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Brief Report

Acute Malnutrition and Under-5 Mortality, Northeastern Part of India

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Summary

We assessed the prevalence of childhood acute malnutrition and under-five mortality rate (U5MR) in Darbhanga district, India, using a two-stage 49-cluster household survey. A total of 1379 households comprising 8473 people were interviewed. During a 90-day recall period, U5MR was 0.5 [95% confidence interval (CI), 0.2–1.4] per 10 000 per day. The prevalence of global acute malnutrition among 1405 children aged 6–59 months was 15.4% (NCHS) and 19.4% (2006 WHO references). This survey suggests that in Darbhanga district, the population is in a borderline food crisis with few food resources. Appropriate strategies should be developed to improve the overall nutritional and health status of children.

Key words: acute malnutrition, mortality, child, health survey, India.

One in every three malnourished children in the world lives in India [1]. According to the third Indian National Family Health Survey, 48% of children <3 years of age were malnourished and 19.8% suffered from acute malnutrition [2]. There are inequalities across castes and gender in specific areas of India, with rural populations suffering more than urban ones [3].

Bihar, in Northern India, is the third most populated state, with the highest percent of people living below the poverty line. Characterized by a vast

stretch of fertile flat land, with major rivers, Bihar is recurrently affected by floods during the monsoon months.

In 2007, in Bihar during floods, the international non-governmental organization, Médecins sans frontières, provided an emergency response to address the health and nutritional needs of the affected population. To guide the emergency response, an initial assessment of the nutritional situation, based on a standardized procedure [4], was conducted. The results of this assessment suggested a high level of acute malnutrition, particularly in Darbhanga district, the poorest area of Bihar. However, the link between floods and the high level of acute malnutrition in children <5 years of age was unclear and questions remained about the prevalence of acute malnutrition during the rest of the year.

As few surveys have been conducted out of floods to evaluate the nutritional status in children and most only on chronic malnutrition [2, 5, 6], this survey was conducted to assess the prevalence of acute malnutrition in children aged 6–59 months and under 5-mortality rate (U5MR) before floods in Darbhanga district.

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Methods

Darbhanga district is the poorest area with the largest landless population in Bihar. According to the 2001 Census of India, its population is 3 018 639 of whom 91.6% are rural and 20.1% are children under the age of 6 years [7]. Scheduled castes, the low castes and poorest population represent 15.5% of the population [7].

We conducted a two-stage household-based cluster survey in Darbhanga district. A village or an area of a town was defined as the first-stage sampling unit (or cluster). Each cluster was selected from the list of all the villages of Darbhanga district, proportional to population size (2001 Census of India). A household was defined as a group of persons eating together on a regular basis in the same house. Sampling was conducted following the spin-the-pen (random walk) method [8–10].

Using an expected prevalence of global acute malnutrition (GAM) of 20%, a precision of 3% and a theoretical cluster effect of 2, a sample size of 1366 children was estimated for the nutritional survey. We followed a sampling plan of 49 clusters of 30 children aged between 6 and 59 months (1470 children), which was sufficient to detect an U5MR of 1.5/10 000/day with a precision of 0.8/10 000 per day.

The survey protocol was approved by the local authorities of Darbhanga District and the head of household provided oral consent to participate in the survey.

All children between 6 and 59 months from the same mother of household were included. If the head of household had several wives, one wife was randomly selected and all of her children aged 6–59 months included. If date of birth was unknown, age was estimated using a local events calendar. Height, weight, mid-upper arm circumference (MUAC) and bilateral pedal edema were measured.

Prevalence of GAM and severe acute malnutrition (SAM) were estimated using both the National Center for Health Statistics (NCHS) child growth references and the 2006 WHO standards.

For the U5MR, the recall period began on 23 March 2008 (date of the Holi festival) and ended the first day of the survey, giving a 90-day recall period. The head of household reported the number of children younger than 5 years at Holi and at the day of the survey. The mid-period population was used as the denominator.

Mortality data were analyzed in Epi-Info version 6.04 (CDC Atlanta, USA), anthropometric indices were calculated using Nutrisurvey version 2007 (SMART, ENA) and cluster effects and 95% confidence intervals (CIs), using Epi-Info.

Results

The survey was performed from 11 to 23 June 2008, in 46 villages of Darbhanga district. Among the 1466 households visited, 73 (5.0%) were absent at the time of the survey and 14 (1.0%) refused to be interviewed. Interviews were conducted in 1379 households including 1405 children under the age of 5 years (Table 1). The median number of children under the age of 5 years per household was one (range 0–8) and 32.6% of the households had no children under the age of 5 years.

The U5MR was 0.53 deaths/10 000 persons/day (95% CI: 0.2–1.4). Among the seven deaths in children under the age of 5 years, 57.1% (4/7) reportedly died from consequences of delivery, 1 from diarrhea and 2 were unknown.

The prevalence of GAM was, respectively, 15.4% (NCHS) and 19.4% (WHO) (Table 2). Four children had bilateral edema and 27 (1.9%) had a MUAC <110 mm. Both GAM and SAM were not significantly different between boys and girls, or between age groups, or Muslim and scheduled castes subpopulations, using both standards.

TABLE 1
Survey profile

	Darbhanga district
Estimated population, No.	3 295 789
No. of households sampled	1379
Population sampled, <i>N</i>	8473
Children under the age of 5 years, <i>N</i> (%)	1528 (18.0)
Household size, mean (range)	6.1 (1–25)
Religion status, <i>N</i> (%)	
Hindu	1054 (76.4)
Muslim	325 (23.6)
Caste status among Hindu, <i>N</i> (%)	
Upper caste	152 (14.4)
Other backward caste	362 (34.3)
Scheduled caste	540 (51.2)

TABLE 2
Childhood acute malnutrition (*n* = 1405) based on weight-for-height *z*-scores (and/or edema)

Prevalence	NCHS child growth references	2006 WHO references
GAM ^a , % (95% CI)	15.4 (12.7–18.2)	19.4 (16.5–22.7)
Severe acute malnutrition ^b , % (95% CI)	1.9 (1.0–2.7)	4.8 (3.4–6.9)

^aLess than –2 *z*-score; ^bless than –3 *z*-score.

Discussion

This survey showed that the prevalence of GAM in children younger than 5 years was 15.4% (NCHS) and 19.4% (WHO) in Darbhanga district. These results obtained with both methods were similar to the emergency threshold of 15–20% [4]. However, they were below those observed in all Bihar (GAM according to WHO standards: 27.1%) or in other rural areas of India (GAM: 20.7%) [2]. Regarding the SAM, the results obtained with both methods (1.9%, NCHS and 4.8%, WHO) were below the emergency threshold of 5% [4].

However, it admitted to note that the previous results reflected the fact that the survey was conducted in a period considered as 'favorable'. Thus, the results obtained during this survey would be exacerbated during the floods, where food insecurity was expected.

The estimated U5MR seemed to be under the emergency threshold for India (i.e. 0.59/10 000 per day), but its 95% CI crossed the emergency threshold [4].

The results of this survey suggested that in Darbhanga district, children aged between 6 and 59 months have low-nutritional status, which could get worse if the food security and sanitary situation become critical.

Even if the Indian government has initiated nutrition interventions including the Integrated Child Development Services and the National Programme of Nutritional Support for Primary Education [11, 12], these ones are mainly focused on undernutrition in children between the age of 3 and 6 years.

Now, appropriate strategies, including food access and management of child acute malnutrition, should be developed to improve the overall nutritional and health status of children, particularly in the poorest Indian states such as Bihar.

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