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Breastfeeding status as a predictor of mortality among refugee children in an emergency situation in Guinea-Bissau

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Summary

OBJECTIVE To identify the population risk factors in emergency situations, we studied breastfeeding status as a predictor for child mortality during a war in Guinea-Bissau.

METHODS Data on breastfeeding status are routinely collected by the surveillance system of the Bandim Health Project in Bissau. We used data collected during a 3-month period prior to the war in Guinea-Bissau in June 1998 to assess the impact of breastfeeding status on mortality in an emergency. We compared the war cohort with two cohorts of children who had had their breastfeeding status assessed in a similar way by the surveillance system in the 3 months prior to June 1996 and June 1997. As very few are weaned prior to 9 months of age and the median age of weaning is 22 months, we assessed the risk of dying over a 3-month period for breastfed and weaned children aged 9–20 months.

RESULTS Controlling for age, weaned children experienced a sixfold higher mortality [mortality rate (MR) = 5.73 (95% CI 2.40–13.71)] during the first 3 months of the war compared with children still breastfeeding. In the two control cohorts from 1996 and 1997, weaned children did not have higher mortality than the breastfed children over a similar 3-month period. Mortality in weaned children was five times higher [MR = 4.96 (1.44–16.63)] during the first 3 months of the conflict than in a similar group of weaned children from early June 1996 and June 1997, whereas there was no significant difference in mortality between breastfed children during the conflict and the preceding years [MR = 1.46 (0.84–2.55)]. Control for other background factors, including living with mother, gender, ethnic group, mother's schooling and district, did not change these differences.

CONCLUSION The protective effect of breastfeeding against infections may be particularly important in emergencies. Continuing or recommencing breastfeeding should be emphasized in emergency situations.

keywords breastfeeding, child mortality, emergency, Guinea-Bissau, weaning

Introduction

Allocation of humanitarian aid may be critical in emergencies. Resources are limited and distribution may be difficult during war or natural disasters. It is essential to identify risk groups and to set priorities for humanitarian aid at an early stage in an emergency. Maintaining breastfeeding is considered an important intervention in emergencies (Seal *et al.* 2001), especially as it can be undermined by indiscriminate provision of breast-milk substitute (Borrel *et al.* 2001). Exclusive breastfeeding is recommended for all children <6 months of age (World Health Organization Information Office 2001), and support of breastfeeding and re-lactation are the first-choice interventions for children <6 months of age in an emergency (Seal *et al.* 2001).

In Guinea-Bissau, as in most sub-Saharan countries, there is a tradition of prolonged breastfeeding (Brown *et al.* 1998), with a median of 22 months (Jakobsen *et al.* 1999). Children who have prolonged breastfeeding experience reduced morbidity and mortality (Molbak *et al.* 1994). We estimated the impact of prolonged breastfeeding on internally displaced children during the first 3 months of the war in Guinea-Bissau in 1998.

The Bandim Health Project

Guinea-Bissau in West Africa is one of the poorest countries in the world with the seventh highest under-five mortality rate (Childinfo 2000). In 1978, the Bandim Health Project implemented a demographic health surveillance system, currently covering about 46 000 people in four sub-urban areas of the capital Bissau. Every month, all houses in the study area are visited to record new pregnancies and new births. Children <3 years of age are followed with three-monthly home visits and breastfeeding

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status, arm circumference, infections, immunizations, residence and survival are ascertained.

On 7 June 1998, an armed conflict started in Guinea-Bissau between rebel soldiers and the government army supported by troops from the neighbouring countries. As a result of heavy shelling of the capital nearly all 300 000 inhabitants of Bissau had fled the city by mid-June. Most inhabitants from the Bandim Health Project's area took refuge just 5–15 km outside Bissau in Prabis, where they were living in a non-camp setting, mainly with family and friends. The first part of the war lasted from 7 June until the beginning of August. Most refugees in the Prabis area returned to Bissau when the fighting temporarily stopped in August. After the war ended in May 1999, virtually all inhabitants in the study area had returned (Aaby *et al.* 1999). It was therefore possible to re-identify all children under surveillance either by direct contact with the family or by interview with neighbours or family. Using the demographic health surveillance system implemented by the Bandim Health Project, the impact of being breastfed was evaluated when the war started in relation to child mortality during the first 3 months of the war (7 June to 6 September 1998).

Methods

Study population

All children aged 9–35 months on 6 June 1998 and living in Bandim in the three preceding months were included (war cohort). Two cohorts of children were used as controls aged 9–35 months on 6 June 1996 and 6 June 1997, respectively. For the war cohort, data on breast feeding status collected in the 3 months before the conflict (March–June 1998) by the Bandim Health Project's routine surveillance system (Jakobsen *et al.* 1996) was used. For the two control groups, we used data collected in a similar way March–June 1997 and March–June 1996.

Data were collected prospectively. For the war cohort, data on breastfeeding status was collected before the war. In September data collection was resumed in Bandim, and we were able to evaluate survival of children for whom we had information on breastfeeding status just before the war. Data on the two control groups were also collected within the frame of the demographic health surveillance system of the Bandim Health Project. Virtually all children were breastfed for at least 9 months (see Table 1), the median age of weaning being 22 months (Jakobsen *et al.* 1996). Children aged 9–23 months are most vulnerable to malnutrition, infections and mortality.

Mid-upper-arm circumference (MUAC) was measured to the nearest 2 mm with a teaching aid at low cost (TALC) insertion tape; 130 mm was used as cut-off point (Aaby *et al.* 1999). All results were adjusted for age.

Statistical methods

Relative mortality risk was calculated as a hazard rate ratio in a Cox proportional regression model with child age as the underlying time scale. Entry time was 7 June 1998 for the war cohort and 7 June 1997 and 7 June 1996, respectively, for the two control cohorts. As indicated by the age-specific proportion of weaned children (Table 1), most children under 21 months would continue

Table 1 Mortality during the first 3 months of the war and for two control groups with 3-month follow-up according to age and breastfeeding status (Guinea-Bissau 1996–1998)

	Deaths/number of children in age group								
	War (1998)			Control (1997)			Control (1996)		
Age in months	Breastfed	Weaned	Proportion weaned in age group	Breastfed	Weaned	Proportion weaned in age group	Breastfed	Weaned	Proportion weaned in age group
9–11	10/184	1/5	2.6	7/213	0/5	2.3	7/239	0/5	2.0
12–14	4/219	2/10	4.4	4/206	0/7	3.3	2/266	1/7	2.6
15–17	4/186	2/18	8.8	9/283	0/16	5.4	3/323	0/38	10.5
18–20	1/180	3/46	20.4	2/250	3/52	17.2	0/232	0/71	23.4
21–23	3/113	1/59	34.3	2/149	0/90	37.7	1/115	1/83	41.9
24–26	1/57	1/96	62.7	3/79	0/155	66.2	0/48	2/146	75.3
27–29	1/39	1/155	79.9	1/61	4/256	80.8	0/34	2/201	85.5
30–32	0/18	3/202	91.9	0/25	1/240	90.6	0/18	1/233	92.8
33–35	0/5	2/149	96.8	0/9	3/169	94.9	0/6	0/146	96.1
Total	24/1001	16/740		28/1275	11/990		13/1281	7/930	

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breastfeeding for the next 3 months, whereas older breastfed children would tend to be weaned in the next 3 months. We therefore compared mortality over the first 3 months of the war for children who were initially 9–20 months of age.

Children were followed until death or censoring because of migration or end of the observation period, which was 6 September 1998, for the war group and 6 September 1996 and 1997 for the two control groups, respectively. Relative risk was calculated using the Mantel–Haenzel test.

Results

Before the conflict, 3214 children aged 9–35 months lived in the study area of whom 1741 (54.2%) provided information on breastfeeding status and had their arm circumference measured. In 1996 and 1997, 3295 and 3304 children aged 9–35 months were registered of whom 2265 (68.7%) and 2211 (66.9%), respectively, had been examined in the preceding 3 months. The lower coverage in 1998 was due to work related to a national polio immunization campaign in March 1998.

A total of 118 children in the war cohort had low MUAC (below 130 mm) before the war. Weaned children were less likely to have low MUAC than breastfed children [relative risk (RR) = 0.33 (95% CI 0.21–0.51)]. This was true both for children younger and older than 21 months. During the first 3 months of the war, 40 (2.3%) of the 1741 children in the war cohort died, of whom three had a MUAC below 130 mm. For all children 9–35 months of age, there was no excess mortality among children with arm circumference below 130 mm compared with children with an arm circumference above 130 mm before the war [MR = 0.86 (0.26–2.82)].

Of the 1741 children in the war cohort, 740 had been weaned before the war started, and 16 died within the first 3 months of the conflict (Table 1). Median length of breastfeeding was 22.7 months for infants in the war cohort. This was significantly longer than the median length of 22 months for the two preceding years ($\chi^2 = 15.54$, $P = 0.00$). Controlled for age, weaned children under 21 months of age had a sixfold higher mortality than breastfed children [MR = 5.73 (2.40–13.71)]. Although trends were in the expected direction, there was no significant excess mortality among weaned children under 21 months in 1996 [MR = 1.46 (0.18–11.88)] or 1997 [MR = 1.83 (0.53–6.34)]. In the age group above 21 months, there was no difference in mortality among weaned and breastfed children [MR = 0.56 (0.15–2.14)].

Comparing mortality among weaned children <21 months from the war cohort with weaned children from the two preceding years and controlling for age, we found a five times higher mortality in the war cohort [MR = 4.96 (1.47–16.63)]. However, we found no difference comparing breastfed children from the war cohort with breastfed children from 1996–1997 [MR = 1.48 (0.84–2.59)]. For children >21 months, there was no significant difference in mortality between breastfed [MR = 1.68 (0.53–5.31)] and weaned children [MR = 1.44 (0.60–3.44)] when comparing the war cohort with the two control cohorts from 1996 and 1997. The overall mortality in the war cohort was significantly higher compared with the overall mortality in 1996 [MR = 2.65 (1.55–4.53)], but not compared with the mortality in 1997 [MR = 1.33 (0.85–2.07)]. The mortality in 1997 was also significantly higher than in 1996 [MR = 2.03 (1.18–3.49)]. The differences were most pronounced for children <21 months.

Of the 1741 children in the war cohort, 1721 were living with their mother before the war and 20 were not. In an analysis including only children who were living with their mother the mortality ratio for weaned children was 4.37 (1.65–11.59) compared with breastfed children. Of the 20 children not living with their mother two died during the war; after the war at least 11 children had returned to live with their mother.

Of the 1741 children in the war cohort, 1598 children (91.8%) had received a measles vaccination before the war broke out. Gender, ethnic group, mother's education and area of living, which are normally risk factors for child mortality in Bissau, were analysed as possible confounders. None of them had a significant influence on the estimate for the effect of breastfeeding and were not included in the final model (data not shown).

Discussion

Estimating death rates and identifying risk factors are often difficult in situations with internally displaced refugees. Usually data are collected in cross-sectional surveys introducing both recall and selection bias. Our data were collected prospectively and we therefore had the possibility of assessing the impact of being weaned as a risk factor for mortality during the war. As data were collected prior to the war, recall bias did not play any role for the assessment, and there would be no under-reporting of death during the war because the total cohort of children could be re-identified.

Weaned children <21 months of age followed during the first 3 months of the conflict had a markedly higher mortality than breastfed children. The weaned children in the war cohort also experienced significantly higher mortality than weaned children in the preceding 2 years. The difference in mortality between breastfed and weaned

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children was only found among children <21 months, reflecting that most children aged 21 months would be weaned during the next 3 months, and that mothers breastfeed ill children longer (Simondon *et al.* 2001). This fivefold higher mortality among weaned children in the war cohort is most likely because of higher infection pressure during the war when people lived in overcrowded houses in the rural area with less access to care (Aaby *et al.* 1999). Breastfeeding was significantly longer in the war cohort compared with the two control cohorts but as all results were controlled for age, it is unlikely that this change in feeding habits has influenced the results. Weaned children were actually better nourished, with significantly larger MUAC than breastfed ones. Probably the mothers take the health status of the child into consideration when taking the decision of weaning. With a higher proportion of malnourished children in the breastfed group, a higher mortality would be expected in this group, leading to an underestimation of the effect of being breastfed. Over the years in Guinea-Bissau we have observed relatively large variations in annual mortality levels, and although 1997 was characterized by high mortality, there was no significantly increased mortality among weaned children in that year.

It is rarely possible to claim a causal relation between breast milk and mortality. Breast milk has a beneficial effect on child health, because it not only provides nutrition but also immune-competent components to the child (Michaelsen *et al.* 2000). WHO recommends breastfeeding throughout the second year and longer in populations with high rates of infections and it is well known that the most pronounced effect of breast milk is seen in poor populations (Habicht *et al.* 1986; Victora *et al.* 1987; Michaelsen *et al.* 2000). It could be argued that breastfeeding acts as a proxy for relatively favourable maternal care. We do not know how many of the dead children were living with the mother at the time of death. However, looking only at the children living with the mother just before the war we still found a fourfold higher mortality among weaned children. In emergencies, the excess mortality is mainly because of common infectious diseases such as measles, diarrhoea and lower respiratory infections and to undernutrition. Of the children in the war cohort, 91.8% had received a measles vaccination before the war broke out. There was no major measles epidemic in Guinea-Bissau during the war (Aaby *et al.* 1998). Breastfeeding is known to protect against diarrhoea and lower respiratory infections and in circumstances of lack of food, breastfed children will also benefit nutritionally.

As there was no difference in mortality for breastfed children in the war cohort compared with the preceding 2 years, our data indicate that in emergency situations with increased risk of infections, maintaining breastfeeding is even more critical than under normal conditions. It appears vital to maintain or even recommence breastfeeding in emergency situations, and weaned children becoming sick may need special attention.

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