

RELATIONSHIPS BETWEEN MATERNAL, NUTRITIONAL STATUS, QUANTITY AND COMPOSITION OF BREAST MILK IN EGYPT

Thesis

رسالة

Submitted for partial fulfilment
of the M.D. degree in Pediatrics.

By

NIVIEN KHATTAB HOSSAM EL-DIN
M.B., B.Ch., M.Sc.

1990/9/10

618.9239
N. K

Supervisors

طه عبد الهادي
م. د. محمد سليمان
م. د. خالد عواد

Prof. Dr. KHALIL ABD-ELHADI
Professor of Pediatrics
AIN SHAMS UNIVERSITY

Dr. MOHAMED SOLIMAN
Consultant; Head of
Pediatric Department
EL-SAHEL TEACHING HOSPITAL

51016

Dr. KHALID AWWAD
Lecturer of Pediatrics
AIN SHAMS UNIVERSITY

Prof. Dr. IBRAHIM NABIH
Head of Medical
Chemistry Laboratory
NATIONAL RESEARCH CENTRE



1990

*TO THE SOUL OF MY FATHER
&
TO MY MOTHER*



∴ A C K N O W L E D G M E N T ∴

I would like to express my sincere gratitude and deep appreciation to Prof. Dr. Khalil Abd-Elhadi, Prof. of Pediatrics, Ain Shams University. I am deeply indebted to him for his kind gratitude, encouragement, support and profound advice.

I am also greatly indebted to Dr. Khalid Awwad, Lecturer of Pediatrics, Ain Shams University for his efficient supervision, kind encouragement and valuable advice throughout this work.

I wish to express my gratitude to Dr. Mohamed Soliman, Consultant and Head of Pediatric Department, El-Sahel Teaching Hospital for his great assistance and supervision.

I am deeply thankful to Prof. Dr. Ibrahim Nabih, Head of Medical Chemistry Laboratory, National Research Centre, for his generous help and advice.

I am greatly indebted to Dr. Magdi El-Sayed, Lecturer in National Research Centre, for his kind help in the practical part of this work.

I wish to express my thanks to Dr. Abdel Khader Makhlouf, Lecturer in National Research Centre, for his valuable help and assistance in carrying out the statistical analysis of this work.

I am also grateful to Dr. Abdel Mohsen Soliman, Lecturer in National Research Centre, for his help and assistance in this work.

I am also grateful to Dr. Abdel-Mohsen Kamel, Head of Maternal and Child Health Unit of Abou-Takyaa for his assistance in the practical part of this work.

I would like to thank all mothers and babies who shared in this study; together with my colleagues in the Pediatric Department for their perfect cooperation.

CONTENTS

	<u>Page</u>
List of abbreviations	iv
List of tables	v
List of figures	viii
INTRODUCTION AND AIM OF THE WORK	1
REVIEW OF LITERATURE	6
Maternal nutritional status and lactational performance	6
Assessment of nutritional status of the mother	12
Human milk volume	22
Biochemical composition of breast milk	31
Milk fat	31
Milk protein	36
Milk lactose	40
Breast feeding and infant growth	43
SUBJECTS AND METHODS	48
RESULTS	62
DISCUSSION	95
SUMMARY AND CONCLUSION	108
REFERENCES	112
ARABIC SUMMARY	148

L I S T O F
A B B R E V I A T I O N S

A.C.	Arm Circumference
ANOVA	Analysis of variance
C.A.T.	Computerized axial tomography
C.C.	Chest circumference
d.f.	degree of freedom
F.A.O.	Food AND Agriculture Organization
H.C.	Head circumference
Hct.	Hematocrite
I.D.F.	International Dairy Federation
m.	Month
N.C.H.S.	National Centre for Health Statistics
N.P.N.	Non protein nitrogen
S.D.	Standard deviation
S.S.	Sum of squares
T.C.S.F.	Triceps skinfold thickness
T.F.A.	Total fatty acids
T.L.	Total lipids
W.H.O.	World Health Organization

LIST OF TABLES

		<u>Page</u>
TABLE (1):	Anthropometric characteristics, hematocrite values and serum albumin concentrations of mothers	66
TABLE (2):	Milk amount per-day and milk concentrations of fat, protein, lactose and energy by infant age	67
TABLE (3):	Concentrations of milk fat, protein, lactose, and energy by maternal A.C. and infant age interval	68
TABLE (4):	Concentrations of milk fat, protein, lactose, and energy by maternal T.C.S.F. and infant age interval	69
TABLE (5):	Analysis of variance (ANOVA) for A.C. groups for milk fat concentration	70
TABLE (6):	ANOVA for A.C. groups for milk protein concentration	71
TABLE (7):	ANOVA for A.C. groups for milk lactose concentration	72

TABLE (8):	ANOVA for A.C. groups for milk energy concentration	73
TABLE (9):	ANOVA for T.C.S.F. groups for milk fat concentration	74
TABLE (10):	ANOVA for T.C.S.F. groups for milk protein concentration	75
TABLE (11):	ANOVA for T.C.S.F. groups for milk lactose concentration	76
TABLE (12):	ANOVA for T.C.S.F. groups for milk energy concentration	77
TABLE (13):	Amount of milk per day and concentration of milk fat, protein, lactose and energy by initial maternal weight and change in maternal weight during period of observation, infants were 3 months of age	78
TABLE (14):	ANOVA for change in maternal weight (all mothers) for milk amount per day (g/day) .	79
TABLE (15):	ANOVA for change in maternal weight (all mothers) for milk fat concentration	80
TABLE (16):	ANOVA for change in maternal weight (all mothers) for milk protein concentration ..	81

TABLE (17):	ANOVA for change in maternal weight (all mothers) for milk lactose concentration ..	82
TABLE (18):	ANOVA for change in maternal weight (all mothers) for milk energy concentration ...	83
TABLE (19):	Multiple regression analysis of milk amount (g/day) on infant weight, maternal weight and A.C.	84
TABLE (20):	Anthropometric measures of infants i.e. weight, recumbant length, H.C. and C.C. as reported monthly.....	85

L I S T O F F I G U R E S

	<u>Page</u>
Fig. (1): Role of laboratory in nutritional assessment ...	13
Fig. (2): T.C.S.F. measurement by Harpenden caliper	50
Fig. (3): Gerber tube	56
Fig. (4): Daily consumption of mother's milk by infant age	86
Fig. (5): Fat Concentration of mother's milk by infant age	87
Fig. (6): Protein concentration of mother's milk by infant age	88
Fig. (7): Lactose concentration of mother's milk by infant age	89
Fig. (8): Energy concentration of mother's milk by infant age	90
Fig. (9): Growth curve of infant's weight by infant age ..	91
Fig. (10): Growth curve of infant's recumbant length by infant age	92
Fig. (11): Growth curve of infant's head circumference by infant age	93
Fig. (12): Growth curve of infant's chest circumference by infant age	94

INTRODUCTION
&
AIM OF THE WORK

INTRODUCTION
AND
AIM OF THE WORK

Gestation and lactation form a biologic continuum during which nutrients, protective factors and growth modulators are transferred from mother to offspring. Because placental transfer ceases at birth, these placental functions must be maintained by feeding (Gaul1 et al., 1982).

The positive effects of breast feeding on the health of infants have been increasingly recognized, particularly for those in developing countries. Concurrently, interest in factors that influence the production of milk of mothers from less privileged countries has been of particular concern because a sizable portion of these women are marginally nourished or at times frankly undernourished.

Starting from high levels of practice in the 1940s in developed western countries, breast feeding declined steadily to low levels in the early 1970s (Robertson, 1961) and then began an upward trend (Martinez et al., 1981) that apparently has continued to the present. In the 1940s, breast feeding was more common among disadvantaged women (black, poor and uneducated). The subsequent decline was more rapid among the disadvantaged, however, so that by the early 1970s, disadvantaged women were consid-

erably less likely than others to breast-feed. Because the increase since the early 1970s has not been so pronounced among the disadvantaged, they continue to have relatively low levels of breast feeding. The causes of these trends are not well understood (Hendershot, 1984). Rassin et al. (1984), found that ethnicity have a greater effect on breast feeding than education. However, Kurinij and Roads (1988), clearly identified the influence of education as the most important variable in the incidence of breast feeding. They described also that breast feeding and less formula supplementation during the hospital stay may increase the duration of breast feeding.

Fortunately, among most Egyptian mothers, breast feeding for a prolonged period is still an accepted practice, based on the advice of Holly Koraan to provide breast feeding up to two years of age.

Breast feeding makes a unique, fundamental contribution to health and nutrition of infants. Human milk has special characteristics matched to nutritional needs and physiological limitation (Anderson et al., 1983). The increase in breast feeding has coincided with growing public and professional awareness of its benefits (Rassin et al., 1984).

The American Academy of Pediatrics Committee on Nutrition (1980), concluded that "given emotional support and favourable

circumstances, 96% of new mothers can breast feed successfully."

The World Health Organization International Code of Marketings of Breast Milk Substitute is designed to encourage, promote and protect breast feeding in all W.H.O. member states (Simopoulos and Grave, 1984).

The upward trend in breast feeding has spurred the development of human milk banks which frequently store milk before it is supplied to infants. Storage of human milk is an alternative to formula feeding. Term or pre-term milk stored for three months in the freezer can provide the recommended allowance of vitamin C for infants (Bank et al., 1985). On national basis, respecting the cumulative opinion of our Dar El Efta, eminent Sheikhs and religious workers, it is clear that construction of such banks is not valid in a moslem country (Abdalla, 1987).

Successful lactation is the result of reflex interaction between the mother and her offspring (Jelliffe and Jelliffe, 1974). In high mammals, successful lactation is the end result of numerous interacting factors including maturity, vigor and intact oro-facial anatomy of the newborn, health and nutrition and nipple structure of the mother (Jelliffe, and Jelliffe, 1978b). Early mother-infant contact can establish a bond that makes it less likely for mothers to cease breast feeding (Sosa and Urrutia, 1976).