Acceptability of exclusive breast-feeding with early cessation to prevent HIV transmission through breast milk, ANRS 1201/1202 Ditrame Plus, Abidjan, Côte d'Ivoire.

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ABSTRACT

Objective: We assessed the uptake of a nutritional intervention promoting exclusive breastfeeding with early cessation between three and four months of age to reduce postnatal transmission of HIV in Abidjan, Côte d'Ivoire.

Design: Between March 2001 and March 2003, HIV infected pregnant women who had received a perinatal antiretroviral prophylaxis were systematically offered prenatally two infant feeding interventions: either artificial feeding, or exclusive breastfeeding during three months then early cessation of breastfeeding. Mother-infant pairs were closely followed for a period of two years, with continuous nutritional counseling and detailed collection of feeding practices.

Results: Among the 557 mothers enrolled, 262 (47%) initiated breastfeeding. Of these women, the probability of practicing exclusive breastfeeding from birth was 18% and 10% at one and three months of age, respectively. Complete cessation of breastfeeding was obtained in 45% and 63% by four and six months of age, respectively. Environmental factors such as living with partner's family were associated with failure to initiate early cessation of breastfeeding.

Conclusions: Acceptability of exclusive breastfeeding was low in this urban population. However, shortening the duration of breastfeeding appeared to be feasible. Further investigations are ongoing to fully evaluate the safety and effectiveness of this intervention in reducing breastmilk HIV transmission.

Keywords: HIV, Africa, mother-to-child transmission, infant feeding practices, exclusive breastfeeding, weaning

INTRODUCTION

Mother-to-child transmission (MTCT) of human immunodeficiency virus type 1 (HIV) is responsible for most of the acquisition of pediatric HIV infections. Each day in the world, 2,200 children become HIV-infected, 90% of them in sub-Saharan Africa where MTCT of HIV is an increasing public health problem [1]. MTCT of HIV can occur in-utero, during delivery, or through breastfeeding. In settings where prolonged breastfeeding is the norm, breast milk transmission is responsible for one third to 40% of perinatally acquired HIV infections [2]. The overall risk of postnatal transmission was estimated to be 8.9 new cases per 100 child-years of breast-feeding (95% confidence interval [CI], 7.8–10.2) in a recent pooled analysis [3].

The efficacy of short-course antiretroviral regimens to prevent HIV transmission around the time of delivery has been demonstrated in industrialized countries and in sub-Saharan Africa [4, 5]. Nevertheless, in the absence of targeted intervention, the subsequent risk of postnatal transmission of HIV considerably reduces the long term efficacy of peripartum antiretroviral prophylaxis [6]. Besides antiretroviral-based interventions to reduce the risk of postnatal HIV transmission [7], different nutritional approaches are conceivable in modifying infant feeding practices such as complete avoidance of breastfeeding in urban settings or shortening the breastfeeding period [8]. Indeed in areas where breastfeeding is usually prolonged at least until 12 months of age, this latter approach should reduce the cumulative risk of postnatal transmission while keeping the benefits of breastfeeding during the first months of life. Moreover, there is some observational evidence that exclusive breastfeeding carries a lower postnatal risk of transmission of HIV than breastfeeding with introduction of other fluids, feeds or milk [9-11]. Indeed, contaminants or bacteria contained in these additional feeds may damage the infant's gut, impair mucosal integrity and thus facilitate postnatal transmission of

HIV [12, 13]. Thus, the combined promotion of exclusivity of breastfeeding with early cessation may substantially reduce breastmilk HIV transmission.

The evaluation of such postnatal nutritional interventions aimed at the prevention of mother-to-child transmission of HIV (PMTCT) must be based on several judgment criteria beginning with the uptake of the intervention proposed, that can be itself divided into its prenatal acceptability and the long-term compliance.

The objective of this study was to assess in an urban west African setting the uptake of an infant feeding strategy based on the promotion of exclusive breastfeeding with early cessation between three and four months of age in a cohort of HIV-infected women.

SUBJECTS AND METHODS

Study area

The ANRS 1201/1202 Ditrame Plus study was conducted in Abidjan, the economic capital of Côte d'Ivoire (3 million inhabitants). In this setting, municipal water of good quality was widely available but household water storage was a common practice, which may contribute to the contamination of drinking water [14].

The study population was recruited in Abobo and Yopougon, the two most densely populated districts of Abidjan. HIV counseling and testing services were set up within the University Hospital of Yopougon and the antenatal clinics of six pre-existing community-run health facilities.

Inclusion procedures

From March 2001 to March 2003, any pregnant woman aged at least 18, attending one of the selected prenatal clinics and living within the limits of Abidjan, was offered pre-test-counseling and HIV testing [15]. Those women who tested positive were offered the opportunity to enter the study from 32 weeks of gestation after having had the objectives of the study explained to them, having accepted the study protocol and signed an informed consent [16].

Research design

Within this open-labeled cohort, women received a short peripartum drug combination of zidovudine +/- lamivudine and nevirapine single dose [17]. Women who delivered a live-birth were systematically proposed post-partum nutritional interventions.

At inclusion, pregnant women were informed about the modalities of post-natal transmission of HIV during a 30 minutes face-to-face counseling session, and were told that alternatives to prolonged and predominant breastfeeding may prevent this risk. The advantages of these

interventions, i.e. the reduction of the risk of HIV transmission through breastmilk, and their disadvantages, i.e. the possible stigmatization and the potential risks for infant health, were fully discussed with the participants.

Two nutritional interventions were then hierarchically and systematically proposed to the women and discussed again during subsequent weekly prenatal visits scheduled until delivery. The first option consisted of the complete avoidance of breastfeeding: artificial feeding from birth free of charge to nine months of age with free provision of the material and using a single oral dose of cabergoline, whose efficacy to inhibit lactation in puerperal women has been demonstrated [18]. The second option consisted of practicing exclusive breastfeeding with the aim to wean after a short period (not exceeding two weeks) and to obtain complete cessation of breastfeeding between three and four months of age. Women were encouraged to cup-feed their infants when initiating weaning. Replacement feeding until nine months of age as well as the material needed were provided free of charge. In all cases, the staff supported the choice expressed by the women and counseled them accordingly.

Follow-up procedures

Two clinics were exclusively dedicated to the enrolment and follow-up of the mother-infant pairs. A total of 60 health care workers recruited from the local area were employed for this study.

From birth up to the second birthday, 19 visits were scheduled for clinical, nutritional, psychosocial and biological follow-up of both mothers and infants. Mother-infant pairs were seen at birth, 48 hours after delivery, weekly until six weeks of age, monthly until nine months of age, and every three months until the second birthday. Services dispensed by the study team were also available whenever needed between scheduled visits. All transport costs were reimbursed and all care expenses related to any scheduled visit or clinical event were entirely supported by the project.

Four nutritionists individually counseled the women about infant feeding practices whenever needed. Collective sessions were frequently organized to help mothers correctly position their baby to the breast, or to reiterate the benefits of exclusive breastfeeding, how to safely prepare artificial feeding, initiate weaning, use appropriate complementary feeding or cook the baby food.

Diagnosis of peri-partum pediatric HIV infection

Paediatric blood samples collected at day two and at four and six weeks of age were processed for plasma RNA viral load measurement by real time polymerase chain reaction using the quantitative Taqman technology allowing a diagnosis of peri-partum HIV infection [17, 19].

Data collection

At each contact, the medical staff documented clinical events that occurred in both mothers and children since the last visit. At each scheduled visit, infant feeding practices were recorded via structured questionnaires by trained social workers who were not involved in nutritional counseling. Women were asked if their child had been given breastmilk, artificial milk or both since the last visit. Fluids and foods other than breastmilk or artificial milk were documented using a 24 hour and a seven day recall history. Social workers went over a detailed list of 15 commonly used fluids or foods. Women were asked if these fluids, foods or some other items not listed had been given in the previous seven days, and if so in what amount (24 hour recall history) and how frequently in the past seven days. The first liquid given after birth was recorded at the day two visit.

Infants were classified at each scheduled visit as exclusively or predominantly breastfed, mixed fed or artificial fed using these recall histories [20]. Being exclusively breastfed from

birth at a given time meant having been classified in this category at all the preceding visits since birth.

We used the following WHO definitions to allow a better comparability of results between studies. *Exclusive breastfeeding* means giving a child no other food or drink, including no water, in addition to breastfeeding with the exception of medicines, vitamin drops or syrups, and mineral supplements [21]. *Predominant breastfeeding* means breastfeeding a child but also giving small amounts of water or water based drinks. Neither food-based fluid nor solid food are allowed under this definition [21]. *Artificial feeding* means feeding a child on artificial foods (including infant formula and powdered animal milk), and not breastfeeding at all [22]. *Mixed feeding* means breastfeeding while giving non-human milk such as infant formula or food-based fluid or solid food [23]. We defined a nutritional change as a switch from one of these categories to one another, and weaning process as the period from the introduction of the first weaning food till complete cessation of breastfeeding.

Statistical analysis

Women whose live-born infants were breastfed at least once were initially classified as breastfeeding at the day two visit and were included in the following analyses.

The prenatal infant feeding choice was described among women who initiated breastfeeding.

Infant feeding practices were presented in detail at one, three, four, six and nine months of age (M1, M3, M4, M6 and M9 respectively). For this purpose, we used a time varying classification according to the liquids and foods consumed over the past seven days before each of these visits, independently of what occurred before these visits.

The probability of being exclusively breastfed from birth as well as the probabilities of initiating weaning and having completely ceased breastfeeding were estimated at given ages using the Kaplan-Meier technique.

We used two different definitions to investigate the proportion of women who successfully practiced the nutritional intervention proposed. Firstly, we defined success as breastfeeding the infant exclusively from birth until the beginning of weaning and having completely ceased breastfeeding between M3 and M4 (definition 1). Secondly, we defined success as complete breastfeeding cessation occurring between M3 and M4, irrespective of the exclusivity of breastfeeding (definition 2). As the assessment of the uptake was impossible among children who died or were lost to follow-up before the age of M4, while they were still being exclusively breastfed (definition 1), or exclusively or predominantly breastfed (definition 2) at their last contact, they were unclassified. Sensitivity analyses were performed to classify these cases as either success or failure to the intervention proposed.

Baseline socio-demographic, clinical and biological maternal characteristics were compared between mothers who succeeded with the intervention and those who failed according to those two definitions of success.

Logistic regression was used to assess the determinants of a complete cessation of breastfeeding occurring beyond the M3-M4 period (failure). Multivariate analysis included maternal baseline socio-demographic, biological and clinical characteristics and multivariate analysis included all variables with $p<0.25$ in the univariate analysis [24].

All statistical analyses were carried out with the use of SAS software (version 8.2; SAS Institute, Inc, Cary, NC).

RESULTS

Recruitment and baseline characteristics

As shown in figure 1, 643 HIV infected pregnant women were consecutively enrolled between March 2001 and March 2003. Sixty-three women with HIV-2 infection only or lost to follow-up prior to delivery were excluded from the analysis. Overall, 580 women gave birth, and after exclusion of stillbirth as well as second and third born babies of multiple birth outcomes, 569 mother-infant pairs were eligible for analysis. Among the 557 mothers whose livebirth was fed at least once, 262 (47%) initiated breastfeeding and constituted the breastfeeding group for the present analysis.

Their baseline socio-demographic, clinical and biological characteristics as well as the delivery circumstances and their newborn characteristics are detailed in table 1. Overall, 47% were illiterate, and 70% were living with their partner, of whom a quarter had shared their HIV status with him before delivery. All but eight had electricity at home, all of them had access to tap water and 74% lived in a shared housing. Three quarters of the women included were at WHO clinical stage 1 or 2, the remaining at stage 3. Their baseline median CD4 count was 392 (IQR: 266-540) and their median viral load was 4.2 log (IQR: 3.6-4.7).

Mother-infant pairs follow-up

From birth until nine months of age, among the 262 mother-infant pairs analyzed, 34 (13%) were lost to follow-up at a median age of 51 days (IQR: 7-133) and 12 (4%) infants died. Among the remaining 216 mother-infant pairs, 197 (91%) completed the 15 visits scheduled from birth until nine months of age, the reminders completing 11 visits on average.

Prenatal choice

Among the 262 women initiating breastfeeding, 255 (97%) made their choice during the prenatal period on how to feed their forthcoming infant. Of these women, 227 (89%) intended

to breastfeed, of whom 84 (37%) underlined they would exclusively breastfeed. Among the 227 women wishing to breastfeed their infant, four (2%) considered ceasing breastfeeding before three months, 88 (39%) between three and four months, 60 (26%) after four months, and the remainder (33%) did not express an opinion antenatally.

Initial infant feeding practice

In this breastfeeding group (n=262), the first liquid given from birth was breastmilk (73%), tap water (9%), boiled or mineral water (4%), sugar water (1%), infant formula (3%), fruit juice (1%) and could not be documented for 9% of the women. Infant formula had been given by the staff of hospitals where women had been hospitalized for a caesarian section. In the first 48 hours of life, 160 (61%) children were predominantly breastfed, 90 (34%) exclusively breastfed and 12 (5%) mixed fed.

Among the 84 mothers who had prenatally chosen to exclusively breastfeed their infant, 51% did so, whereas 75% of the 143 mothers who had prenatally chosen to predominantly breastfeed actually initiated this practice ($p<0.001$).

Exclusivity of breastfeeding

As shown in figure 2, at one and three months of age, the majority of infants had not been exclusively but predominantly breastfed the week before the interview (respectively 59% and 62%) as they were also given water, essentially from a tap. Use of boiled or mineral water was relatively common at one month of age (30%). Most of the infants (39%) were mixed fed at four months of age, of whom 83% were in the process of being weaned and were thus receiving infant formula. From six months of age, most of the infants were not breastfed any more and received artificial feeding instead, while the remaining breastfed infants were essentially mixed fed as they also received baby food, other solid or semi solid foods such as dairy products, meat, fish, or all sorts of plants.

The cumulative probabilities of being exclusively breastfed from birth were 0.18 (95% CI: 0.13-0.22), 0.10 (0.06-0.13) and 0.01 (0-0.02) at ages M1, M3 and M6 respectively (figure 3).

Duration of breastfeeding

Overall, 167 mothers (64%) had completely ceased breastfeeding before M9, 38 infants (14%) died or were lost to follow-up before reaching that age while they were still being breastfed at their last contact and 57 (22%) infants were still breastfed at M9.

Overall, 24 women (9%) ceased breastfeeding before M3: 12 mothers were counseled by the medical and nutritional staff of the study to cease breastfeeding for maternal medical reasons (chickenpox, breast pathology, AIDS-related disease), child's disease (candidiasis), or breastmilk deficiency, and 12 mothers changed their mind and switched to artificially feed their infant. Altogether, 100 women (38%) completely ceased breastfeeding at M3-M4 as recommended.

The cumulative probabilities of beginning the weaning process and having completely ceased breastfeeding are detailed in figure 4. The median age of infants at initiation of the weaning process was 97 days (IQR: 91-125) ; it was 106 days (IQR: 94-136) at complete cessation of breastfeeding. Complete cessation of breastfeeding was achieved for 94% of these infants after one endeavor of weaning. The weaning process was initiated with the introduction of infant formula to replace breastfeeding. At that time, 4% of the women preferred to be kept away from the child for a while and 2% used bandages to cover their breasts. None of the women reported to have used any repellent products to facilitate the weaning process. Women reported breast pain (33%), breast engorgement (18%), or baby tears (17%) related to the weaning process. Only 2% of the women reported partner or family disapproval to the early breastfeeding cessation.

Success of the intervention proposed

Among the 262 mothers-infant pairs who had initiated breastfeeding, 4 (1%) infants died or were lost to follow-up before M4 while they were still being exclusively breastfed at their last contact. Only 14 (5%) succeeded in practicing exclusive breastfeeding until weaning in having completely ceased breastfeeding between M3 and M4, i.e. did it as planned in the protocol concerning the quality of breastfeeding and its duration .

Women who failed to achieve this objective had in median fewer living children (1 vs. 3, p=0.01) and were at less advanced stages of HIV disease than those who succeeded (HIV-1 RNA plasma viral load of 4.2 vs. 4.6, p=0.04).

We then considered the second, less stringent definition of success. Among the 262 mother-infant pairs who had initiated breastfeeding, 33 (13%) infants died or were lost to follow-up before M3 while they were still being breastfed at their last contact, irrespective of the exclusivity of the breastfeeding practice. Among the 229 mothers who could thus be classified, 24 (10%) ceased breastfeeding before M3, 100 (44%) between M3 and M4 and 105 (46%) beyond M4.

In an unadjusted analysis detailed in table 1, being followed in the clinic based in the district of Abobo, living in a typical shared housing and having delivered at home were associated with failure of the proposed intervention. Women who failed to practice the recommended intervention also had significantly higher CD4 count than those who succeeded.

The results of the multivariate logistic regression model investigating the determinants of a complete cessation of breastfeeding occurring beyond the M3-M4 period (n=105 vs. n=100) are detailed in table 2. After adjustment, failure of the proposed intervention was significantly associated with being followed in the Abobo site, having a maternal CD4 count above 500 and living with partner's family. Similar results were obtained when investigating the determinants of a complete cessation of breastfeeding after vs. before M4 completed i.e. in pooling together women who ceased breastfeeding before M3 and in the M3-M4 period.

DISCUSSION

This study investigated in an urban African context the uptake of a nutritional intervention aimed at preventing HIV transmission through breastmilk. In this setting where predominant and prolonged breastfeeding is widely practiced [6, 25], HIV infected women were given a proposal to feed their infants in an unusual way compared to common local practice, as it consisted of implementing both exclusive breastfeeding and early cessation of breastfeeding from three months of age. Overall, the uptake of this combined intervention was low as only 5% of the women strictly fed their infant as planned by the study protocol in terms of exclusivity and duration of breastfeeding. However, complete cessation of breastfeeding was obtained in 45% and 63% of the women at M4 and M6, respectively.

The Ditrame Plus study was conducted among all attendees of community run health facilities located in poor areas, with no other selection criteria than being HIV infected, at least 18 years old, and having accepted the study protocol. As a result, half of the women included were illiterate and three quarters of them lived in crowded typical accommodation, thus quite representative of the general population in Abidjan [25].

This prospective study provided information on the evolution of infant feeding practices from birth until nine months of age in a Sub-Saharan African setting with a reasonably high level of precision. Indeed, emphasis was made on the collection of nutritional data with the use of standardized forms to perform the recall histories, the frequent visits scheduled over the follow-up period and interviews conducted by trained health care workers other than those who counseled the women on infant feeding practices. This minimized the maternal recall bias that could have impaired the estimation of the age of introduction of the liquids and foods and thus could have overestimated the duration of exclusive breastfeeding [26, 27].

Before the implementation of the Ditrame Plus study, we had performed within the same community-run health facilities a baseline cross-sectional study among women of unknown HIV status. We found that all mothers had given tap or stored water to their child in median one day after delivery, underlying that exclusive breastfeeding was not practiced in this population [28]. Despite the efforts made on prenatal and postnatal counseling to promote exclusive breastfeeding within the Ditrame Plus study, the probability of being exclusively breastfed from birth remained as low as 10% at M3. The same low acceptability of exclusive breastfeeding had been previously reported within another prospective study conducted in rural South Africa where at M3 about 10% of children were exclusively breastfed from birth [29]. However, in our study, the proportion of mixed fed children remained rather low in the first three months of life. The low uptake of exclusive breastfeeding was primarily the consequence of early introduction of other liquids than breastmilk rather than early introduction of infant formula or semi-solid foods. From four months of age, the study protocol implied a short period of mixed feeding (nine days in median), linked to the use of both infant formula and breastmilk during the weaning process, whose consequences in terms of postnatal transmission of HIV will be difficult to assess but are likely to be limited considering the briefness of the period. Beyond four months of age, infants who were still exposed to breastfeeding were essentially mixed fed. These long term breastfed infants would remain at risk of being HIV infected through breastmilk as the longer the breastfeeding continued, the higher the postnatal risk [3].

Breastfeeding women included in the Ditrame Plus study failed to practice exclusive breastfeeding, but most of them succeeded in ceasing breastfeeding early, as the median age at complete cessation of breastfeeding was 4 months (IQR: 3-5). Indeed, the median duration of breastfeeding was previously found to range from 8 months (IQR: 7-10) to 15 months (IQR: 13-18) within two different PMTCT studies conducted in Abidjan from 1995 to 2000

with no systematic counseling on infant feeding practices [30-32]. Thus, our study provides useful knowledge underlining that shortening the duration of breastfeeding would be feasible in this population.

Women who failed to cease breastfeeding before M4 were under the social pressure of the family of the partner (especially his mother) influencing the decision process about infant feeding practices. Moreover, living in crowded accommodation appeared to be linked with difficulties with early initiation of the weaning process. Prenatal sharing of HIV status with a relative tended to be associated with failure to cease breastfeeding early, but this factor never reached statistical significance, even after adjustment. These social factors must however be carefully taken into account when counseling mothers on infant feeding options, and emphasis should be made on issues regarding confidentiality. Women at more advanced stages of the disease were those who significantly ceased breastfeeding the earliest. They may have been too ill to be able to continue breastfeeding. Nevertheless, as these women also tended to practice more exclusive breastfeeding than the others, this is consistent with the fact that they could have decided to be more compliant to the nutritional intervention proposed. They might also have been urged by health care workers to do so, as we previously reported that the Ditrame Plus staff believed the choice of the feeding practice should be guided by the value of maternal CD4 count [33]. Generally speaking, health care workers have a key role to play in reaching successful practices of alternatives to prolonged and predominant breastfeeding. Indeed, the fact that despite the adjustment on mothers' characteristics, failure to cease breastfeeding early was strongly associated with being followed in one of the two study sites rather than in the other one could underline differences on infant feeding counseling between the two sites. Indeed, this nutritional counseling remains difficult to standardize.

Acceptability of exclusive breastfeeding was extremely low in this population where early introduction of liquids is a common practice from birth. We thus strongly believe that new tools and innovative ways of counseling women on the importance of exclusive breastfeeding for infant health are needed to make the promotion of exclusive breastfeeding feasible in this context. However, shortening the duration of breastfeeding appeared to be feasible in this urban setting given appropriate counseling on infant feeding practices, a close nutritional and clinical follow up and the free provision of breastmilk substitutes from initiation of the weaning process up to nine months of age. To fully evaluate this complex nutritional intervention, these results will be balanced in the future with its potential benefits such as the reduction of postnatal transmission of HIV, as well as its potential risks for infant health, especially after early weaning (growth characteristics, severe morbidity, mortality) or linked to the mother (incidence of new pregnancies, stigmatization).

APPENDIX

Composition of the ANRS 1201/1202 Ditrame Plus Study Group

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Ethical permissions

The ANRS 1201/1202 Ditrame Plus study was granted ethical permission in Côte d'Ivoire from the ethical committee of the National AIDS Control Programme, and in France from the institutional review board of the French Agence Nationale de Recherches sur le Sida (ANRS).

Conflict of interest

None of the authors had any conflict of interest to declare.

Author Contributions

Study concept and design: KC, FD, VL, MTK. *Field work and data collection*: RB, LB, DKE, NC, HT, IV. *Statistical analysis*: RB, VL. *Interpretation of results*: RB, DKE, VL, CS. *First drafting of the manuscript*: RB, VL. *Critical revision of the manuscript for important*

intellectual content: RB, LB, KC, NC, FD, DKE, VL, MTK, HT, CS, IV. *Obtained funding*: FD, VL

Previous presentation

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Table 1. Baseline characteristics of mother-infant pairs according to the infant's age at complete cessation of breastfeeding, ANRS 1201/1202 Ditrame Plus study, Abidjan, Côte d'Ivoire (N=262)

		Age at cessation of breastfeeding			p-value		
	Overall (n=262)	**< M3 (n=24)**	**M3-M4 (n=100)**	**> M4 (n=105)**	**overall**	**M3-M4 vs. < M3**	**M3-M4 vs. > M4**
Maternal baseline socio-demographic characteristics	**N (%)**	**N (%)**	**N (%)**	**N (%)**			
Site							
Avocatier, district of Abobo	225 (86)	20 (83)	76 (76)	101 (96)	< 0.001	0.44	< 0.001
Niangon, district of Yopougon	37 (14)	4 (17)	24 (24)	4 (4)			
Age at delivery (median, IQR)	26 (22-30)	22 (19-28)	26 (24-30)	26 (22-30)	0.05	0.01	0.50
Education							
No schooling	123 (47)	11 (46)	43 (43)	49 (47)	0.62	0.90	0.36
Primary school	89 (34)	7 (29)	34 (34)	40 (38)			
Secondary school or higher	50 (19)	6 (25)	23 (23)	16 (15)			
Lifestyle							
Lives alone	6 (2)	0	2 (2)	3 (3)	0.68	0.48	0.69
Lives with her partner	183 (70)	12 (50)	72 (72)	78 (74)	0.06	0.04	0.71
Lives with her family	104 (40)	15 (62)	36 (36)	39 (37)	0.05	0.02	0.87
Lives with her partner's family	71 (27)	5 (21)	24 (24)	33 (31)	0.37	0.74	0.23
Prenatal sharing of HIV status with partner *when applicable*	48 (26)	3 (12)	17 (17)	30 (29)	0.07	0.59	0.05
At least one co-spouse	72 (27)	8 (33)	26 (26)	28 (27)	0.76	0.47	0.91
Mother employed in formal economic sector	149 (53)	12 (50)	49 (49)	61 (58)	0.40	0.93	0.19
Lives in a shared housing (cour commune) [1]	193 (74)	14 (58)	70 (70)	84 (80)	0.06	0.27	0.09
Electricity at home	254 (97)	23 (96)	95 (95)	104 (99)	0.23	0.86	0.09
Main water supply							
Tap water with tap at home	61 (23)	7 (29)	23 (23)	21 (20)	0.61	0.53	0.60
Tap water with tap outside home	201 (77)	17 (71)	77 (77)	84 (80)			
History of pregnancies (median, IQR)	3 (2-5)	3 (1-4)	4 (3-5)	3 (2-4)	0.16	0.11	0.13
Number of children alive (median, IQR)	1 (0-2)	1 (0-2)	1 (0-2)	1 (0-2)	0.27	0.10	0.77

[1] typical housing in Abidjan with several houses organized around a yard where inhabitants share kitchen and restroom, and live in crowded accommodation

Table 1 (continued).

	Overall (n=262)	Age at cessation of breastfeeding < M3 (n=24)	M3-M4 (n=100)	> M4 (n=105)	p-value overall	M3-M4 vs. < M3	M3-M4 vs. > M4
Maternal baseline biological and clinical characteristics	**N (%)**	**N (%)**	**N (%)**	**N (%)**			
Lymphocyte CD4+ count/mm^3 (median, IQR)	392 (266-540)	321 (204-483)	381 (283-485)	406 (274-604)	0.06	0.17	0.13
Lymphocyte CD4+ percentage (median, IQR)	26 (20-33)	24 (17-29)	26 (20-33)	27 (20-35)	0.13	0.16	0.36
Log10 HIV-1 RNA plasma viral load (median, IQR)	4.2 (3.6-4.7)	4.4 (3.7-5.0)	4.1 (3.7-4.7)	4.3 (3.7-4.7)	0.42	0.27	0.37
WHO clinical stage							
Stage 1 or 2	197 (75)	19 (79)	81 (81)	75 (71)	0.60	0.97	0.27
Stage 3	65 (25)	5 (21)	19 (19)	30 (29)			
Stage 4/AIDS	0	0	0	0			
Delivery circumstances and newborn characteristics	**N (%)**	**N (%)**	**N (%)**	**N (%)**			
Home delivery	38 (15)	2 (8)	10 (10)	21 (20)	0.08	0.80	0.04
Caesarean section	11 (4)	0	8 (8)	3 (3)	0.12	0.15	0.10
Maternal complications following delivery	18 (7)	1 (4)	10 (10)	5 (5)	0.29	0.37	0.15
Multiple birth outcome	10 (4)	4 (17)	3 (3)	2 (2)	< 0.001	0.001	0.61
Female livebirths	124 (47)	11 (46)	48 (48)	59 (56)	0.42	0.85	0.24
Birth weight, kg (median, IQR)	3.0 (2.7-3.2)	2.9 (2.5-3.2)	3.0 (2.7-3.2)	3.0 (2.7-3.2)	0.03	0.03	0.75
Pediatric peri-partum HIV-infection	14 (5)	0	5 (5)	7 (7)	0.41	0.26	0.61

Table 2. Determinants of ceasing breastfeeding beyond the M3-M4 period (failure to the recommended practice), multivariate logistic regression, ANRS 1201/1202 Ditrame Plus study, Abidjan, Côte d'Ivoire (N=205).

	Odds Ratio	**95% CI**	**p-value**
Abobo site vs. Yopougon site	9.13	2.90 - 28.82	< 0.001
Mother living with partner's family vs. not	1.99	1.01 - 3.93	0.04
Prenatal sharing of HIV status with someone vs. not	1.95	0.98 - 3.91	0.06
Mother gainfully employed vs. not	1.69	0.91 - 3.14	0.10
Mother living in a shared housing vs. not	1.46	0.71 - 2.97	0.30
Electricity at home vs. not	7.19	0.78 - 66.37	0.08
Maternal CD4 count at inclusion above 500 vs. below	2.00	1.01 - 3.95	0.04
Single birth outcome vs. multiple	2.82	0.41 - 19.46	0.29

LEGENDS FOR FIGURES

Figure 1.

Cohort profile according to the infant feeding options. ANRS 1201/1202 Ditrame Plus, Abidjan, Côte d'Ivoire

Figure 2

Infant feeding practices at ages M1, M3, M4, M6 and M9 in the breastfeeding group. ANRS 1201/1202 Ditrame Plus, Abidjan, Côte d'Ivoire (N=262)

Figure 3

Kaplan-Meier probability of being exclusively breastfed from birth. ANRS 1201/1202 Ditrame Plus, Abidjan, Côte d'Ivoire (N=262)

Figure 4

Kaplan-Meier probability of having initiated weaning and completely ceased breastfeeding . ANRS 1201/1202 Ditrame Plus, Abidjan, Côte d'Ivoire (N=262)

Figure 1

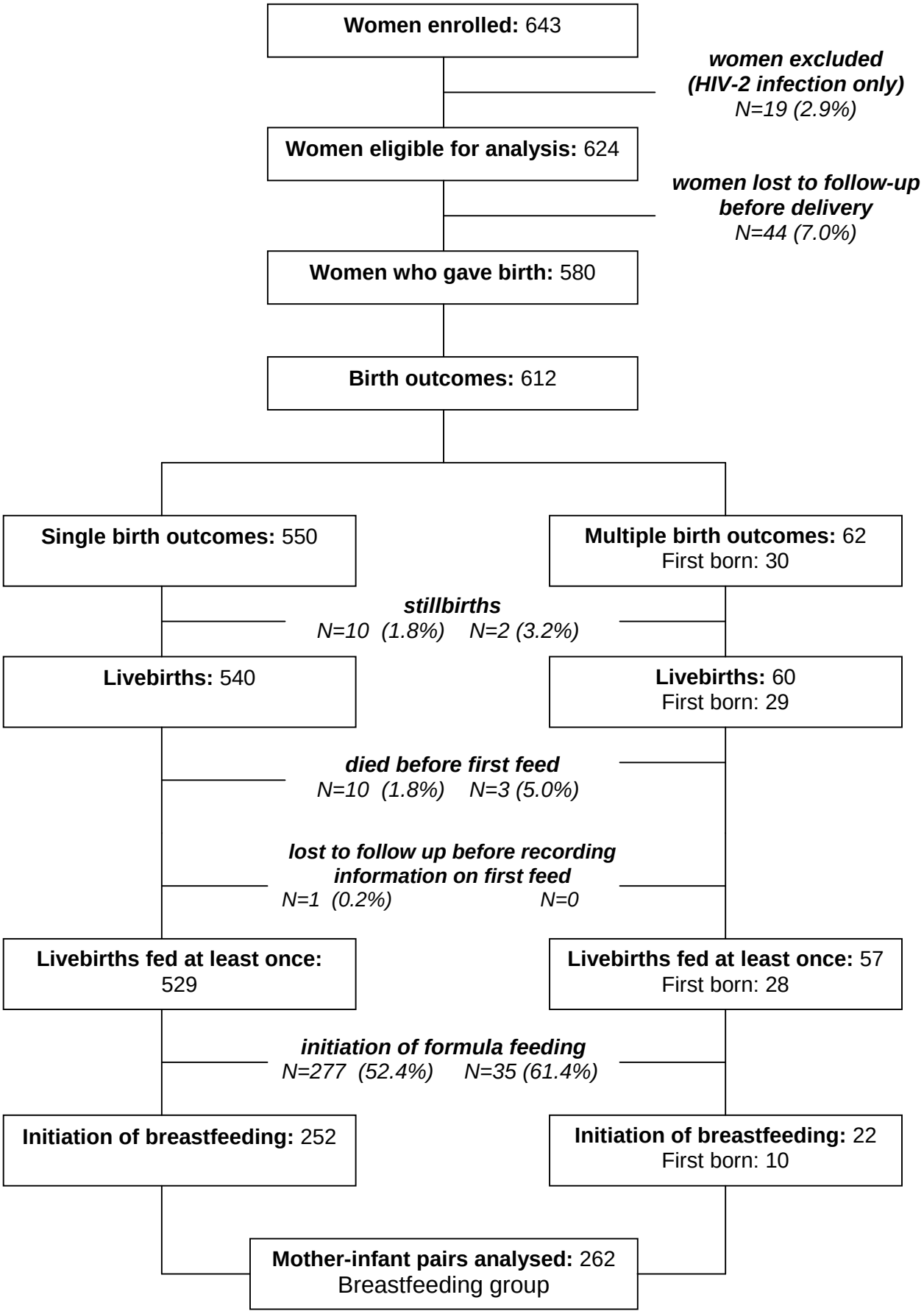

Women enrolled: 643
women excluded (HIV-2 infection only) N=19 (2.9%)
Women eligible for analysis: 624
women lost to follow-up before delivery N=44 (7.0%)
Women who gave birth: 580
Birth outcomes: 612
Single birth outcomes: 550
Multiple birth outcomes: 62 First born: 30
stillbirths N=10 (1.8%) N=2 (3.2%)
Livebirths: 540
Livebirths: 60 First born: 29
died before first feed N=10 (1.8%) N=3 (5.0%)
lost to follow up before recording information on first feed N=1 (0.2%) N=0
Livebirths fed at least once: 529
Livebirths fed at least once: 57 First born: 28
initiation of formula feeding N=277 (52.4%) N=35 (61.4%)
Initiation of breastfeeding: 252
Initiation of breastfeeding: 22 First born: 10
Mother-infant pairs analysed: 262 Breastfeeding group

Figure 2

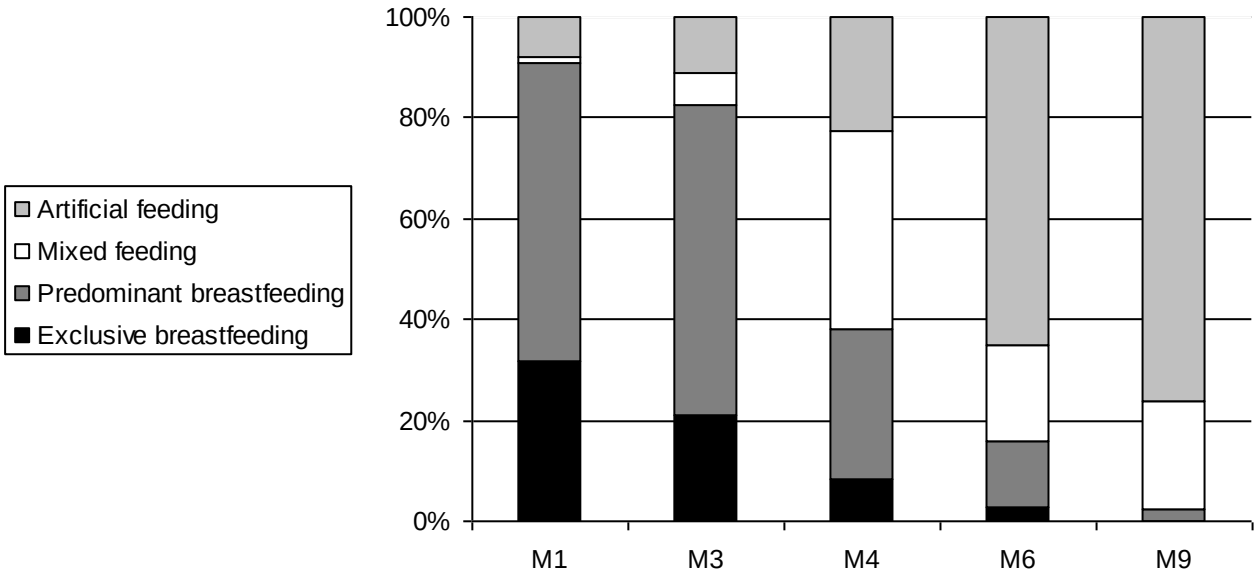
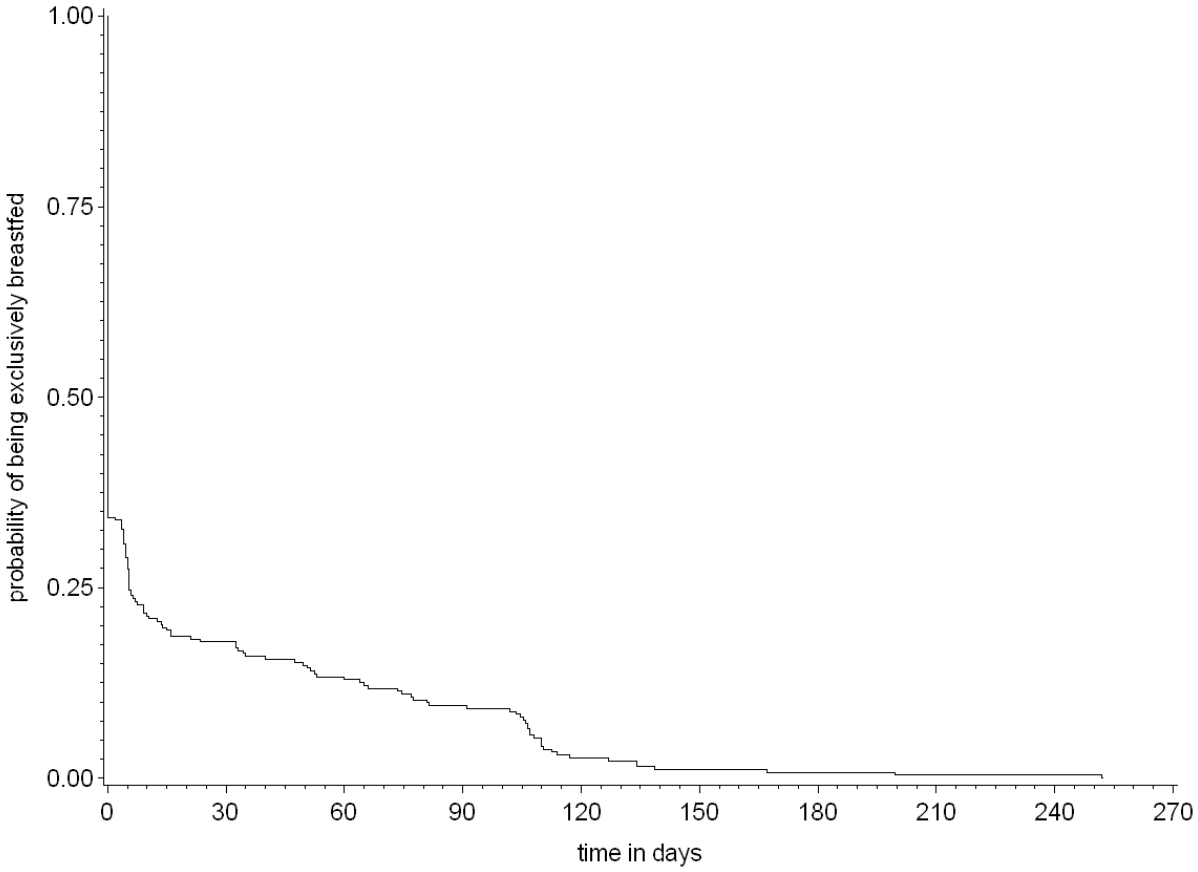
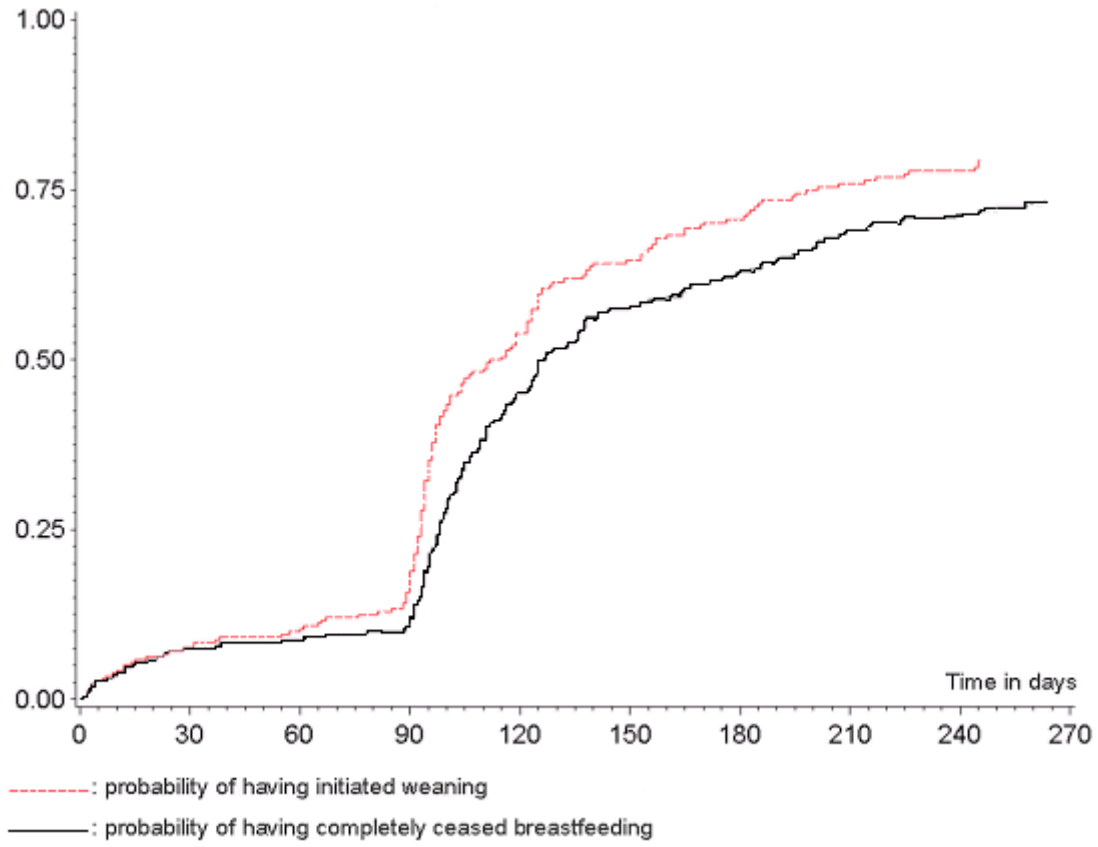

Artificial feeding
Mixed feeding
Predominant breastfeeding
Exclusive breastfeeding
100%
80%
60%
40%
20%
0%
M1
M3
M4
M6
M9

Figure 3



	M1	M3	M4	M6	M9
Probability of being exclusively breastfed	0.18	0.10	0.03	0.01	0
95% CI	0.13-0.22	0.06-0.13	0.01-0.05	0.00-0.02	-

Figure 4



	M1	M3	M4	M6	M9
Probability of having initiated weaning	0.08	0.19	0.54	0.71	0.79
95% CI	0.05-0.11	0.14-0.24	0.48-0.60	0.65-0.77	0.74-0.85
Probability of having ceased breastfeeding	0.08	0.11	0.45	0.63	0.73
95% CI	0.05-0.11	0.07-0.15	0.39-0.52	0.57-0.69	0.68-0.79