Revue Africaine de Médecine et de Santé Publique

Article original e-ISSN : 2617-5746 p-ISSN: 2617-5738

Acute malnutrition in rural twins before their second birthday: insights from a cohort study in Burkina Faso.

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Abstract

Background: Twins constitute a vulnerable subpopulation among children under 5 years of age. In sub-Saharan Africa, it has been found that multiple births tend to be undernourished and the risks of acute malnutrition and stunting are high.

Objective: Examining the relationship between acute malnutrition and twins in rural areas

Methods: This is a cohort study. 199 villages in the province of Sanmentenga, Burkina Faso. Multiple logistic regression was used to examine the relationship between acute malnutrition and twin status at birth after adjusting for wealth index, presence of latrines, main water source, fever, and presence of diarrhoea. The statistical threshold for significance was P < 0.05 and all analysis were performed using STATA version 14.0.

Results: A total of 708 children were included in the study, including 236 children born twins and 472 children born twins.non-twins. Children born to mothers younger than 18 years were more common among non-twins than among twins (5.6% vs. 1.0%, p = 0.001). Acute malnutrition was more common among twins than non-twins (42.1% versus 28.0%, p<0.001). Children with fever were more common among non-twins than among twins (10.2% versus 5.5%, p=0.04).After adjusting for the wealth index, the presence of latrines, the main source of water, the presence of fever and the presence of diarrhea, twins were 1.46 times more malnourished than single children (RR = 1.46 , 95% CI [1.17-1.81], p =0.001).

Conclusion: Children receiving rural health and nutrition education, twins were likely to be malnourished before their second birthday compared to non-twins.' Particular attention should be paid to twins to reduce the risk of acute malnutrition before their second birthday.

Keywords: Acute malnutrition, Rural, Twins, Second birthday, Burkina Faso.

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Article reçu : 17-02-2024
Accepté : 02-09-2024 Publié : 02-10-2024

Pour citer cet article : Franck GARANET et al. Acute malnutrition in rural twins before their second birthday: insights from a cohort study in Burkina Faso. Revue de Médecine et de Santé Publique. 2024 ; 7(2) : 36 - 45

The world is facing a worrying nutritional situation(1–6). According to the 2017 Global Nutrition Report, 2 billion people are deficient in essential micronutrients, such as iron and vitamin A, 155 million children are stunted, 52 million children are wasted, 2 billion adults are overweight or obese, 41 million children are overweight(7). 88% of countries in the world are heavily affected by two or three forms of malnutrition. According to the joint report, in 2017, stunting affects approximately 22.2% or 150.8 million people and acute malnutrition continues to threaten the lives of approximately 7.5% or 50.5 million children. Less than 5 years old in the world(7) .In sub-Saharan Africa, there were 58.7 million stunted children and 9.7 million people with acute malnutrition during the same period among children under 5 years old. Twins constitute a vulnerable subpopulation among children under 5 years old(2.3).Multiple births, which represent approximately 3% of births and 14% of infant deaths, are becoming more and more frequent. Multiple birth rates began to decline in the 1950s, reaching a low in the 1970s and increasing since then(8,10,11). Twin and triplet rates followed the same upward trend until 1998, after which triplet birth rates began to decline while twin birth rates continued to increase(8). In a study of multiple births in sub-Saharan Africa, it was found that multiple births tended to be malnourished as singleton children and the risks of acute malnutrition, stunting and underweight were successively 1.31, 1.83 and 1.73 times higher. However, multiple births return to their age and size deficits by the end of the fourth year(10).In some studies of factors associated with malnutrition, the birth of twins has been identified as a risk factor for malnutrition, and some studies have reported similar results. Furthermore, few studies of exposed/unexposed cohorts have explored the relationship between being a twin and the occurrence of acute malnutrition during the first two years of life. From July 2014 to September 2016, a cohort of children received nutritional supplements with nutritional education from mothers as part of preventing malnutrition and improving maternal and child health. To fill this gap and guide future interventions aimed at reducing acute malnutrition in this specific group, we examined the association between acute malnutrition in twins in a rural supplementary feeding setting in a study of this cohort.

Materials and methods

Type and population study.

This is a secondary analysis of a prospective cohort study .The study population consisted of children under 27 months of age receiving dietary supplements as part of the ViM project(12–15).

Data collection period and method: Data are collected to August 2014 at December 2016. All children of twins were included in the study, as well as children who live in the same household and are the same age as the twins. On each distribution day, trained interviewers were responsible for administering the questionnaire and performing anthropometric measurements.

Study variables:

The primary outcome assessed was acute malnutrition.

Nutritional status was calculated according to growth standards published by WHO in 2006(16). Then the z scores were grouped into 02 categories which are: Z scores ≤ -2 (acute malnutrition) and Z scores > -2 (no malnutrition). For the regression analysis, we categorized acute malnutrition (Yes or No). An a priori selection of covariates was performed for factors associated with increased risk of acute malnutrition and included maternal age (<18, 18-35 years, ≥35 years), wealth index (poor, less poor, average, less rich or rich).), Number of children under 5 years old in the household (1-3 or 4-6, more than 6) and presence of latrines in the household (Yes or not), Mother's and head of household education level, the main source of household water and the birth season. For the clinical characteristics we are nutritional status, fever (No or Yes), and Diarrhea (No or Yes).

For the wealth index, 20 items related to household assets were used with principal component analysis to generate wealth quintiles (poorest, second, middle, fourth and richest) (17). These 20 items included the presence of a bucket, bowls, cup, gas fireplace, bed, mattress, table, chair, radio functional, a functional clock, a functional lamp, a functional television, a functional bicycle, a functional motorcycle, a functional telephone, a functional cart, a wheelbarrow, donkey or horse, and poultry, sheep or goat. We then produced a wealth quintile.

Statistical analyzes and tools

The distribution of sociodemographic and clinical characteristics of the participants was summarized and a descriptive analysis was presented. Bivariate tests of the association

between twins and maternal characteristics were performed using the Pearson chi-square test for categorical variables. We used modified Poisson regression to assess the association between twins and non-twins (reference group) for acute malnutrition (18,19). Results are presented as unadjusted and adjusted relative risks with a corresponding 95% confidence level. The statistical threshold for significance was P < 0.05 and all analyses were performed using STATA version 14.0 (20). Reporting was conducted in accordance with the Strengthening Research for Observational Studies (STROBE) guidelines (21).

Ethical considerations

The original study in which anthropometric data were collected was approved by the Tufts University Health Sciences Institutional Review Board (IRB number: 10899) as well as the Department of Health Institutional Review Board. Health of Burkina Faso (number: 2013-10-090). Informed consent was obtained from all participants after the study was explained. For ethical reasons, only identifiers were used for data analysis. The data collected was locked in a cabinet and accessible only to the principal investigator.

Results

A total of 708 children were included in the study, including 236 children born to twins and 472 singleton children in the same village.

Basic characteristics of the sample.

Twins and non-twins were comparable in terms of wealth index, maternal education level, household education level, Education level of the head of household, presence of latrines, the main source of water, the number of children under the age of 5 in the household, and the birthing season. Children born to mothers younger than 18 years were more common among non-twins than among twins (5.6% versus 1.0%, p = 0.001) (Table 1).

Table 1: Basic sociodemographic characteristics of children in rural areas before their second birthday.

Variables	Twins (N=246) n(%)	No twins (N = 472) n(%)	P-value
Mother's age			**<0.001***
Under 18	2(1.0)	24(5.6)	
18-35 years old	172(83.1)	375(87.2)	
Over 35 years old	33(15.9)	31(7.2)	

Wealth index			0.22
Very poor	45(19.5)	95 (20.2)	
Poor	52(22.5)	88(18.7)	
Medium	53(23.0)	87(18.5)	
Rich	44(19.0)	96(20.5)	
Very rich	37(16.0)	104(22.1)	
Number of children under 5 years old in the household			0.2
1 to 6	217(93.5)	452(95.8)	
More than 7	15(6.5)	20(4.2)	
The presence of latrines in the household			0.81
Private	86(36.9)	174(37.0)	
Public	8(3.4)	21(4.5)	
No latrines	139(59.7)	275(58.5)	
Mother's education level			0.27
None	191(84.1)	383(83.4)	
Primary	25(11.0)	63(13.7)	
Secondary and above	11(4.9)	13(2.9)	
Secondary and above			
Education level of head of household			0.80
None	173(76.2)	348(75.3)	
Primary and more	54(23.8)	114(24.7)	
The main source of household water			0.28
Pump	198(85.0)	384(81.5)	
GOOD	19(8.1)	57(12.1)	
Surface water	16(6.9)	30(6.4)	
Birth season			0.18
Rainy	223(94.5)	456(96.6)	
Dry	13(5.5)	16(3.4)	

*, significant p-value

Twins and non-twins were comparable vaccination status at 06 months and presence of diarrhea at inclusion.

Acute malnutrition was more common among twins than non-twins (42.1% versus 28.0%, p<0.001). Children with fever were more common among non-twins than among twins (10.2% versus 5.5%, p=0.04)(Table 2).

Table 2: Clinical characteristics of children in rural areas before their second birthday.

	Twins (N=236) n(%)	No twins (N = 472) n(%)	p-value
Acute malnutrition			**<0.001***
No	136 (57.9)	339 (72.0)	
Yes	99 (42.1)	132 (28.0)	
Presence of fever at inclusion			**0.04***
Yes	13(5.5)	48(10.2)	
No	223(94.5)	424(89.8)	
Presence of diarrhea at inclusion			0.17
Yes	8(3.4)	27(5.7)	
No	228(96.4)	445(94.3)	
Vaccination status at 6 months			0.54
Up to date	21(9.0)	419(89.5)	
No to update	221(91.0)	49(10.5)	

*, significant p-value

Acute malnutrition and twins

We use modified Poisson regression to examine the relationship between and twins.

In univariate regression, twins were 1.5 times more malnourished than singleton children (RR = 1.5, 95% CI [1.22-1.85], p-value < 0.0001).

After adjusting for wealth index, presence of latrines, main source of water, presence of fever and presence of diarrhea, twins were 1.46 times more malnourished than children single (RR = 1.46, 95% CI [1.17-1.81)], pvalue =0.001)(Table 3).

Table 3: Association betweenacute malnutrition and twins in rural areas before their second birthday.

	RR crude	CI* (95%)	P-value	RR adjusted**	CI (95%)	p-value
Twins						
No	1			1		
Yes	1.5	1.22-1.85	<0.001	1.46	1.17-1.81	0.001

Confidence interval: RRadj, risk ratio adjusted to the wealth index, presence of latrines, the main source of water, the presence of fever and the presence of diarrhea.

Discussions

Twins and acute malnutrition

Acute malnutrition was more common among twins than non-twins (42.1% versus 28.0%, p<0.001). This difference was statistically significant. In 2016, in a study comparing complementary feeding practices between mothers of twins and mothers of single children, Bentil et al. found that the prevalence of underweight was 26% among twins and 24% among singleton children. Stunting was 20% among twins and 24% among singleton children and underweight was 14% among twins and 10% among singleton children. This difference may be related to the small sample size of this study. Indeed, the comparison was made with 50 twins and 50 single children (5).

In multivariate analysis, twins were 1.46 times more malnourished than single children (aRR: 1.46, 95% CI - [1.17-1.81]).

Bentil et al. found that it resulted in the opposite. Malnutrition was present in both groups but there were no significant differences (p>0.05). This difference in results may be related to the small sample size of this study. In fact the comparison was made with 50 twins and 50 single children (1), in a study of risk factors for malnutrition in children born to HIV-married mothers, showed that risks of stunting and underweight were associated with multiple versus single children. Our results in multivariate analysis corroborate those reported by Madiga(1). Even in the context of nutritional supplementation, twins remain more likely than other children to suffer from acute malnutrition. This may be related to mothers' care of twin versus non-twin children. In 1990, Chang(11), in a study on twins in families, showed that of the 296 mothers of twins asked about the difficulties encountered in raising twins, 49% reported insufficient sleep, 18% financial constraints, 39% emotional,

22% of marital relations and 43% of the time to take care of other children.With the growth of the twins, the problems gradually decreased, except for emotional disorders, the most difficult period being the first year(8,11). Only 15% reported leaving babies in the care of loved ones during the day. Overall, 68.2% felt the father's support, but 39% felt that this support was not necessary; 49% were supported by the mother-in-law, but 43% felt that the mother-in-law was of no help to them; 36% were cared for by their own mother, but 54% reported receiving little help. In this study, it was found that social support from parents was insufficient. Regular and close medical monitoring would be necessary in children born to twins.

Conclusions

In this prospective cohort study of children supplemented with health and nutrition education in rural areas, twins were twice as likely to be malnourished before their second birthday compared to non-twins. Children from less poor families were protected from acute malnutrition compared to children from poor households. Other predictors of acute malnutrition were the presence of fever and diarrhoea. Special attention should be paid to twins to reduce the risk of being malnourished before their second birthday.

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