD :	normal vaginal delivery
OR:	odds ratio
PCR:	polymerase chain reaction
PCV13:	13-valent pneumococcal conjugate vaccine
PCV7:	7-valent pneumococcal conjugate vaccine
PMN :	polymorphonuclear
PPD:	purified protein derivative
PPSV23:	23-valent pneumococcal polysaccharide vaccine
RR :	relative risk
RSV :	respiratory syncytial virus
<i>S. pneumonia:</i>	streptococcus pneumonia
SIDS:	sudden infant death syndrome
TC	total cholesterol
TCH :	Texas children's hospital
U5M :	under five mortality
US :	united states
UNICEF:	united nations children's fund
WHO:	world health organization

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INTRODUCTION

Breast milk is the most important food in the first year of life. (*Riordon,2010*) . Components of breast milk give its protective mechanism against childhood illnesses. Immune complexes in breast milk help to initiate and stimulate the child's immune system .Oligosaccharides, immunoglobulin A (IgA), lactoferrin, and immune cells provided from the mother's milk have been shown to protect the child from infection during the first year of life by providing bactericidal, viricidal, and fungicidal properties (*Hanson et al., 2002*).

Authors varied in their definitions of breast-feeding (*Labbok & Krasovec, 1990*). A lack of a clear consistent definition of breastfeeding is a flaw in many breastfeeding studies given the fact that there is a wide variation in feeding practices and that mothers often erroneously report supplements given to the infant (*Aarts et al.,2000*). Most treated breast-feeding as a dichotomous variable, separating children who received any amount of breast milk from all other children. Few studies considered > 2 breast-feeding categories. These studies are important because they show dose response associations and also because grouping together children who are exclusively breast-fed with those receiving small amounts of breast milk may underestimate its protective effect (*Victora et al., 1999*).

Regarding mortality, according to the World Health Organization (WHO) and the American Academy of Pediatrics, breastfeeding for at least six months can decrease worldwide infant mortality due to diarrhea, respiratory illness, and other infectious diseases by up to 55% (*Chantry et al., 2006*). Among these, pneumonia is the leading cause of death in children under five years worldwide (*César et al., 1999*).

Regarding morbidity, when compared with exclusive breast feeding for 4 months, greater protection against infections has been demonstrated for the 6 month duration. This fact is well established for gastrointestinal infections but it is controversial when it comes to respiratory tract infections (*Chantry et al., 2006*).

The World Health Organization recommended in 2001 that all children be exclusively breastfeed for 6 months instead of 4 months. However, the organization also called for more research regarding the benefits of 6 versus 4 months of exclusive breastfeeding (*Liesbeth et al.,2010*)

AIM OF THE WORK

This is a retrospective observational study to assess one of the important benefits of exclusive breastfeeding (EBF) for 6 months, which is protection of young children against pneumonia (the leading cause of death in children under 5 years) , and whether it gives an extra protection when compared to EBF for 4 months.

REVIEW OF LITERATURE

Chapter 1: BREAST MILK COMPOSITION AND FACTORS AFFECTING IT

Human breast milk is species-specific and is adapted over time to meet infant needs. Breast milk is similar to other living tissues, such as blood, and is able to strengthen immunity, transport nutrients, affect biochemical systems and destroy pathogens. It is important to recognize that its composition continuously changes and research continues into the roles of its various components. Breast milk is composed of about 10 percent solids and 90 percent water. The solids are essential for energy and growth, while the water component maintains hydration (*Riordan, 2010*).

Components of breast milk

1. Major components of breast milk

Fat content of breast milk

The fat in breast milk provides about half of the milk's calories and is its most variable component. Fat varies from one mother to another and from early to late lactation. Total fat of human milk ranges from 22 to 62 g/L and is independent of breastfeeding frequency (*Kent et al., 2006*). Fat is required for growth and development, provides an energy source and supports physiologic interactions. (*Lawrence & Lawrence, 2005*). Breast milk contains a wide range of long-chain polyunsaturated fatty acids (LC-PUFAs), which represent 88 percent of milk fat and are the most variable element in milk (*Jensen, 1995*). LC-PUFAs include docosahexanoic acid (DHA) and arachidonic acid (AA), which are associated with higher visual acuity and cognitive ability. Breastfed infants

accumulate DHA in the visual cortex, whereas formula-fed infants merely maintain the same amount of DHA present at birth. As a result, breastfed infants have higher levels of DHA than an age-matched group of formula-fed infants (*Baur et al., 2000*). Cholesterol is another fatty component of breast milk important for brain development. Like DHA, cholesterol is crucial to the production of myelin. At present, infant formulas do not contain cholesterol (*Pond 2003*). Breastfeeding is associated with increased mean total cholesterol (TC) and low density lipoproteins (LDL) levels in infancy but lower levels in adult life. These results suggest that breastfeeding may have long-term benefits for cardiovascular health and may have implications for the content of formula milks (*Christopher et al., 2002*).

Carbohydrate content of breast milk

Human milk contains an extensive amount of oligosaccharides. This form of nourishment accounts for 12g/L of mature milk and approximately 22g/L of colostrums (*Newburg, 1997*). Though research has provided evidence of the pathophysiology of the oligosaccharides regarding infant gastrointestinal disease, research has not shown that this mechanism works for pneumonia (*Story and Parish, 2008*). Some oligosaccharides, named as bifidus factor promote the growth of lactobacillus bifidus, one of the intestinal flora, thus increasing intestinal acidity and stemming the growth of pathogens (*Dai et al., 2000*). Moreover, the acid environment (produced by bifidus factor, low protein and phosphate levels) discourages replication of enteropathogens such as Shigella, Salmonella and some E.coli (*Rubaltelli et al., 1998*). Lactose, a disaccharide, accounts for most of the carbohydrate in breast milk (*Riordan, 2010*). Lactose enhances calcium absorption and metabolizes readily to galactose and glucose which supply energy to the rapidly growing brain of the infant (*Dai et al., 2000*).

Protein content of breast milk

Breast milk provides high quality protein to meet the energy needs of infants. The protein content of mature breast milk from well-nourished mothers is about 0.8 to 0.9 g/dl . The percentage of protein in human colostrums is greater than in mature breast milk. This high level is due to the fact that in colostrums lactose and water haven't yet flooded the system and also because of the presence of additional amino acids and antibody-rich proteins, especially secretory IgA and lactoferrin (*Riordan, 2010*). Human milk contains casein and whey protein. Whey/casein ratio is about 90:10 in early lactation, 60:40 in mature milk, and 50:50 in late lactation (*Kunz & Lonnerdal, 1992*). Whey proteins are acidified in the stomach, forming soft, flocculent curds. These quickly digest, supplying a continuous flow of nutrients to the baby. By contrast, caseins (the primary protein in untreated bovine milk) form a tough, less digestible curd that requires high expenditure of energy for an incomplete digestive process . Whey protein is composed of five major components: (1) α -lactalbumin, (2)serum albumin, (3) lactoferrin, (4) immunoglobulins, and (5) lysozyme. The latter three elements play important roles in immunological defense (*Riordan, 2010*).

Lactoferrin: Being the main protein in human milk, this nourishment acts as a microbicidal agent killing bacteria and viruses (*Hanson et al., 2002*). Lactoferrin has broad antimicrobial properties including disruption of the bacterial outer membrane (*Lawrence and Pane., 2007*). Lactoferrin amounts to approximately two to four grams per liter of breast milk, but is not present in bovine milk (*Hanson and Korotkova, 2002*).

IgA:Colostrum and human milk contain an abundant amount of IgA (*Islam et al., 2006*). IgA prevents the attachment of bacteria and viruses to the