RESEARCH ARTICLE

EFFECTS OF BIRTH INTERVAL ON NUTRITIONAL STATUS OF UNDER FIVE CHILDREN IN PERIURBAN AREA OF MADHYA PRADESH, INDIA

Ahmed Shahjada[1], BK Sharma[2], Shireen Sharma[1], Piyusha Mahashabde[1], Abhishek Bachhotiya[1]
[1] Department of Community Medicine, Index Medical College Hospital & Research Centre, Indore, Madhya Pradesh, India
[2] Department of Pathology, S. S. Medical College, Rewa, Madhya Pradesh, India

Correspondence to: Ahmed Shahjada (shahjada786@hotmail.com)

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ABSTRACT
Background: Childhood under-nutrition is caused by several factors, but birth spacing is often overlooked even though it is strongly associated with stunting, a characteristic of under-nutrition. Encouraging women to space births through family planning services and educational awareness could contribute to reducing childhood under-nutrition, improve maternal health, and provide healthy childhood development.
Aims & Objective: To find out any association between nutritional status of children and birth interval.
Materials and Methods: It was a Cross-sectional; Observational Community based study conducted in the practice area of Urban Health Training Centre, Index Medical College Hospital & Research Centre, Indore (MP), India. House to house visit, Clinical examination and Anthropometric measurements of the under five children and interview of the adult care-givers with a pre-designed pre-tested proforma was done.
Results: The prevalence of underweight, wasting and stunting in the study population was found to be 46.8%, 38.6% and 40.6% respectively. Majority of the undernourished children were with birth interval less than 24 months. The prevalence of underweight, wasting and stunting was highest among children with birth interval less than 24 months i.e. 57.21%, 42.78% and 51.03% respectively as compared to children with birth interval more than 48 months where prevalence of underweight, wasting and stunting was found to be lowest i.e. 29.62%, 22.22% and 25.92 respectively.
Conclusion: The study showed a consistently positive association, i.e., a longer interval was associated with better nutritional status of children. Such a scenario would be consistent with an association between short subsequent birth interval and child malnutrition.
Key Words: Protein Energy Malnutrition; Z-Score; Birth Interval; Under-Five; Underweight; Wasting; Stunting

Introduction

There are many reasons to suspect that a short birth interval could adversely affect nutritional status of the child. A short previous birth interval could be risky if the mother's nutrient reserves become depleted, which could increase the risk of intrauterine growth retardation and adversely affect infant nutrient stores at birth and nutrient delivery via breast milk.[1-3] A short subsequent birth interval can also place the child at risk for several reasons. A new pregnancy often prompts weaning of the current child, or at least a reduction in the volume of breast milk consumed, and reduced breast milk intake can be hazardous both nutritionally and in terms of resistance to infection.[4-7] The relationship between subsequent birth interval and duration of breastfeeding is bidirectional, however, as cessation of breastfeeding (or introduction of other infant foods) can prompt the return to fertility, which in the absence of contraception will cause a shorter birth interval. Caring for a new infant also reduces the amount of time that the mother can devote to caring for the older child. Children who are younger when this occurs (i.e., when there is a short birth interval) are likely to be more vulnerable to reduced care-giving than children who are older. Even before the new infant is born, simply being pregnant may alter care practices that affect the current child's health.[8]

Objective: To find out any association between nutritional status of children and birth interval.

Materials and Methods

Study Design

- *Type of Study:* It was a community based cross sectional study.
- *Sample Size & Sampling Methods:* For assessment of the nutrition & health status of the children under-five, the prevalence of PEM in children 1-5 years of age in India which is 48% was considered for sample size calculation.[1] Sample size was calculated based on the formula $4PQ/L^2$, where P is the prevalence (48), Q is 100-P (52) and L is the permissible error i.e. 10%. For the convenience of the study round figure of 500 was taken as the final sample size.
- *Setting:* The Urban Health Training Centre Practice

Area, Index Medical College Hospital and Research Centre, 8th mile, Indore (M.P). India.

- *Study Period:* From September 2012 to August 2013

Selection of Subjects

The Urban Health Training Centre, Index Medical College, 8th Mile, Indore (M.P), India which covers 24 villages with 40,000 populations, every alternate village was selected for sampling purpose. For arriving at desired sample size of 500, 41 children of one to five years of age from every alternate village was included in the study by following systematic random sampling based on house to house survey. In families having two or more than two under-five children the younger children was selected for the study. Data was collected from the adult care-givers of the under-five children after taking consent.

- *Inclusion Criteria:* All under-five children (1-5), except those meeting the exclusion criteria were included in the study.
- *Exclusion Criteria:* Pre-term new-born, neonates, infants, congenital anomalous child and severely ill children was excluded from the study.
- *Study Protocol:* (i) House to House survey was conducted. (ii) Mothers were interviewed on a predesigned and pretested questionnaire. (iii) Nutritional status of the child was assessed by anthropometric measurements (weight for age, height for age and weight for height).

Assessment of Under-Nutrition

It was assessed, using the anthropometric calculator provided by the Department of Nutrition, World Health Organization (WHO) Geneva, Switzerland.[2] The weight and height measurements were converted into Weight for age (Underweight), height for age (Stunting) and weight for height (Wasting) which were calculated in standard deviation values (transformed as Z - scores) using reference median as recommended by WHO (WHO, 2006). Children who were less than two standard deviation below the reference median (<-2 SD) on the basis of weight for age, height for age and weight for height nutritional indices were considered to be underweight, stunted and wasted respectively.[3]

Results

The study was conducted in the Urban Health Training Centre Practice Area, Index Medical College Hospital and Research Centre, Indore, India. A total of 500 children 1-5 years of age formed the study population out of which 75 (15.0%) children were in the age group of 12-23 months, 108 (21.6%) in the age group of 24-35 months, 92 (18.4%) in the age group of 36-47 months and 225 (45.0%) were in the age group of 48-60 months. There were 248 males (49.6%) and 252 females (50.4%) (Table 1). Out of 500 study subjects 33.6% were 1st child whereas majority of children (38.8%) had birth interval of less than 24 months, 22.2% with birth interval of 24-48 months followed by 5.4% children with birth interval of more than 48 months (Table 2).

Table-1: Distribution of children according to their age and gender

Gender	Age Group (In Months)				Total
	12-23	24-35	36-47	48-60	
Male	39 (15.72%)	63 (24.40%)	42 (16.93%)	104 (41.93%)	248 (49.6%)
Female	36 (14.28%)	45 (17.85%)	50 (19.84%)	121 (48.01%)	252 (50.4%)
Total	75 (15.0%)	108 (21.6%)	92 (18.4%)	225 (45.0%)	500 (100.0%)

$\chi^2 = 5.068$; DF = 3; p = 0.167

Table-2: Distribution of children according to their birth interval

Birth Interval	Male (248)	Female (252)	Total (500)
1st child	96 (38.70%)	72 (28.57%)	168 (33.6%)
< 24 months	79 (31.85%)	115 (45.63%)	194 (38.8%)
24 - 48 months	53 (21.37%)	58 (23.01%)	111 (22.2%)
> 48 months	20 (8.06%)	7 (2.77%)	27 (5.4%)

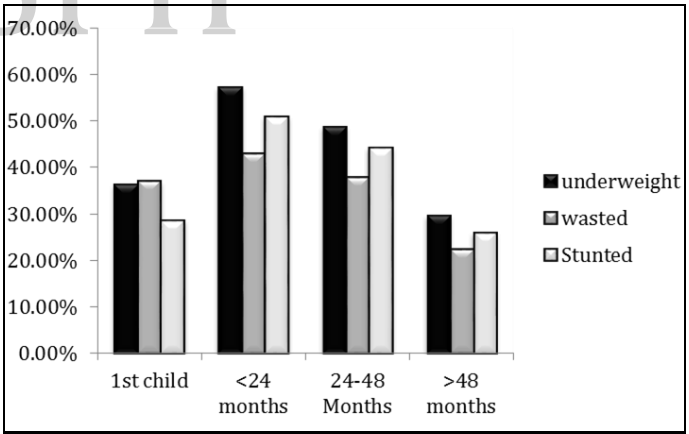

Figure-1: Association between nutritional status and birth interval

As per nutritional status, overall 46.8% of children were found to be underweight, 38.6% with wasting and 40.6% with stunting. Maximum numbers of underweight children i.e. 47.55% were in the age group of 48-60 months. Overall 38.6% of children showed wasting out of which most of them were from age group 48-60 month's i.e.41.33% and least wasting was from 12-23 months age group. Out of 500, 40.6% children were found to be stunted. Most of the stunted children were in the age group of 12-23 months i.e.46.66% while least was seen in the age group of 48-60 months i.e. 38.22% (Table 3).

Table-3: Age-wise prevalence of underweight, wasting and stunting in the study population

Age Group (Months)	No. of Children	Weight for Age		Weight for Height		Height for Age	
		Underweight	Normal	Wasting	Normal	Stunting	Normal
12-23	75 (15.0%)	35 (46.66%)	40 (53.33%)	25 (33.33%)	50 (66.66%)	35 (46.66%)	40 (53.33%)
24-35	108 (21.6%)	50 (46.29%)	58 (53.70%)	41 (37.96%)	67 (62.03%)	43 (39.81%)	65 (60.18%)
36-47	92 (18.4%)	42 (45.65%)	50 (54.34%)	34 (36.95%)	58 (63.04%)	39 (42.39%)	53 (57.60%)
48-60	225 (45.0%)	107 (47.55%)	118 (52.44%)	93 (41.33%)	132 (58.66%)	86 (38.22%)	139 (61.77%)
Total	500 (100.0%)	234 (46.8%)	266 (53.2%)	193 (38.6%)	307 (61.4%)	203 (40.6%)	297 (59.4%)
p Value		**$\chi^2 = 1.770$; DF = 3; p > 0.05**		**$\chi^2 = 2.156$; DF = 3; p > 0.05**		**$\chi^2 = 1.82$; DF = 3; p > 0.05**	

Table-4: Association between Nutritional Status and Birth Interval

Birth Interval	Total Children	Weight for Age		Weight for Height		Height for Age	
		Underweight	Normal	Wasted	Normal	Stunted	Normal
1st Child	168 (33.6%)	61 (36.30%)	107 (63.69%)	62 (36.90%)	106 (63.09%)	48 (28.57%)	120 (71.42%)
<24 months	194 (38.8%)	111 (57.21%)	83 (42.78%)	83 (42.78%)	111 (57.21%)	99 (51.03%)	95 (48.96%)
24 to 48 months	111 (22.2%)	54 (48.64%)	57 (51.35%)	42 (37.83%)	69 (62.16%)	49 (44.14%)	62 (55.85%)
>48 months	27 (5.4%)	8 (29.62%)	19 (70.37%)	6 (22.22%)	21 (77.77%)	7 (25.92%)	20 (74.07%)
Total	500 (100.0%)	234 (46.8%)	266 (53.2%)	193 (38.6%)	307 (60.8%)	203 (40.6%)	297 (59.4%)
p-value		**$\chi^2 = 17.78$; DF = 3; p < 0.05**		**$\chi^2 = 4.718$; DF = 3; p > 0.05**		**$\chi^2 = 21.81$; DF = 3; p < 0.05**	

Majority of the undernourished children were with birth interval less than 24 months. The prevalence of underweight, wasting and stunting was highest among children with birth interval less than 24 months i.e. 57.21%, 42.78% and 51.03% respectively as compared to children with birth interval more than 48 months where prevalence of underweight, wasting and stunting was found to be lowest i.e. 29.62%, 22.22% and 25.92 respectively (Table 4).

Discussion

In the present study, a strong relationship between under-nutrition and birth interval was observed. Overall, prevalence of underweight, wasting and stunting was found to be 46.8%, 38.6% and 40.6% respectively (Table 3). According to NFHS-III MP (2006, India), the prevalence of underweight increased among under-five children from 53.5% to 60.3% but stunting decreased from 49% to 40% while the prevalence of wasting increased from 20.2% to 33.3% in Madhya Pradesh, India.[4] No significant difference was observed in our study as compared to state data. Majority of the children (38.8%) had birth interval of less than 24 months followed by 5.4% children with birth interval of more than 48 months (Table 2). The children with birth interval of less than 24 months suffered more from different grades of malnutrition as compared to those with birth interval of more than 48 months. Overall, prevalence of underweight, stunting and wasting in children with birth interval less than 24 months was 57.21%, 42.78% and 51.03% respectively while in children with birth interval more than 48 months it was found to be lowest as compared to other age groups (underweight 29.62%, wasting 22.22% and stunting 25.92%). The prevalence of stunting (51.03%) was found to be highest in children with birth interval less than 24 months (Table 4). The association among birth interval and underweight, stunting was found to be statistically significant ($p < 0.05$) while with wasting it was not found to be significant ($p > 0.05$). The study showed a consistently positive association, i.e., a longer interval was associated with better nutritional status of children. Similarly, Yimer G et al, Ethiopia (2000) observed that chronic malnutrition is significantly linked with shorter birth interval. The proportion of stunted children among those children with short preceding birth interval less than 24 months was 47.7% while it was 45.2% and 32.5% for children with a birth interval of 24-48 months and above 48 months respectively.[5] Another study from Bangladesh, Israt et al (2006) found that 52.8% stunted had birth interval less than 24 months, 48.3% with birth interval 24-47 months while 55% underweight with birth interval less than 24 months and 9.4% wasted with birth interval less than 24 months.[6] G Kathryn et al observed, the studies on child nutrition outcomes indicate, a longer birth interval is associated with a lower risk of malnutrition in some populations, but not all. In those countries in which the relationship was significant, the reduction in stunting associated with a previous birth interval > 36 months (compared to 24-35 months) was 30-54%. Some of this reduction may be due to residual confounding, i.e., to factors not included in the analysis (such as breastfeeding and maternal height).[7] Similar findings were observed in our study. Another study done in Bangladesh (2000), Mazumder A B et al observed, the proportion of children who were under 60% weight-for-age decreased with the increase in the length of the subsequent birth interval, the proportion of malnourished children increased with the number of older surviving children. Children were at higher risk of malnutrition either previous or subsequent siblings were

born within 24 months.[8] Similar to our study, Nale T et al (2013,India) observed that 93% children were malnourished where interval between two pregnancies was ≤ 24 months as compared to 36.37% where interval between siblings was ≥ 36 months.[9] According to NFHS-III (2006,India), 48% children were malnourished when interval between two pregnancies was ≤ 24 months as compared to 40% malnourished children when interval between two pregnancies was ≥ 36 months.[1] However, from the review of the literature, it is expected that the additional benefits of birth spacing are likely to accrue. Physicians and family planning programs should be made aware of these benefits and counsel their patients accordingly.

Conclusion

The study showed a consistently positive association, i.e., a longer interval was associated with better nutritional status of children. Such a scenario would be consistent with an association between short subsequent birth interval and child malnutrition.

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