NUTRITION OF THE NEWBORN

Essay

Submitted for Partial Fulfilment of Master Degree in Paediatrics

By

SAMAR YAHYA ABU-SHARKH

M.B., B.Ch.

Ain Shams

Supervised By

Prof. Dr. ABD EL-KHALIK KHATTAB

M.D. (Ain Shams), Ph. D. (Ed.), F.R.C.P. (Ed.), F.R.C.P. (Glasgo)

Professor and Chairman of the Paediatrics Department,

Ain Shams University

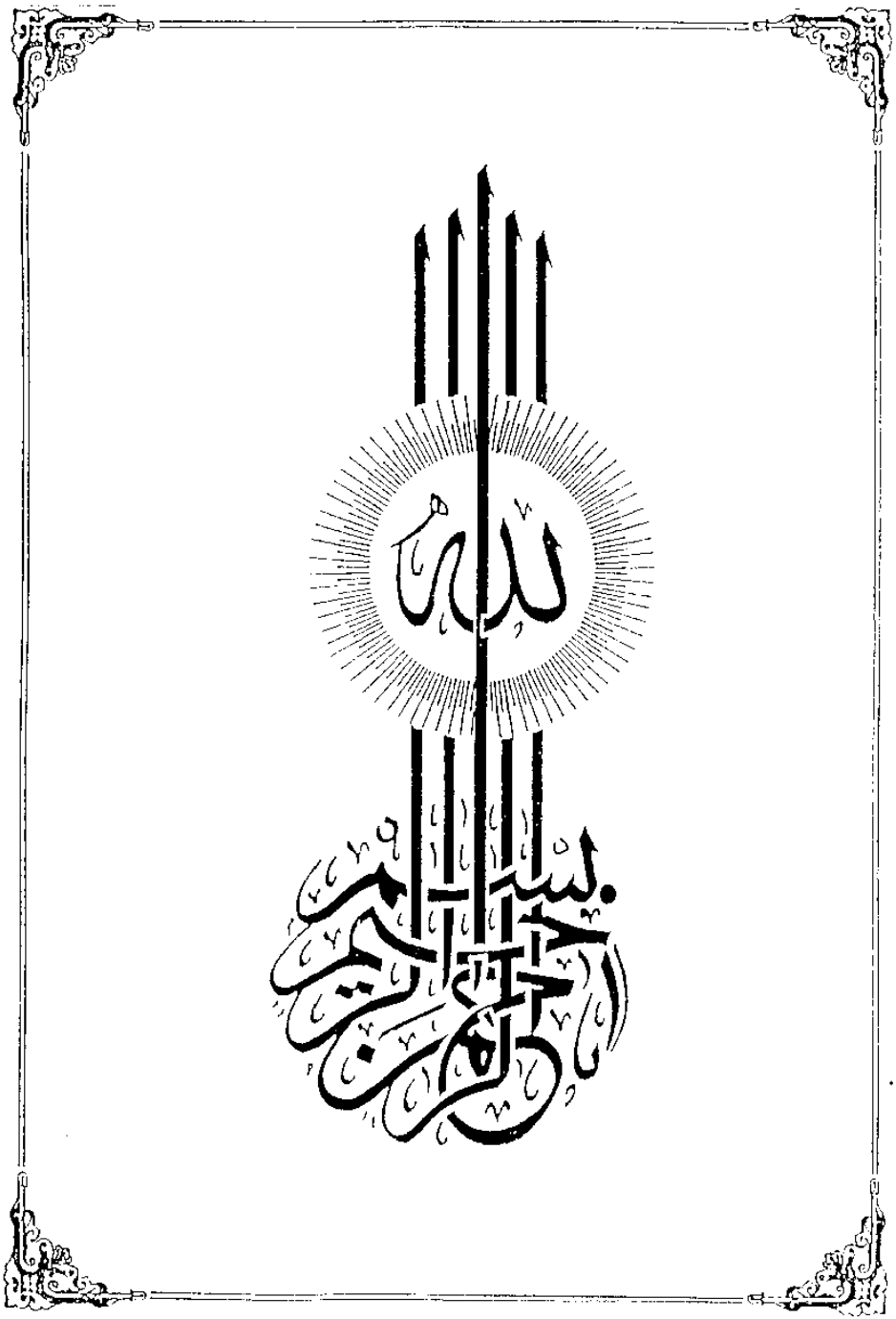
FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

1988

ACKNOWLEDGEMENT

I would like to express my deep gratitude to Prof. Dr. Abd El-Khalik Khattab, Professor and Chairman of Paediatrics Department, Ain Shams University, under whose supervision I had the honour to proceed with this work, for his generous encouragement, continuous supervision, useful suggestions and kind help throughout the work.



CONTENTS

INTRODUCTION

INTRODUCTION

In paediatrics, nutrition has at all times received much greater attention than other clinical disciplines. This is due to the world wide experience indicating that the future well being, the mental and physical development of an infant may be considerably influenced by the way in which he is fed and the quality of food received in the first months after birth *(Thompson, 1983)*.

Concerning the types of milk available for feeding the normal newborn baby, these are two: breast feeding and formula feeding. On the other hand, healthy infants who are small for gestational age, premature infants, and sick newborns of any birth weight may require specific feeding formulae or techniques for restoration and support of metabolic functions and requirements for growth *(Cox, 1985)*.

There are two general approaches to the feeding of the small or sick newborn. The first involves feeding by mouth or other modifications of enteral feeding to provide nutrition through the gastrointestinal tract.

In some infants, however, it is impossible to provide adequate nutrition enterally, and, therefore, it is necessary to feed the infant with parenteral nutrition *(Thompson, 1983)*.

Each of the alternative enteral and parenteral methods has specific indications, complications and solutions that will be discussed in this review.

DEFINITIONS

DEFINITIONS

The neonatal period is usually defined as the interval from birth to age 28 days. It is a highly vulnerable time during which many of the physiologic adjustments required for extrauterine existence are completed.

The normal full-term newborn infant is that infant who weights approximately 3.4 kg, his length averages about 50 cm, and head circumference averages about 35 cm. The respiratory rate varies from 35-50 per minute and the heart rate ranges from 120-160 per minute. His skin is ruddy and often mottled and has an Apgar score that ranges from 7-10.

Prematurity may be defined as the termination of pregnancy in the period from approximately the twenty-eighth to the end of the thirty-seventh week of gestation *(Marlow, 1973)*.

Infants who weight 2500 gm or less at birth are defined as "low birth weight" (LBW) *(Keay and Morgan, 1982)*. This group of infants are considered to have had either a shortened gestational period (referred to as preterm) or a less than expected rate of intrauterine growth rate (referred to as intra-uterine growth retardation) or both *(Illingworth, 1983, Behrman and Vaughan, 1983)*.

Live born infants delivered before 37 weeks of gestation calculated from the first day of the last menstrual period are considered to have a shortened gestational period and are termed premature by the "World Health Organization" (WHO). The American Academy of paediatrics uses 38 weeks to delineate prematurity *(Behrman and Vaughan, 1983)*.

Infants small for gestational age (SGA): are defined as: The infant's weight is two standard deviations below the mean, or below the tenth percentile *(Cloherty and Stark, 1981).*

The term "Very Low Birth Weight" infants refers to those infants born weighing less than 1500 grams at birth *(Behrman and Vaughan, 1983).*

Table 1: The chief differences which can be observed by examination of term and preterm baby

	Term infant	Preterm infant
Length	50 cm (20 in.)	Less than 47 cm. (18.5 in.)
Weight	3.180-3.640 g.	2.500 g. or less.
Proportions	- Head circumference 35.5 cm.	Less than 33 cm.
	- Chest circumference 33 cm	Less than 29 cm.
	- Umblicus midway between symphysis pubis and xiphi--sternum	Umblicus near symphysis pubis
Vitality	- Strong and active	- Weak and sluggish
	- Wakes for feeds	- Drowsy
	- Lusty cry	- Weak, mewing cry
	- Normal temperature	- Subnormal temperature
	- Strong suction	- Feeble or absent suction.
Skin	- Subcutaneous fat present	- Little fat present
	- Nipples raised	- Nipples flat.
Ears	- Firm and stand out	- Soft and flat.
Soles of feet	- Complex series of criss-crossed creases cover soles of feet.	- One or two transverse creases.
Nails	- Hard	- Soft.
Genitals	- Testicles in scrotum	- Testicles in abdomen, inguinal canal or scrotum.
	- Labia minora covered by labia majora.	- Not covered.

Table 2: Contrasting features of appropriate–for–dates preterm, and light–for–dates malnourished infants

Feature	Preterm	Light–for–dates
Definition	Born before 37 weeks' gestation	Birth–weight below 10th percentile for gestational age.
Vernix	Present in variable amount.	Little or absent
Skin	Red and transparent	Dry, folds of lax skin.
Subcutaneous tissue	Sparse	Sparse
Skull	Bones soft and pliable	Less pliable
Facies	Doll–like	Mature
Abdomen	Prominent	Usually flat or scaphoid.
Cord	Thick and fleshy	Thin, flabby and stained.
Cry	Feeble	Mature
Muscle tone	Hypotonic, frog–like position	Variable, usually active.
Complications	– Hypothermia – Respiratory distress – Infection – Cerebral haemorrhage	Hypoglycaemia. Hypoclacaemia Hypothermia

RECOMMENDED DAILY DIETARY ALLOWANCES FOR INFANTS

Table 3: Recommended daily dietary allowances for infants

Components	Infants Aged 0.0 – 0.5 year	Infants Aged 0.5 – 1 year
A. Protein	2.2/kg body weight	2.0/kg body weight
B. Energy	115/kg body weight	105/kg body weight
C. Fat–soluble vitamins:		
– Vitamin A (μg retinol equivalents)	400	420
– Vitamin D (μg)	10	10
– Vitamin E (mg – tocopherol)	3	4
– Vitamin K (μg)	12	20
D. Water–soluble vitamins:		
– Ascorbic acid (mg)	35	35
– Thiamine (mg)	0.3	0.5
– Riboflavin (mg)	0.4	0.6
– Pyridoxine (mg)	0.3	0.6
– Niacin (mg nicotinamide)	6	8
– Folacin (μg)	30	45
– B_{12} (μg)	0.5	1.5
– Biotin (μg)	35	50
– Pantothenic acid (mg)	2	3
E. Minerals:		
– Zinc (mg)	3	5
– Iodine (μg)	40	50
– Iron (mg)	10	15
– Magnesium (mg)	50	70
F. Trace elements:		
– Copper (mg)	0.5	1.0
– Fluoride (mg)	0.1	1.0
– Manganese (mg)	0.5	1.0
– Chromium (mg)	0.01	0.06
– Selenium (mg)	0.01	0.06

(American Academy of Paediatrics, 1983)

RECOMMENDED NUTRIENT INTAKES FOR LOW BIRTH WEIGHT INFANTS

Table 4: Recommended nutrient intakes for low birth weight infants

Nutrient	Recommended intake*
Protein	1.8 gm
Fat	3.3 gm
	(300 mg essential fatty acids)
Carbohydrate	–
Sodium	20 mg
Potassium	80 mg
Calcium	50 mg
Magnesium	6 mg
Phosphorus	25 mg
Chloride	55 mg
Iron	0.15 mg
Zinc	0.5 mg
Copper	60 μg
Manganese	5 μg
Iodine	5 μg
Vitamins	
Vitamin A	250 IU
Vitamin D	40 IU
Vitamin E	0.7 IU
	(1 IU/gm linoleic acid)
Vitamin K	4 μg
Vitamin C	8 mg
Thiamin	40 μg
Riboflavin	60 μg
Niacin	250 μg
Vitamin B_6	35 μg
	(15 μg/gm protein)
Folic acid	4 μg
Pantothenic acid	300 μg
Vitamin B_{12}	0.15 μg
Biotin	1.5 μg
Inositol	4 mg
Choline	7 mg

(American Academy of Paediatrics, 1977)

* Minimum levels of intake recommended per 100 calories.

Recommended caloric intake is 110 to 150 calories/kg/day.