Original Article

Feeding patterns before 6 months of age: the relative validity of recall from interviews of mothers of Guatemalan infants and toddlers

Marieke Vossenaar PhD[1], Ilse van Beusekom MSc[1], Colleen Doak PhD[2], Noel W Solomons MD[1]

[1]*Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM), Guatemala City, Guatemala*
[2]*Health Sciences, VU University, Amsterdam, Netherlands*

The WHO recommends exclusive breastfeeding during the first 6 mo of life; however, deviations from this recommendation are widespread. The objective of the current study was to evaluate exclusive and predominant breastfeeding rates, as defined by the WHO, in a cross-sectional sample of Guatemalan children using retrospective records on the temporal pattern of introducing foods and beverages before 6 mo. Mothers of 150 infants, aged 6 to 23 mo, attending a public health clinic were interviewed about early life feeding practices with a structured questionnaire. In addition, the plausibility of the reported offering of liquids and foods, other than breast milk, since birth was checked against reported current feeding practices. We observed that estimated exclusive breastfeeding was rare with 14% of infants receiving exclusive breastfeeding for 5 mo, and only 9% for the recommended 6 mo. The proportion of infants with predominant breastfeeding, which allows certain liquids such as water, juices and ritual fluids, was 33% through 5 mo and 23% through 6 mo. One-quarter of mothers (n=38) reported implausible answers concerning age-of-introduction of liquids and foods. Nevertheless, retrospective reports at up to 2 y give credible outcomes for estimations of feeding pattern at 6 mo of age. Our findings match the findings of other studies conducted in Guatemala. Overall adherence to the WHO guidelines for feeding in the first semester of infancy was much less than ideal and in need of strengthening.

Key Words: infant and young child feeding, infant and young child nutrition, dietary assessment, exclusive breastfeeding, Guatemala

INTRODUCTION

The World Health Organization (WHO) recommends that infants should be put on the breast within 1 h after birth, be exclusively breastfed (EBF) for the first 6 mo, and continue to be breastfed along with adequate complementary foods to at least 2 y of age.[1] The 2003 *Lancet* series on child survival identified the promotion of EBF during the first 6 mo and continued breastfeeding to 12 mo as the single most effective preventive public health intervention for reducing mortality among children aged <5 y.[2] More recently, the 2013 *Lancet* series on maternal and child nutrition estimated that suboptimum breastfeeding results in more than 800,000 child deaths annually.[3] EBF is defined by the WHO as the infant's consumption of human milk with no supplementation of any type (no water, juice, formula milk nor foods) except for oral rehydration solution (ORS), drops and syrups (vitamins, minerals, medicines). Moreover, between the recommended EBF and mixed feeding (MF), is a category of predominant breastfeeding (PBF), in which items such as water, water-based drinks, juices and ritual fluids are tolerated, but none of the more substantive beverages (including infant formula) or solid foods (Table 1).[4]

The WHO definition for the assessment of EBF rates is "the proportion of infants aged less than 6 mo given only breast milk in the past 24 h".[5] The WHO indicator is commonly used to estimate EBF prevalence across populations. The World Breastfeeding Trends Initiative (WBTi), for example, uses a 24-h dietary recall to assess global EBF rates across 82 countries,[6] partly based on data from demographic and health surveys across nations. Not all investigators use the 24-h recall indicator to assess EBF rates, and the estimated rates of EBF vary according to indicator used. The difference between EBF rates based on a 24-h recall, which represents "*current status*" and data based on feeding behavior data since birth, which represents "*feeding history*", is rarely recognized.

Corresponding Author: Dr Marieke Vossenaar, Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM), 17 Avenida # 16-89 (interior), Zona 11 (Anillo Periferico), Guatemala City, 01011 Guatemala.
Tel/fax: +502-24733942
Email: mvossenaar@hotmail.com; cessiam@guate.net.gt
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Table 1. The WHO classification of infant breastfeeding practices[†]

	Requires that the infant receive	Allows the infant to receive
Exclusive breastfeeding (EBF)	Breast milk (including milk expressed or from a wet nurse)	ORS, drops, syrups (vitamins, minerals, medicines)
Predominant breastfeeding (PBF)	Breast milk (including milk expressed or from a wet nurse) as the predominant source of nourishment	Certain liquids (water and water-based drinks, fruit juice), ritual fluids and ORS, drops or syrups (vitamins, minerals, medicines)
Mixed feeding (MF)	Breast milk (including milk expressed or from a wet nurse) and solid or semi-solid foods	Anything else: any food or liquid including non-human milk and formula or human milk in a bottle

[†]As defined in the 2003 WHO report entitled "*Implementing the Global Strategy for Infant and Young Child Feeding*".[4]

Our group published an analysis of estimated EBF and PBF rates for 5 mo old infants attending a public health clinic in the provincial capital in the western highlands of Guatemala.[7] We illustrated how unrepresentative of the true history of exposure to non-breast milk foods the WHO 24-h recall dietary recall method to estimate EBF rates can be. The estimated rate of EBF using the WHO indicator[5] was 56%, however 20% of these infants were EBF based on "*current*" feeding practice questions and 9% were EBF based on lack of exposure to non-breast milk items since birth. Similarly wide discrepancies between the results obtained from both methods were observed in Swedish infants. At 6 mo the difference in the EBF rate was 9 percentage points; estimated rates of EBF were 11% based on "*current status*" data and 1.8% based on data on "*exclusive breastfeeding since birth*".[8] A study in Zimbabwe compared EBF rates using feeding behavior "*ever since birth*" and "*in the previous 7 d*", showing that 31% of infants who were EBF in the last 7 days were EBF since birth.[9] The WHO indicator based on a 24-h period may be inadequate and even misleading for many purposes. What gives the most valid information for an individual or population is the experience of consuming something other than human milk since birth.

The WHO 24-h recall indicator[5] requires the study population to be aged less than 6 mo. For infants in the second semester of life and toddlers, a different approach to assess EBF rates retrospectively is required. A feeding history could potentially provide the needed information to estimate EBF at 6 mo retrospectively. A number of studies suggest, however, that memory of an occurrence of interest is distorted by the passage of time.[10-12] The objective of the current study was to evaluate EBF and PBF rates, as defined by the WHO, in a sample of Guatemalan children aged 6 to 23 mo attending a public health clinic, using retrospective record on the temporal pattern of introducing foods and beverages before 6 mo. The present study was prompted by the opportunity to compare the estimated patterns of EBF and PBF rates based on feeding practices reported retrospectively by mothers of children aged 6 to 23 mo to the findings of a companion project examining feeding patterns in 5 mo old infants.[7] Our current population sample was recruited in the same health clinic in the Guatemalan highlands, during the same time period, and using the same data collection tool.

SUBJECTS AND METHODS

Subject selection

This study was conducted in the highlands of Guatemala in the city of Quetzaltenango. The population of interest was a cross-sectional sample of young children aged between 6 and 23 mo. Initially 208 mother-child dyads visiting the local public health centers for various reasons such routine check-ups, vaccinations or illness were recruited in the study. Exclusion criteria included: (i) the infant was premature (defined as born more than 4 weeks preterm), (ii) had siblings that participated in the study, (iii) had congenital anomalies or chronic illness or (iv) the mother failed to sign the study consent form. The study recruitment period was from February to October 2011.

Ethical approval was obtained from the Human Subjects Committee of the Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM) and the study conforms to the provisions of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000). The procedures and privacy issues of the study were explained and informed consent was obtained from all mothers. This trial was registered at "Nederlands Trialregister" (http://www.trialregister.nl/) as NTR3292.

Data collection

The structured questionnaire was designed to examine child feeding practices. The data collection tool was pretested in a group of women with similar characteristics to the woman eligible for this study and adapted in terms of comprehensiveness and feasibility. Due to low literacy rates in the population, face-to-face interviews were conducted by trained, Spanish speaking, female dieticians.

Socio-demographic data of the mother were collected: date-of-birth, age, marital status, composition of the household, number of children, current occupation, and highest level of schooling obtained. In addition, information around the time of the child's birth, such as place of birth, reported birth weight and length and whether the infant was put to the breast within 1 h of giving birth was collected.

The child's dietary intake was assessed using 3 methods: (i) recall of feeding practices since birth, (ii) current feeding practices, and (iii) previous day dietary recall, as previously described in detail by van Beusekom et al.[7] In the recall since birth dietary assessment section, use of formula milk, "*other*" liquids or drinks, "*other*" foods and ritual fluids was queried as a yes or no question. The term

"*other*" refers to anything other than breast milk. If affirmative, the mother was asked what the age of introduction as an open-ended question.

Questions on current feeding practices included "*usual*" intake of breast milk, formula milk, "*other*" liquids or drinks and "*other*" foods. The previous day dietary intake of the infant was collected starting with the first drink or food consumed by the infant the day before the interview. A complete record of all foods and drinks consumed was collected, including food preparation methods and brand names. Portion sizes were estimated using kitchen models. Breast milk intake was recorded, but not quantified.

Data analysis

Age of the infant was calculated based on the date-of-birth and date-of-interview; reported age was not used. Children were subdivided into three different age groups: 6-12 mo, 13-18 mo and 19-23 mo. Age of the mother was calculated based on the date-of-birth and date-of-interview. The mothers were categorized into two groups according to their age (i) teenagers or (ii) adults, with the cut-off point at 19 y. Mother's level of schooling was classified as "low" for primary school and lower, and as "high" for secondary school and higher. The occupation of the mothers was categorized into two groups: (i) working outside the home or (ii) not working outside the home, which includes housewives. The ethnicity of the mother was determined by the clothes of the woman. If the mother was wearing a traditional dress, she was classified as *Indigenous*, when wearing modern clothes she was classified as *Ladina*.

Early initiation of breastfeeding within 1 h of birth

The WHO formula for assessing early initiation of breastfeeding, defined as the proportion of children born in the last 24 mo who were put to the breast within 1 h of birth, was used.[5]

Feeding pattern

The WHO/UNICEF definitions for EBF, PBF and MF (Table 1) were used to assess rates of these feeding patterns.[5] The proportion of infants who were EBF was calculated as follows:

$$\frac{\text{Infants aged 6-23 mo who received only breast milk during the first 6 mo of life}}{\text{Infants 6-23 mo of age}}$$

This formula was adapted to assess the rate of EBF and PBF up to the age of 5 and 6 mo. Only the recall since birth dietary assessment was used to examine feeding patterns.

Internally inconsistent (implausible) responses

To monitor the plausibility of the interview responses, the reported use of ritual fluids, drinks, formula milk and foods since birth was checked against the recall from the previous day and current feeding practice questions. Responses were conflicting if "*other*" drinks or foods had not been reported in the recall of feeding practices since birth, but they had been reported as given on the previous day or in answer to current feeding practice questions.

Comparison with previous published findings

The estimated rates of EBF, PBF and MF based on retrospective dietary recall reports presented in this manuscript were compared with published analysis of estimated EBF and PBF rates for 5 mo old infants attending the same public health clinic.[7] These estimates were based on recall of feeding practices since birth in infants aged 5 mo at the time of interview, i.e. just before reaching the 6 mo goal for EBF.

Statistical analysis

All data analyses were done in SPSS for Windows 21.0 (SPSS Inc, Chicago, IL, USA). Outliers and missing values were verified against the original questionnaires. Chi-square tests were used to determine significant differences between subgroups. This included comparing rates of early breastfeeding initiation based on the interview query, and the feeding pattern (EBF, PBF or MF) at 5 mo and 6 mo. They were assessed in relationship to the following characteristics: (i) gender, (ii) age of the child in 3 categories, (iii) place of birth, (iv) teenage mother, (v) marital status, (vi) parity, (vii) schooling, (viii) occupation, and (ix) ethnicity. Finally, the relationship between early initiation of BF and feeding pattern were assessed. Chi-square tests were used to determine significant differences in estimated EBF and PBF rates between this sample and previously published estimates.[7] A p value of 0.05 was considered significant.

RESULTS

Response rate

Of the 208 mothers initially approached to participate in the study, 174 (84%) were interviewed and 150 (72%) were used for the final data analysis. A total of 58 children were not interviewed or excluded for various reasons; 11 were premature, 1 had siblings that participated in the study, 17 were ill, 3 were too old, 1 was too young, and 10 were unwilling to be interviewed, mostly due to time constraints.

Demographic characteristics

The demographic characteristics of the total study population are presented in Table 2. The mothers interviewed had more girls (57%) than boys (43%). The mean age of the children was 13±5 mo (range 6-23 mo), and the proportion of younger children age 6-11 mo was higher (43%) than the proportion of older children aged 18-23 mo (27%). Less than two-third (59%) of children were born in the national hospital and very few (12%) were born in a home setting. The mean age of the mother was 26±6 y (range 15-44 y), and few (14%) were teenage mothers. The mothers had between 1 and 9 children (median of 2 children), and 38% of children had no siblings. More than half the mothers (55%) had minimal schooling, having only completed primary school or less. Almost one-third (29%) of mothers worked outside their homes and were likely to spend significant time away from the child. There were twice as many *Ladina* mothers as *Indigenous* mothers.

Table 2. Demographic characteristics of the infants and mothers

		Entire sample (n=150)	
		Number	Proportion (%)
Gender	Boys	65	43
	Girls	85	57
Age categories	6-11 mo	65	43
	12-17 mo	45	30
	18-23 mo	40	27
Place of birth	National hospital	88	59
	Private clinic/hospital	43	29
	Home setting	19	12
Teenage mother	No	128	85
	Yes	21	14
Marital status mother	Single	25	17
	United or married	123	82
	Divorced or widowed	2	1
Parity	1 child	57	38
	>1 child	93	62
Level of schooling mother	None or primary school	82	55
	Secondary school or higher schooling	68	45
Occupation of the mother	Housewife or works at home	106	71
	Works outside the home	44	29
Ethnicity	Ladina	104	69
	Indigenous	46	31

Early breastfeeding initiation

A large proportion of children (69%) were put to the breast within 1 h of birth. Differences in initiation rates were observed between place of birth, with the highest rate in the national hospital (80%) and the lowest rates in private clinics or hospitals (47%) (p=0.013). Mothers with previous children had higher initiation rates (76%) than first time mothers (56%) (p=0.022). The remaining seven comparisons with characteristics were not statistically significant (*this data is not presented in tables*).

Feeding patterns

Estimated rates of EBF, PDF, and MF at 5 and 6 mo based on retrospective reports are presented in Table 3. The estimated full breastfeeding rate (defined as EBF and PBF together) was 39% at 5 mo and 31% at 6 mo. When examining difference in feeding patterns between subgroups, we only observed differences in estimated rates between genders and place of birth. At 6 mo, estimated EBF, PBF and MF rates were 12%, 16%, 72% in girls and 3%, 31%, 66% in boys, respectively (p=0.031). Furthermore, estimated MF rates were the highest for children born in private clinics (86% at 5 mo and 95% at 6 mo), and the lowest for births in home settings (25% at 5 mo and 41% at 6 mo).

Internally inconsistent (implausible) responses to the introduction of "other" liquids and foods

The number of implausible responses of the mothers to the questions on infants' intake of drinks or foods other than breast milk based on recall since birth compared with previous day or current feeding questions are presented in Table 4. A total of 38 mothers provided one or more implausible responses. A single mother reported implausible answers for ritual fluids and formula milk, reporting not offering these since birth and at the same time reporting these in the previous day recall. Implausible responses were more commonly given for the reported introduction of liquids or drinks (15%) and foods (17%), than for ritual fluids and formula milk. In the sample of mothers with plausible answers only (n=112), the estimated full breastfeeding rate was 36% (9% EBF and 27% PBF) at 5 mo and 27% (5% EBF and 21% PBF) at 6 mo (*this data is not presented in the tables*).

DISCUSSION

The estimated rates of EBF and PBF in a population vary according to the definitions of feeding patterns used.[8,13,14] Few investigators detail the early infant feeding patterns in terms of the WHO categories[4] (Table 1) to investigate the relationship between feeding patterns and child morbidity or mortality.[9,15-18] Although there is an implicit sense of the hierarchy of benefits for the WHO feeding patterns, with EBF as the ideal behavior, PBF as the next best and MF as the least appropriate,[16,17] PBF has not often been used in the categorization in epidemiological studies. To our knowledge, few studies have shown no difference in the risk of disease between EBF with PBF infants, and a significant difference in risk of morbidity[9,16] and mortality[17] between EBF and MF patterns, illustrating the importance of the distinction between the feeding patterns.

The issue of maternal recollection and memory for events or landmarks in their infant's development, and in their own response with changing feeding and caring practices has been examined by our group[7,10,19,20] and others.[11,12,21,22] The cognitive elements for memory retention without distortion and the social issues of understanding and honestly responding to an interviewer's survey question cannot be assessed for this population of

Table 3. Estimated rates of exclusive breastfeeding, predominant breastfeeding and mixed feeding based on retrospective dietary recall reports in 6 to 23 mo old children in comparison to previously published rates in 5 mo old infants

	Estimated rates (%)		
	Based on retrospective reports in 6 to 23 mo old Children (n=150)		Based on a published report in 5 mo old infants (n=156)[†,‡]
	At 5 mo of age	At 6 mo of age	In 5 mo old infants
Exclusive breastfeeding (EBF)	12	8	9
Predominant breastfeeding (PBF)	27	23	22
Mixed feeding (MF)	61	69	69

[†]Based on the findings previously published by our group in a sample of mother-infant dyads attending the sample health center as our current sample.[7]
[‡]The difference in estimated rates of feeding patterns based on retrospective reports and findings previously published by van Beusekom et al[7] were not significant (p=0.954 at 6 mo).

Table 4. Number of internally inconsistent (implausible) responses amongst mothers to the questions on infants' intake of drinks or foods other than breast milk based on "*recall since birth*" compared to "*previous day*" or "*current feeding*" questions

	Internally inconsistent responses[†]							
	Age groups (mo)							
	All (n=150)		6-11 (n=65)		12-17 (n=45)		18-23 (n=40)	
	n	%	n	%	n	%	n	%
Ritual fluids	1	1	0	0	1	2	0	0
Liquids or drinks *(excluding breast milk)*	23	15	8	12	8	18	7	18
Formula milk	1	1	0	0	0	0	1	3
Foods *(excluding breast milk)*	25	17	10	15	9	20	6	15
Sum[†]	50	33	18	28	18	40	14	35

[†]Note that this is the number of inconsistent answers and not the number of mothers with inconsistent answers. A total of 38 mothers provided one or more implausible responses.

low-income urban Guatemala mothers of mixed ethnic classification. The retrospective assessment of estimated EBF rates at 6 mo (an important landmark), based on the reported time of introduction of foods and beverages a significant time after the event (up to 18 mo later), showed remarkable homology to findings in a similar sample of 5 mo old infants.[7] In fact that pattern of estimation of EBF duration for different women of the same clinic population is numerically closer to the 6 mo question interval for van Beusekom's data[7] than is the 5 mo interval questioning in the same earlier study (Table 3). Our inclination prior to data analysis was to expect a major drift away from the estimates of our earlier study. The observed concordance with the modest, ~150-interview sample-sizes in each study, attests to a fundamental robustness and consistency at these ages, which in turn argues toward a validity and accuracy of the responses as the most plausible basis for the repetition consistency. Further testimony to putative reliability, moreover, comes from the reasonable internal-consistency test of response-plausibility (Table 4). As was the situation in the prior experience within the younger age-range, a relative dearth of implausible answers attests to interviewee attention and understanding of the reporting task. The existence of the plausibility algorithm, however, allows for the further refining of "valid" data, as performed here. The practical implications of these two surveys, at least for the use of these questions to differentiate early feeding patterns in the Western Highlands of Guatemala are that these questions as framed and presented in the interview instrument provide useful information as applied all the way out to the end of the second year of life.

Strengths and weaknesses

A major strength of this study is its focus on the WHO recommendations,[1,5] and recognizing the often ignored three-way differentiation of feeding patterns as EBF, PBF and MF. A well trained and standardized interviewer staff was working in a stable and trusted facility for medical attention within the communities. The study uses a variance in the dimension of time to assess the consistency of survey-data reporting. Among the limitations are the modest sample-size in this study, and its companion study[7] and the convenience sample design. Speculatively, women of the same communities and social class, who were not accustomed to attendance at the public clinics, might have provided a different panorama of feeding patterns or a different level of consistency and repeatability with interview intervals across the first two years of their offspring's lives.

Conclusion

The self-reported distribution of presumptive feeding practices through the first semester of life in the low-income, public clinic population surveyed in 6 to 23 mo olds is solidly reproducible within the larger study participant pool, independent of the proximity in time of addressing the questions, at least out to the 2-y boundary. In this setting, and potentially in other similar ones in Guatemala and beyond, the collection of useable data on infant and toddler feeding patterns of interest to the WHO recommendations[1] can cover the entire period of interest

to early feeding.

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AUTHOR DISCLOSURE

The authors declare no conflicts of interest. Financial support was obtained from Sight and Life, Basel, Switzerland.

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Original Article

Feeding patterns before 6 months of age: the relative validity of recall from interviews of mothers of Guatemalan infants and toddlers

Marieke Vossenaar PhD[1], Ilse van Beusekom MSc[1], Colleen Doak PhD[2], Noel W. Solomons MD[1]

[1]*Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM), Guatemala City, Guatemala*
[2]*Health Sciences, VU University, Amsterdam, Netherlands*

6 月龄之前的喂养模式：危地马拉婴幼儿母亲受访时回忆的相对有效性

世界卫生组织（WHO）建议在出生后的 6 月内进行纯母乳喂养，然而经常很多人无法做到这一点。本研究对危地马拉儿童采用横断面研究，使用回顾记录的时间模式，了解 6 月龄之前婴儿的食物及饮料情况，根据 WHO 规定的喂养标准，来评估纯母乳喂养率以及以母乳为主的喂养率。150 名 6-23 月龄的孩子的母亲在公共卫生诊所接受了婴儿早期生活的结构问卷调查。此外，报道了自出生以来以及目前除母乳外的为孩子提供的液体和食物的合理性。我们发现，纯母乳喂养的情况很少，估计只有 14%的婴儿接受 5 个月的纯母乳喂养，只有 9%的婴儿纯母乳喂养能到达推荐的 6 个月。以母乳为主，同时给予液体比如水、果汁、仪式液体等喂养 5 个月的占 33%，喂养 6 个月的占 23%。四分之一的母亲（n=38）所报道的根据年龄喂养食物和饮料情况不够真实。然而，至 2 岁的回顾性分析证实了 6 月龄的喂养模式是可信的。我们的研究结果与危地马拉其他研究结果相符。总体上，与 WHO 婴儿第一阶段喂养标准差距还很大，有待加强。

关键词：婴幼儿喂养、婴幼儿营养、饮食评估、纯母乳喂养、危地马拉