

Maternal Factors Relating to Breast-feeding Duration in Areas around Guadalajara, Mexico¹

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To investigate breast-feeding patterns and factors encouraging early weaning, a survey was conducted in Tonalá and Tlaquepaque, two suburbs within Guadalajara's metropolitan area, in 1991. For this purpose a multiphase probabilistic sample of infants born in these areas from May 1990 through April 1991 was selected. This was done by choosing at random primary health care units in the study areas, health posts associated with these units, and all infants meeting the above criteria at each selected post. A total of 166 homes was visited and interviews were conducted with 141 mothers (91% of the 155 predicted) in June and July 1991. These interviews made use of a 33-item questionnaire developed for the purpose; the interviewers were social workers previously trained in such activities.

Logistic regression models were used to calculate the relative risk (RR) and probability of early weaning being associated with certain variables. To help ensure the validity of the results, several regression models were constructed for the purpose of selecting the one best fitting the data. In addition, the attributable population risk (APR) was calculated.

The results indicate that failure to breast-feed and early weaning were prevalent in the study population, 34.8% of the study infants being breast-fed less than 1 month. Three risk factors were associated statistically ($P < 0.05$) with early weaning, these being maternal age < 20 years (RR = 3.75; 95% CI = 1.53–9.19), maternal marital status single (RR = 2.88; 95% CI = 1.08–7.69), and social status of the main family provider other than "worker"—i.e., employee, professional (RR = 2.72; 95% CI = 1.17–6.28). The likelihood that a study infant would have been breast-fed less than a month was 0.84 if the infant was exposed to all three of these identified risk factors and 0.15 if he or she was exposed to none of them. The high percentages of study mothers less than 20 years old and with a social status other than "worker" were reflected in high attributable population risks found for these variables. In general, the findings point up a need to reduce the influence of these risk factors and to prolong maternal breast-feeding in the study population.

Because of its benefits—improvement of children's nutritional status and survival, prevention of diarrheal diseases during the first year of life, extension of amenorrhea following pregnancy, and

establishment of an affective relationship between mothers and their children—breast-feeding has vital public health implications.

Despite its advantages, however, the incidence and duration of breast-feeding are declining, particularly in the developing countries. Regarding duration, although the trend varies from one country or geographic region to another, it has been observed that only 35% to 60% of the children in Latin America and the Caribbean continue being breast-fed up to the age of 6 months (1). In general, this decline appears more marked than

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in Asia or Africa. In contrast, the trend has changed in most developed countries; following a long period when the duration of breast-feeding was very short, as it still is in developing countries, it is now becoming longer (1).

Within Latin America, Mexico is no exception to the general downward trend. Numerous studies using various approaches have analyzed breast-feeding patterns in Mexico (2–6); all have reaffirmed that the frequency of breast-feeding in that country has declined notably. Among other things, it has been found that only slightly more than a third of the mothers who live in urban areas breast-feed their children for more than 3 months (2, 3). The results of the National Survey of Breast-feeding and Weaning Practices, carried out by the Ministry of Health and Welfare in 1983 (7), supported these findings and suggested that a similar situation prevailed in the rural areas as well.

Since the World Health Organization first established breast-feeding as a priority strategy for primary care and maternal and child health in the 1980s, many investigators have analyzed the relationships between breast-feeding and amenorrhea (8, 9), children's nutritional status (10, 11), and diarrheal diseases (12). In general, these studies have pointed up the benefits derived from breast-feeding. However, few researchers have attempted to deal with the characteristics of mothers who do *not* breast-feed their children and the reasons for early weaning.

In general, it seems evident that the duration of breast-feeding depends on a diverse array of biologic, demographic, socioeconomic, psychosocial, and cultural factors. The aim of the survey reported here, which was performed within the metropolitan area of Guadalajara, Mexico, was to characterize factors influencing breast-feeding's duration and to determine those maternal factors associated with early weaning.

MATERIALS AND METHODS

The survey was carried out in 1991 in the municipalities of Tlaquepaque and Tonalá in the Mexican state of Jalisco. These municipalities, located east and southeast of Guadalajara, the state capital, are part of that city's metropolitan area. Their combined recorded 1990 population of 508 204 (13) then accounted for approximately 18% of the inhabitants of the metropolitan area.

The study population consisted of children under 1 year of age who were born between 1 May 1990 and 30 April 1991, who survived the first month of life, and whose mothers were residents of Tlaquepaque or Tonalá and were beneficiaries of the Mexican Social Security Institute (Instituto Mexicano del Seguro Social—IMSS). From among nearly 3 000 eligible infants with these characteristics, plans were made to select a probabilistic multiphase sample of 155 infants and their mothers (confidence level 95%, precision 7.5%).

It was known that about 750 eligible children were served by each primary health care unit (*unidad de atención primaria de salud*—UAPS) in the study area, and that approximately 28 eligible children were served by each family medicine consultation post within these units. Accordingly, two of the four UAPS serving the study area were selected, a list of the 48 consultation posts within these units was compiled, and six of these posts were randomly selected.

The intent was to include as many as possible of the 166 eligible children served by these posts and their mothers within the study population. However, some 11% of these children and mothers were not included because the residence reported by the family did not exist or because the family no longer resided at that address. In addition, seven sets of questionnaire responses were not included because the

information they contained was incomplete. As a result, the final study sample included 141 children and their mothers—which is to say, 91% of the initially planned 155 mother-child pairs.

The questionnaire developed for the survey contained 33 questions organized within a number of modules that sought information about housing, socioeconomic status, and maternal and child health. This questionnaire had been tested previously by interviewing maternal beneficiaries of the IMSS within the two study area UAPS that were not included in the main survey. Following this pilot survey, the questionnaire was modified to improve ease of delivery and comprehension. The questionnaire was administered during June and July 1991 by social workers especially trained for this work. When necessary (especially regarding prenatal and obstetric care of the mother and pediatric care of the child), clinical records filed at the UAPS were reviewed. Information obtained from these records was given priority consideration.

The decision to survey only mothers who were IMSS beneficiaries was made because of the relatively good facilities the institution offered for structuring the sample and obtaining the information needed. It was recognized, however, that there were noteworthy differences between the population affiliated with the IMSS and the general population. (At least one member of each IMSS-affiliated family had stable employment, greater opportunities for receiving medical care, and social benefits such as provision of milk for an infant during its first year of life.) Therefore, no attempt was made to extrapolate the survey results to other population groups in the municipalities covered.

To help characterize the duration of breast-feeding in the study population, the proportion of children breast-fed at the time of the investigation and their

proportional distribution in terms of breast-feeding duration were estimated. Because we were interested in identifying associations between early weaning (short duration of breast-feeding) and various socioeconomic, biologic, demographic, and cultural variables, early weaning was considered as a dependent variable. The predictor or explanatory variables were deficient housing conditions (HC), maternal age under 20 years (MA), maternal schooling less than 4 years (YMS), social status of the main family provider other than "worker" (i.e., employee, professional) (SOCST), single (not married) mother (SM), delivery problems (DP), birth order 1 (BO1), maternal failure to recognize feeding as an element essential to her child's health (FRFCH), child not wanted (CNW), and maternal age under 20 years at birth of the first child (A1C). Mothers who were not formally married but were in common law unions were considered unmarried for purposes of the survey due to the unstable nature of such unions in the area studied.

Most of the above variables were readily quantifiable, but a few (housing conditions, delivery problems, failure to recognize the importance of feeding as an element essential to child health, and child not wanted) had to be quantified in ways that were not self-evident. In these cases the following procedures were employed:

Housing conditions (HC) were evaluated by taking into account considerations such as overcrowding (based on the average number of people sleeping in the same bedroom), lack of piped water or sanitary facilities within the home, the absence of certain electrical appliances (television, radio, refrigerator), etc. A total of 14 elements was considered. Ten of them were assigned a score of 0 to 2 (for example, the presence of a television set received a score of 2, while its absence

was scored as 0). The remaining four elements, which were felt by the authors to deserve greater weight in classifying housing adequacy, were given scores of 0 to 5 (for example, overcrowding with three or more persons in the same bedroom and lack of piped water both received a score of 0, while bedroom occupation by three or fewer persons and presence of a piped water system both received a score of 5). By adding these scores a scale of values was constructed, with the total scores ranging from 0 (worst housing conditions) to 40 (best conditions). Dwellings that did not score 60% of the maximum (24 points) were classified as deficient.

Though some authors recommend evaluating housing conditions in an integral manner (14, 15), most prefer to deal separately with different elements, which are then used to develop a scale of values. Even so, the elements assigned the greatest importance in this survey were ones invariably used in characterizing housing conditions. To gauge the validity of the values obtained, an analysis was made of the correlation between housing conditions and per capita family income. The value of the correlation coefficient (0.787) and its sign demonstrate the internal coherence of the housing data. Moreover, the assignment of different weights to the component elements of this variable does not appear to substantially modify the results, since similar proportions of study children were found living in deficient housing conditions whether or not they were breast-fed 1 month or more.

Delivery problems (DP) were taken to include (for the mother) caesarean section, prolonged delivery, excessive bleeding, and anesthesia problems; and (for the child) forceps delivery and neonatal disorders.

Failure to recognize breast-feeding's contribution to child health is a highly

subjective variable. In our case, determination of such failure was based on the mothers' replies to two questions, "What do you believe your child needs in order to be healthy?" and "Of all the things you do for your child, which do you consider the most important?" Failure to mention feeding in the replies given to either question was taken to indicate that the mother did not immediately recognize nutrition as a factor essential to her child's health, at least verbally.

To determine if a study child was unwanted, the mother was asked "At the time when you were pregnant, did you really want to have your child?" A strong correlation was observed between a "no" answer to this question and a positive response to a prior question indicating use of a contraceptive device to avoid pregnancy.

After considering a broader set of variables, those eventually included in the survey were those that showed a relatively great individual association with the dependent variable. Since it appeared that exposure of children to these variables could perceptibly alter their chances of being breast-fed less than 1 month, each of them was considered as a possible risk factor associated with early weaning.

For purposes of statistical analysis, all the explanatory variables were dichotomized and assigned values of 1 or 0 to respectively denote the presence or absence of the risk factor involved. The dependent variable was assigned a value of 0 when the duration of breast-feeding was 1 month or more, and 1 when the duration was less than 1 month.

Relative risk (RR) was used to gauge the degrees of association between the dependent variable and the various risk factors. Using the LOGIT statistical package (16), various logistic regression models were constructed in order to select the one with the best fit for estimating the

relative risks. The statistical importance of the models was evaluated by the verosimilitude ratio and the Chi-square test, and the models were validated by means of the goodness of fit test of Hosmer and Lemeshow (17), estimating the statistic *H*. The 95% confidence intervals of the relative risks were estimated in a similar manner. The regression coefficients were estimated by means of the maximum verosimilitude method, and their degree of statistical significance was evaluated using Student's *t* test. In addition, an estimate was made of the probability that a child would be breast-fed for less than 1 month when exposed or not exposed to each of the risk factors included in the model (18, 19). The social importance of the estimated relative risks was evaluated in terms of attributable population risk (APR) in accordance with Levin's formula (20). To estimate the APR values involved, the percentages of children exposed to each risk factor included in the model were estimated, and the 95% confidence intervals of the APR values were calculated.

RESULTS

Table 1 shows the age distribution of the study children and the percentage in

each age group that was being breast-fed by their mothers at the time of the interview. Only slightly over one-quarter (25.5%) were being breast-fed at that time. Examination of the data for different age groups showed that the proportion being breast-fed from the fourth month on was very low, amounting to less than one-fifth of the children in each age group. Even in the youngest (1 to 3 months) age group, however, the proportion being breast-fed was less than one-half.

As Table 2 indicates, slightly more than one-third of the children studied (49 of the 141) could not have been breast-fed at the time of the survey because their duration of breast-feeding was less than 1 month. In addition, as Table 3 shows, nearly three-quarters of the study children (105 of 141) had been weaned at the time of the survey. The overwhelming majority of these (88.6%) had been breast-fed for less than 4 months, and nearly half (46.7%) had been breast-fed less than 1 month.

High correlations between the independent variables were not observed—either for the children weaned early or for those breast-fed 1 month or more. However, moderate positive associations were found in both groups (especially among those breast-fed less than 1 month)

Table 1. Distribution of the 141 study children by age, showing the number being breast-fed in each age group at the time the questionnaire was administered. Tlaquepaque-Tonalá, Guadalajara, Mexico, 1991.

Age (months)	No. of children	Children being breast-fed at time questionnaire administered	
		No.	%
1-3	38	18	47.4
4-6	36	6	16.7
7-9	39	7	17.9
10-12	28	5	17.9
Total	141	36	25.5

Table 2. Distribution of the study children by duration of breast-feeding. Tlaquepaque-Tonalá, 1991.

Duration of breast-feeding (in months)	Study children	
	No.	%
<1	49	34.8
≥1	92	65.2
Total	141	100.0

Table 3. Distribution of the study children who were no longer breast-fed at the time of the survey, by duration of breast-feeding. Tlaquepaque-Tonalá, 1991.

Duration of breast-feeding (in months)	Study children	
	No.	%
<1	49	46.7
1	15	14.3
2	18	17.1
3	11	10.5
≥4	12	11.4
Total	105	100.0

between the following sets of variables: maternal age <20 (MA) and maternal age <20 when first child born (A1C); maternal age <20 (MA) and birth order 1 (BO1); and birth order 1 (BO1) and single (unmarried) status (SM). Accordingly, several logistic models were constructed, including and excluding the correlated variables, with the aim of avoiding possible multicollinearity and of finding the model that best fit the observed data.

Table 4 displays the results obtained with the final logistic regression model and shows the associations found between breast-feeding for less than 1 month and the independent variables analyzed. Overall, seven of the eight independent variables analyzed showed positive regression coefficients and, consequently, relative risks exceeding 1.0. Those that appeared to have an especially close association with early weaning were youth (maternal age <20 years—MA), a social

Table 4. Results of applying the logistic regression model, showing associations between breast-feeding for less than 1 month and the 10 selected variables. Tlaquepaque-Tonalá, 1991.^a

Variable	Coefficient β	Standard error	Probability (T)	Relative risk (RR)	95% Confidence interval (CI)
Housing conditions (HC)	0.1467	0.4408	0.50	1.16	2.74–0.49
Maternal age <20 years (MA)	1.3213	0.4578	0.00	3.75 ^b	9.19–1.53
<4 years maternal schooling (YMS)	0.3055	0.4655	0.50	1.36	3.38–0.55
Maternal social status other than "worker" (SOCST)	0.9992	0.4277	0.02	2.72 ^b	6.28–1.17
Mother single (SM)	1.0567	0.5014	0.03	2.88 ^b	7.69–1.08
Delivery problems (DP)	0.1790	0.4001	0.50	1.20	2.62–0.55
Failure to recognize feeding as key to child health (FRFCH)	0.1609	0.2512	0.50	1.17	1.92–0.72
Child not wanted (CNW)	-0.1583	0.2966	0.50	0.85	1.53–0.48
Constant	-1.7219	0.3980	0.00		

^aChi-square test (8 degrees of freedom) of likelihood ratio = 18.674; P = 0.017.

^bP < 0.05.

Table 5. The percentage attributable population risks (APR) of variables identified as risk factors associated with early weaning (a breast-feeding duration of less than 1 month). Tlaquepaque-Tonalá, 1991.

Risk factor	% Study children exposed	Relative risk (RR)	% Attributable risk (APR)	95% Confidence interval
Maternal age <20 years	23.4	3.75	39.2	11.3–65.7
Mother's status other than "worker"	48.9	2.72	45.7	7.7–72.1
Mother unmarried	17.0	2.88	24.2	1.4–53.2

status other than "worker" (SOCST), and the mother's being single (SM).

As may be seen, the presence of these latter factors considerably raised the risk of a study child being breast-fed for less than 1 month. Indeed, the factor of maternal age (for a mother under 20 years old at the time of the survey) increased the apparent risk of early weaning almost four times (RR = 3.75) as compared to the risk faced by children born to mothers 20 years of age or more. Similarly, the apparent risk was more than doubled for the children of single mothers and for children whose mothers had a social status other than "worker." The *t* test results (see Table 5), together with the fact that the lower limits of the 95% confidence intervals for the RR of these three variables exceeded 1.0, led to rejection of the null hypothesis that there was no association between the predictive variables and the dependent variables—which is to say that the regression coefficient was equal to 0. The model used was the one that presented the best fit—the statistic *H* was equal to 6.71 (*p* = 0.5), indicating that the model adequately fit the observed data.

Table 5 shows the percentages of study children exposed to each of the three identified risk factors. When combined with the relative risk figures already noted, these percentages cause higher attributable risk (APR) values to be assigned to the variables maternal age (MA) and so-

cial status other than "worker" (SOCST)—39% and 46%, respectively—than to marital status (24%).

Table 6 shows the probabilities of a child being breast-fed by its mother for less than 1 month if it were exposed to all the possible risk factors considered, to the three identified risk factors, and to none of the risk factors. Since the overall probability of a child from the sample being breast-fed for less than 1 month was 0.35, it appears that this probability was increased notably (to 0.90) by exposure to all the risk factors, and by nearly as much (to 0.84) by exposure to the three identified risk factors. On the other hand, the chances of such early weaning would be relatively low (probability 0.15) if none of the possible risk factors were present.

Table 6. The probability of study children being breast-fed for less than 1 month relative to the presence or absence of the 10 study variables and 3 identified risk factors. Tlaquepaque-Tonalá, 1991.

Risk factors	Probability
Presence of all 10 potential risk factors studied	0.90
Presence of the 3 identified risk factors	0.84
Absence of all 10 potential risk factors studied	0.15
Average probability of breast-feeding <1 month	0.35

DISCUSSION

Despite certain limitations of the survey—especially possible biases relating to the inability to locate mothers at certain reported residences, the incomplete questionnaires, the subjective nature of the responses to some questions, and the scope of the survey (limited to maternal beneficiaries of the IMSS)—the data obtained appear to point up the importance of early weaning in the population studied. The high proportion of children breast-fed for less than 1 month, together with the high number of children weaned before the fourth month, points to a situation that while not unique to Mexico or the Hemisphere (2, 21, 22) is nonetheless worrisome from the standpoint of maternal and child health. In all, approximately 1 000 of the nearly 3 000 children born to mothers who were beneficiaries of the IMSS in the municipalities studied were breast-fed less than 1 month or not at all.

Even in the Mexican urban context, the 11.4% figure for children breast-fed more than 3 months (see Table 3) appears low (3, 5, 6), and the same is true when these results are compared with those obtained from studies carried out in other parts of Latin America (23, 24). This finding must be considered in light of the fact that the IMSS is obliged by law to provide six rations of powdered milk free of charge to newborns during their first year of life, this powdered milk usually being provided from the time the mothers begin to bring their infants in for childrearing consultations.

In practice, these powdered milk rations are very often provided during the first 6 months of life, a circumstance that to some extent encourages early suspension of breast-feeding. It is true that these powdered milk rations are of great value as nutritional supplements for the child; but they would be even more valuable if

they were not provided at the time of the first childrearing consultation.

One alternative to the present state of affairs might be to set an appropriate age at which such supplements would start being provided, although this would not prevent the institution involved from supplying newborns beforehand with some kind of dietary supplement, not necessarily in the form of a milk product.

The foregoing considerations notwithstanding, it should be noted that the duration of breast-feeding in the study population was not homogeneous, depending as it did on the presence or absence of various factors, in most of which maternal conditions played a paramount role. In particular, the statistical associations revealed between certain variables and breast-feeding of less than 1 month's duration point up the importance of adolescent maternity and instability of the parental union as risk factors encouraging early weaning. Within this context, it seems reasonable to think that lack of full psychosocial and physiological preparedness on the part of young women to assume all the responsibilities associated with motherhood, their lack of experience in caring for children (many of these mothers were primiparas), and their emotional instability are circumstances contributing to this increased risk.

The relationship observed between membership in a social group other than the unskilled working class and early weaning could well be explained by the traditional tendency of women with more schooling not to breast-feed for long periods of time, due to professional or aesthetic reasons or for reasons already noted.

It should be noted that the relationship between maternal schooling and duration of breast-feeding cannot be understood from a linear perspective. Although the survey found that fewer than 4 years of schooling increased—but not significantly—the probability of early

weaning (breast-feeding for less than a month), the mothers with 4 years or more of schooling did not constitute a homogeneous group. In general, it has been found that mothers with relatively higher levels of school attendance are more likely to wean their children earlier (25).

From a health perspective, the true social importance of the factors involved derives not merely from the relative risk estimated in each case, but rather from the relative risk in combination with the number of children exposed to each factor.

The results reported above give some idea of the notable increase in breast-feeding that might be achieved if the children were not exposed to the main risk factors identified, particularly being born to a mother less than 20 years of age or one with a social status that encourages early weaning. It is unrealistic to think of eliminating such risk factors altogether, but it should be possible to reduce their influence and thereby to diminish the excess risk. In the case of maternal age, for example, displacement of births toward more appropriate maternal ages could have an indirect but favorable influence on the reduction of early weaning.

Attainment of such goals, of course, is beyond the capacity of the health services. Rather, it requires that intersectoral efforts by a variety of social actors be directed toward appropriate changes.

Estimation of the probability that a given child will be breast-fed for less than 1 month permits affirmation at the individual level of the need to consider socioeconomic, biologic, demographic, and cultural variables affecting the mother, especially those variables showing a close statistical association with early weaning. Within this context, the small difference found between the probability of a child being breast-fed for less than 1 month if it were exposed to all 10 unfavorable factors analyzed versus only the three risk

factors identified points up the importance of these three factors and their apparent predictive value.

CONCLUSIONS

Despite various problems involved in analyzing factors that determined the duration of breast-feeding among the study children, a pronounced pattern of early weaning was evident. This pattern was reflected in the high percentage of mothers who did not breast-feed their children for even 1 month and in the small percentage of children who were breast-fed after the third month of life.

Risk factors associated with breast-feeding for less than 1 month were identified as a maternal age of less than 20 years at the time of the survey, a maternal social status other than "worker," and a mother who was single. Given the large number of study children born to mothers who had a status other than "worker" or who were under 20 years of age, these factors were identified as being of clear social importance.

Individual prognosis of the duration of breast-feeding requires consideration of various maternal conditions, especially those whose close association with early weaning is evident. Such consideration would make it possible for family physicians and personnel in IMSS departments such as Social Work and Maternal and Child Nursing to provide education from the prenatal period up through childbirth aimed at promoting breast-feeding, especially among pregnant women whose circumstances are likely to make them less disposed toward breast-feeding for a prolonged period of time. The formulation of risk categories referring specifically to the duration of breast-feeding, as have been developed here with regard to obstetrics, could prove to constitute an appropriate strategy for reduction of early weaning.

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