



MATERNAL NUTRITIONAL STATUS, BREAST-MILK PRODUCTION AND NEWBORN GROWTH AND DEVELOPMENT

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Abstract

Breast-feeding practice of Venezuelan mothers is very short (less than 3 months). In 1995, 52% of the lactating women stopped breast feeding before the first month. Exclusive breast-feeding is very infrequent, especially among low income women. The most important reasons for quitting breast feeding are: early weaning, working mothers in "informal market", and lack of nutritional knowledge. There are new programs, from governmental (CONALAMA) and non-governmental (UNICEF) groups that improve this practice. There is little information regarding breast-milk production, composition, nutritional and socio-cultural behaviors of lactating women in Venezuela. With the goal of providing reliable information on this topic, we are studying maternal nutritional status, and breast-milk production of low SES mothers, and growth of their infants. In this study we selected isotopic methods to measure breast-milk intake, on the other hand, vitamin A contained in women breast milk was determined. Another objective of this project was to assess mother's vitamin A status according to the conjunctival impression cytology (CIC) and the retinol dose response (RDR) methodology. Mother body composition was determined through different skinfold measurements and body mass index (BMI). Also, the babies' growth during the first three months of breast-feeding was evaluated. During that period it was possible to evaluate vitamin A reserves and corporal composition of the mother and nutritional status of their infants. No important prevalence of vitamin A deficiency was detected (6.3%), high risk of malnutrition was demonstrated by SES (92%), and between 11 and 18% of the mother began the lactating period undernourished.

1. SCIENTIFIC BACKGROUND

Breast-feeding practice of Venezuelan mothers is of very short duration (less than 3 months). In 1995, 52% of the lactating women stopped breast feeding before the first month [1-2].

Exclusive breast-feeding is very infrequent, especially among low income women. The most important reasons for its abandonment are: early weaning, high number of working mothers in "informal market" (even though we have laws that protect the working mother during the lactating period, many of the low SES women are not protected because they work in the informal sector of our economy), and lack of nutritional knowledge [1-4].

In view of these problems, new programs that advocate breast-feeding have been created, both from governmental (CONALAMA) and non-governmental (UNICEF) groups. We are conducting our study in one of the two hospitals in the city of Valencia with such programs. The hospital is located within a very poor suburban area of the city. Only natural deliveries are attended and their breast-feeding program follows UNICEF guidelines, such as common rooming and counseling on lactating issues.

From the beginning of the project, in May 1996, our research team has participated in all of the hospital's activities concerning breast-feeding, among them,

we provide counseling to mothers, prepare visual aids material for breast-feeding education programs, and written information to handout.

There is little information regarding breast-milk production, composition, nutritional and socio-cultural behaviors of lactating women in Venezuela.

With the goal of providing reliable information on the topic, we are studying maternal nutritional status, breast-milk production of low SES mothers, and the growth of their infants.

2. METHODS

2.1. Sample

Thirty women, after delivery, were willing to breast-feed for at least a period of three months. Currently we are including mothers who breast- and bottle-feed (mixed-feeding), as well as those who breast-feed exclusively. This decision was taken because exclusive breast-feeding during the three-month period is almost impossible to find in this low SES sample. Most of the women are working-mothers and/or they have a cultural-social bias, in the sense that they feel that an exclusively breast-fed baby is not well nourished. Hence, we will be measuring breast-milk intake in infants with both exclusive breast-feeding and mixed-feeding.

2.2. Inclusion criteria for the mother and her babies

- a) Mothers' age: 18 to 35 years old.
- b) Mothers and babies free of acute or chronic diseases. Undernourished mothers were included.
- c) Mothers that do not drink alcohol and non-smokers.
- d) Low socio-economic status.
- e) Gestational age: 37-42 weeks.

2.3. Parameters to be measured

- a) Maternal body composition and vitamin A (VA) status at the beginning and at the end of a 3 months breast-feeding period.
- b) Breast-milk volume by isotopic method, measured during the same period of time.
- c) Infants' growth and development, assessed by anthropometric evaluation during this period.
- d) Vitamin A content in breast-milk, after the first month of breast-feeding.

2.4. Methodology

Socioeconomic status evaluation: Assessment by the Graffar Mendez-Castellano Method [5].

2.5. Anthropometric assessment

Maternal: Weight, height, mid-upper arm circumference, triceps, biceps, subscapular, and suprailiac skinfolds.

Infant: Weight, height, triceps and subscapular skinfold, mid-upper arm circumference, and cephalic circumference.

2.6. Body composition

Assessed by body mass index (BMI), and combination of skinfolds for body fat estimates. Reference values for mothers by NCHS and for infants by PROYECTO VENEZUELA, a national reference [6-11].

2.7. Vitamin A status

Assessment by serum retinol levels, retinol dose response (RDR) and Conjunctival Impression Cytology by ICEPO [12-13]. Serum retinol was determined by HPLC.

2.8. Breast milk output

Measured by water turnover rates using $^2\text{H}_2\text{O}$, as described by Coward [14-16]. [Note: Deuterium analysis will be performed by Gabriela Salazar, in INTA Department of Physics, Faculty of Science, University of Chile, (personal agreement)].

2.9. Vitamin A content in milk. Assessed by HPLC assay.

2.10. Work Schedule

time 0: 0-3 days after delivery:

- ⇒ Selection of the mother (n=30) according to pre-established criteria.
- ⇒ Mother's motivational talk and encouragement towards breast-feeding and participation in the project.
- ⇒ Collection of venous blood sample and CIC samples for vitamin A status.
- ⇒ Anthropometric assessment of mother and infant.

time 1: 30 days after delivery:

- ⇒ Mother and infant anthropometric assessment.
- ⇒ Collection of breast-milk sample to determine VA content.
- ⇒ Determination of breast-milk volume (by isotopic method).
- ⇒ Collection CIC samples for the vitamin A status.

time 2: 3 months after delivery:

- ⇒ Mother and infant anthropometric assessment.
- ⇒ Collection of venous blood sample and CIC samples for vitamin A status.
- ⇒ Collection of breast-milk sample to determine VA content.
- ⇒ Determination of breast-milk volume (by isotopic method).

3. RESULTS

We have had very important limitations in recruiting the mothers and obtaining their breast-milk samples. Sample collection by the isotopic method was initiated with the saliva samples. For the mother, saliva samples collection was very difficult, so we decided to change the collection to urine samples. Very few mothers have successfully completed the procedure, even though the team has thoroughly explained and showed the methodology. One of the limiting factors affecting the

collection may be the low educational level of the women. Another important limiting factor has been the lack of safe transportation to visit the households in order to collect the samples. Currently only 8 mothers successfully completed the urine collection. These samples were sent to Chile (INTA) in October 1999 for analysis. Data on these results are not available yet.

The determination of breast-milk vitamin A content is another objective of the project. Here, I would like to comment that, even though it has been difficult to accomplish, last month we started with the analyses. I do not have any results yet

During 1997, as a pilot project, 162 mothers and their newborn were evaluated according to the work plan at time 0. Anthropometric data, serum retinol, CIC and RDR test were collected and analyzed. Only two of them completed urine collection to evaluate milk production satisfactory. Results of antropometric nutritional status of mother and infants and vitamin A status of mother are showed.

During 1999, 40 mother-infant pair was assessed. Eighteen of these units attended the first month control visit and were assessed. Of these, only 11 agreed to continue in the study, and samples of maternal milk, blood, and CIC were obtained. At this visit, deuterium was administered in order to evaluate milk production and vitamin A transfer from mother to infant. Not all of them completed satisfactorily the urine collection (only 7) (Table I). Reasons for not attending to the first control visit (n = 22, 55%) were similar to those reported previously (1997). Cessation of maternal nursing, lack of interest, motivation, and knowledge regarding nutritional control visits, and household moving. During the first months of 1999, laboratory results and nutritional counseling were offered as incentives for mothers to attend. In view of the difficulties found during the first stage of the project regarding the attendance to the control visits, in July 1999 it was decided to offer a \$35 bonus to those subjects that attended all the controls. Since then, the attendance to the first and third month control increased by 17%.

TABLE I: RECOLLECTION DATA OF THE SAMPLES

1999	Anthropometry, Socioeconomics	Vitamin A	Breast-milk collection	Urine collection
Time 0: 40 mother- infant pairs	40	40 by CIC, and Serum retinol	12	--
Time 1: 11 mother- infant pairs	11	7 by CIC	7	6
Time 2: 7 mother- infant pairs	7	7 by CIC, and Serum retinol	7	6

3.1. Socio-economic results

1997: 92.3% of the mother were in poverty condition (Status IV and V Graffar method modified by Mendez Castellano). Mother's education level was low:

38,6% had completed elementary school, 43,1% had incomplete high school education, and 16,3% completed high school. None of the subjects had a university education.

1999: 87.1% of the mother were in poverty. As presented for 1998, mother's education level was low: 35,9% had completed elementary school, 43,6% had incomplete high school, and 17,9% completed high school. Only 1 subject (2.6%) had a university education.

A high percentage of them live under poverty conditions and, therefore, are at risk for malnutrition by this indicator.

It is important to note that 80% of our population are considered poor, as assessed by the Graffar method.

TABLE II: ANTHROPOMETRIC STATUS

	Mothers		New born	
	Pre-pregnancy BMI	Postpartum BMI	Limb Fat Area	Weight/age index
1997				
Deficit	22. %	11%	15%	11%
Normal:	65%	57%	83%	86%
Excess:	14%	32%	2%	3%
1999				
Deficit	16%	18%	15%	23%
Normal:	81%	45%	85%	72%
Excess:	3%	37%	---	5%

We observed that a number of women are undernourished during the first months of pregnancy (22% for 1997 and 16% for 1999) and some of them started their lactation period in the same condition (11% for 1997 and 18% for 1999). A good correlation between BMI, pre-gestational BMI and fat area was found. The percentage of undernutrition in the newborn was similar to the postpartum BMI (11% for 1997 and 23% for 1999). These percentages are above the national prevalence. According to NCHS references, 30% of the mothers were below 3rd percentile for height.

TABLE III: MATERNAL ANTRHOPOMETRIC INDEX (MEAN ± SD) ACCORDING TO NEWBORN NUTRITIONAL STATUS, 1997.

Newborn nutritional diagnosis	Pre-pregnancy BMI (Kg/m ²)	Weight gain (Kg) *	Maternal Height (cm) *	Maternal Weight (Kg)*
IUGR(16)	19.6 ± 2.4	7.7 ± 2.8	154.8 ± 4.18	51.3 ± 6.1
AGA(136)	22.5 ± 2.9	10.6 ± 6.4	156.1 ± 5.89	59.4 ± 7.7
Total (147)	22.2 ± 3.1	10.2 ± 6.4	156.0 ± 5.69	58.0 ± 7.9

*significantly different (p<0,001) T student

TABLE IV: MATERNAL ANTRHOPOMETRIC INDEX AND BODY COMPOSITION INDICATORS (MEAN±SD) ACCORDING TO NEWBORN NUTRITIONAL STATUS, 1997

Newborn nutritional diagnosis	Limb fat area (cm ²) *	Fat free area (cm ²)	Fat % * (by Siri)	Arm circumference (cm)*
IUGR (16)	13.0 ± 3.2	31.4 ± 5.3	24.6 ± 3.2	23.5 ± 1.78
AGA (136)	22.2 ± 8.9	34.1 ± 5.7	30.0 ± 5.5	26.5 ± 1.81
Total (147)	21.1 ± 8.8	33.9 ± 5.7	29.4 ± 5.4	26.2 ± 2.90

*significantly different (p<0,000) T student

Comparing some indicators of the maternal nutritional status by the infant nutritional diagnosis, it was found that the pre-gestational BMI, mother limb fat area and the percentage of the body fat was significantly minor in the mothers of the infant with intrauterine growth retardation.

TABLE V: MATERNAL VITAMIN A STATUS

	VA < 30 µg/dl	Abnormal CIC	RDR > 20%
1997	0%	6.3%	6.1%
1990	0%	0%	12.5%

The percentage of women with vitamin A deficiency was low with all indicators. This level of vitamin A deficiency suggests that it is a light problem of public health.

4. CONCLUSION

During puerperal period vitamin A reserves, corporal composition of the mothers and nutritional status of the infants were determined. No important prevalence of vitamin A deficiency was detected, high risk of malnutrition by SES was demonstrated, and between 11 and 18% of the mother began the lactating period undernourished. Breast milk intake as well as vitamin A breast milk concentration are been performed.

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