Association of diarrhoea and upper respiratory infections with weight and height gains in Bangladeshi children aged 5 to 11 years

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Introduction The association between infection and growth delay is not well documented in school-age children in developing countries. We conducted a prospective cohort study to examine the association between infectious disease and weight and height gains among Bangladeshi children.

Methods A one-year follow-up study was performed to elucidate the determinants and consequences of physical growth of children under five years of age. The study included 135 households randomly selected from four villages in the Matlab area.

Results The most frequent infections were upper respiratory infections (mean = 4 episodes or 27 days per year) followed by non-dysenteric diarrhoea (mean = 2.3 episodes or 15 days per year) and dysentery (mean = 0.2 episodes or 2 days per year). The number of episodes and their duration decreased significantly with age. Over a 12-month period the mean weight gain was 1.3 kg and the mean increase in height was 2.9 cm. The total number of days when diarrhoea occurred was negatively associated with annual weight gain (regression coefficient β = –7 g per day, $P = 0.02$), with adjustment for age, sex, energy and protein intake, and household land ownership. The incidence of diarrhoeal disease was significantly associated with weight gain in intermediate models but only marginally associated with it in the final multivariate model ($P = 0.08$). Neither the incidence nor the duration of upper respiratory infections was associated with weight gain. Height gain was not significantly associated with the duration or incidence of either category of illness. Diarrhoea was a significant correlate of retarded weight gain among children above preschool age, whereas upper respiratory infections were not.

Discussion Diarrhoeal morbidity slowed growth in children well beyond the weaning age, suggesting that increased attention should be given to the study of the continuous impact of diarrhoea in children aged over 5 years. An understanding of the determinants of growth in school-age children in developing countries would maximize the health and developmental outcomes that are the target of international child survival strategies at younger ages.

Keywords: diarrhoea; respiratory tract infections; growth; body weight; body height; child; prospective studies; cohort studies; Bangladesh.

Bulletin of the World Health Organization, 2000, **78:** 1316–1323.

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Introduction

Diarrhoea and other infections impair the growth of preschool children throughout the developing world. (*1–6*) With adequate energy intake and improved environmental conditions, children can demonstrate catch-up growth (*7–9*). If these factors are not corrected, however, children may not recover completely from acute growth deficits and may remain stunted (*10*, *11*).

Most studies have focused on the period between birth and 36 months of age, i.e. when mortality and morbidity resulting from undernutrition and infection are commonest (*12*). In many countries there is a high prevalence of undernutrition, parasitism and infectious disease among children of school age (*13–17*). Among Tanzanian schoolchildren aged 5–12 years, 8% reported recent symptoms of gastrointestinal disease (*18*). Several studies have shown that catch-up growth is possible in children of school age (*19–22*), and such growth has been clinically observed in children with disease once the cause of growth deficit has been removed (*23–26*). Golden (*9*) reviewed evidence on complete catch-up

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Ref. No. **99-0220**

growth in stunted malnourished children and argued that, although possible, it did not usually occur because appropriate environmental and dietary conditions were not maintained in the long term. Catch-up growth also depends on developmental maturity and the time left for growth. A follow-up study of Guatemalan children from birth to 7 years of age, and weight data from a cross-sectional study of the same individuals when they were aged 11–25 years, showed that delayed skeletal development permitted a longer period of maturation when partial catch-up growth might be possible (*27*, *28*).

Weight gain accelerates in the mid-childhood growth spurt, before the onset of the adolescent growth spurt in height (*29, 30*). Inadequate weight accumulation may limit the subsequent height spurt. There is conflicting evidence for a mid-growth spurt in height in school-age children (*31*). Some studies have shown positive evidence of a mid-growth spurt between 6.5 and 8.5 years of age (*32*) but others have not indicated this phenomenon (*29*, *30*, *33*).

School-age children currently constitute about 25% of the population in developing countries, and the absolute numbers and proportion of the population in this age group are expected to grow (*34*). The prevention and prompt treatment of infectious diseases as well as the correction of inappropriate environmental and dietary conditions may be important for realizing the growth potential of children above preschool age.

In this paper we prospectively examine the association of infectious disease with child growth among Bangladeshi children aged 5 to 11 years. We hypothesize that the development of such disease is associated with retarded weight gains and/or height gains.

Methods

Data collection

The present study was conducted in Matlab Thana, Comilla District, Bangladesh, between June 1977 and August 1978. The methods for collecting data in the field on morbidity, growth rate and dietary intake have been reported elsewhere (*2*, *35*, *36*). The study was conducted in accordance with ethical guidelines of the International Centre for Diarrhoeal Disease Control, Bangladesh.

The study population included children aged 5 to 11 years, this being the commonest upper cut-off point used in growth studies of children in developing countries. Eleven years was selected as the upper age limit so as to exclude children entering the adolescent height spurt. There were 92 boys and 90 girls available for analysis in the selected age range.

Growth rate

Anthropometric measurements were obtained every four months. Weight and height gains during the year of observation were used to define growth rate (*37*). The dependent variable was the slope of each child's regression of weight or height on time (*2*, *38*). This method diminished the effect of intrapersonal variability in weight or height during the year and provided the best linear estimates of average weight and height gains (*2*).

Infectious diseases

Information on infections included data on incidence and total days of illness attributable to non-dysenteric diarrhoea and upper respiratory infections. Information on the incidence and duration of infectious disease episodes was obtained from children's carers during monthly visits to households. One or two diseases experienced in the month preceding each visit were coded. The association between infectious illnesses and growth was evaluated separately for each disease category as both the number of episodes and the number of days of illness during the year.

Baseline variables

Several variables were considered for inclusion in the multivariate regression models in order to reduce unexplained variability of the dependent variable and to adjust for confounding while assessing the impact of morbidity on weight and height gain (Box 1).

Analysis

Weight gains and height gains during the study year were predicted on the basis of disease experienced during the same period. The study, whose design did not allow the investigation of seasonal effects, examined the relationship of weight and height gains to disease experienced for an entire annual cycle. Since the measurements of growth and morbidity were simultaneous, unidirectional causality could not be established. Simple tabulations made it possible to explore age and gender in relation to the occurrence of disease, and univariate regressions were used to explore the association of diarrhoea and upper respiratory infections with weight and height gains. The association of weight and height gains with diseases was further explored in multivariate models with adjustment for possible confounders.

Box 1. **Variables for inclusion in the multivariate regression models**

- Sociodemographic characteristics included age, sex and family land tenure (*39*, *40*). Age in years was included in the analyses as a continuous variable.
- Dietary measurements consisted of six 24-hour recalls obtained every two months, as described elsewhere (*36*). The dietary intake measures used in this analysis were the average daily energy intake during the year calculated from the six 24-hour recalls, and the protein intake adjusted for energy intake. A record was kept as to whether protein was of cereal or non-cereal origin.
- Weight-for-age and height-for-age at the beginning of the 12-month study period were used in multivariate analyses to adjust for the prior nutritional status of children. These measures were calculated relative to the National Centre for Health Statistics/WHO reference population (*41*).

Results

Table 1 shows the weights and heights of children, their average nutritional status, and their weight and height gains during the year by age and sex. Boys were taller and heavier than girls but *Z*-scores relative to National Centre for Health Statistics/WHO standards (*39*) were similar for both sexes. *Z*-scores of weight-for-age were higher in older than in younger children ($P = 0.01$), but average *Z*-scores of height-for-age and the prevalence of severe stunting (less than 3 standard deviations below National Centre for Health Statistics reference curves) remained fairly constant across age groups. Table 2 shows the mean daily protein and energy intakes by age and sex. Total energy and protein intakes increased with age ($P = 0.001$).

Older children gained more weight (β = 0.054 kg/year, P = 0.04) and less height (β = –0.24 cm/year, P = 0.0001) than younger ones, and girls had higher absolute weight gains (β = 0.374 kg/year, P = 0.0005) and height gains (β = 0.50 cm/year, P = 0.002) than boys. Nonetheless, adjusted height and weight gains did not vary significantly by age or sex.

Household land ownership, dietary quality and nutritional status at the beginning of the study were associated with weight or height gains. Children of landless families had smaller height gains (β = 0.47 cm/year, P = 0.002) and smaller weight gains (β = 0.24 kg/year, P = 0.05) than those of middle landowner families, and also had smaller height gains (β = 0.10 cm/year, non-significant) and smaller weight gains (β = 0.39 kg/year, P = 0.009) than children of the largest landowner families. Higher protein intake after total energy adjustment (specifically, higher non-cereal, i.e. fish, pulses, content in the diet) was associated with higher weight gain (β = 0.011 kg/year for every additional gram of protein, P = 0.0001). Energy consumption was not associated with weight or height gains. Nutritional status at the beginning of the study was inversely related to height gain (β = –0.09 cm/unit *Z*-score, P = 0.0007) during the year.

Table 3 shows the number of episodes and the duration of reported illness for boys and girls by age. The most frequent category of illness was upper respiratory infection (mean = 4 episodes or 27 days/year) followed by non-dysenteric diarrhoea (mean = 2.3 episodes or 15 days/year). The number of episodes and the duration of reported illness decreased significantly with age. Children of wealthier families had a lower incidence and duration of diarrhoea and lower levels of respiratory infections, but the differences were not statistically significant.

Table 4 shows the results of univariate regression of weight and height gains on the incidence and duration of diarrhoea and upper respiratory infection. The incidence of diarrhoea (β = –0.085 kg/episode, P = 0.001) and total days with diarrhoea (β = –0.010 kg/day, P = 0.0002) were significantly associated with reduced weight gains during the year. Neither the incidence nor the

Table 1. **Means and standard deviations of weight and height indices by age and sex among Bangladeshi children aged 5 to 11 years**

Age[a] (years)	Sex	No.	Mean weight (kg)	Mean height (cm)	*Z*-score		Average weight rate (kg/year)	Average height rate (cm/year)
					Weight-for-age	Height-for-age		
5	male	11	13.6 (1.3)[b]	103 (13)	–2.7 (0.6)	–2.8 (0.9)	1.1 (1.2)	3.8 (2.1)
	female	9	13.4 (1.2)	98 (4)	–2.3 (0.8)	–2.7 (0.8)	1.1 (0.5)	3.5 (1.1)
6	male	15	14.9 (1.2)	104 (4)	–2.6 (1.1)	–2.9 (1.3)	1.1 (0.9)	3.1 (1.1)
	female	13	14.1 (2.0)	101 (5)	–2.6 (0.8)	–3.2 (0.9)	0.9 (0.7)	2.9 (1.1)
7	male	10	16.1 (2.1)	108 (6)	–2.8 (0.7)	–3.1 (1.1)	0.8 (0.7)	2.6 (0.7)
	female	10	14.9 (1.4)	105 (5)	–2.1 (1.6)	–2.5 (1.9)	1.3 (0.7)	2.7 (0.7)
8	male	16	16.8 (2.0)	112 (4)	–2.9 (0.6)	–3.2 (0.8)	1.4 (0.8)	3.0 (1.1)
	female	21	16.9 (1.7)	111 (5)	–2.3 (0.8)	–2.6 (1.1)	1.5 (0.7)	3.0 (0.7)
9	male	16	19.9 (3.4)	118 (7)	–2.3 (.8)	–2.7 (1.2)	1.4 (0.7)	3.1 (0.9)
	female	14	18.4 (2.1)	116 (6)	–2.2 (0.9)	–2.6 (1.2)	1.4 (0.7)	3.1 (2.7)
10	male	11	21.1 (2.8)	122 (6)	–1.5 (1.6)	–1.9 (1.8)	1.3 (1.2)	2.2 (1.0)
	female	12	20.3 (2.5)	120 (6)	–2.5 (0.4)	–3.0 (0.8)	1.6 (0.7)	2.5 (0.7)
11	male	13	22.0 (2.8)	124 (6)	–2.0 (1.3)	–2.5 (1.4)	1.8 (0.5)	1.7 (0.7)
	female	11	21.4 (3.4)	123 (8)	–2.4 (1.1)	–3.2 (1.6)	1.6 (0.5)	3.4 (1.1)
All		**182**	**17.5 (3.6)**	**112 (7)**	**–2.4 (1.0)**	**–2.8 (1.2)**	**1.3 (0.8)**	**2.9 (1.3)**

[a] At beginning of study.

[b] Values in parentheses are standard deviations.

duration of upper respiratory infection was associated with weight gain. Height gain was not significantly associated with either the duration or the incidence of these illnesses.

In the multiple regression model for weight gain, the total number of days with diarrhoea (β = –0.007 kg/day, $P = 0.02$) was associated with lower weight gains after adjusting for age, sex, energy and protein intake, and land ownership. Table 5 shows regression coefficients for the duration of diarrhoea in models of increasing complexity. The incidence of diarrhoeal disease was significantly associated with weight gain in intermediate models but was only marginally associated with weight gain ($P = 0.08$) in the final multivariate model.

Discussion

We found that infectious disease morbidity was associated with lower weight gains in Bangladeshi children aged 5 to 11 years. There was a non-significant association between retarded height gain and infection, but both the incidence and the total duration of non-dysenteric diarrhoea were associated with retarded weight gains. These findings were consistent with those reported for children aged under five years (*3*, *35*, *42–44*) and suggested that the strong association may persist well beyond the years of peak diarrhoea incidence. The absence of a significant association between upper respiratory infections and retarded weight or height gains was also consistent with findings in younger children (*5*, *45*).

Our study suggested that children over 5 years of age might benefit from greater attention to the control of diarrhoeal diseases. International initiatives targeting child mortality have focused on children under 5 years of age and it has been assumed that little benefit would derive from including older children. Although in practice older children might not have been explicitly excluded, educational and training efforts have exclusively focused on younger children. As our study suggested, school-age children might also be potential targets for diarrhoeal disease control programmes, particularly as mortality reductions are achieved in the younger age groups and developmental outcomes receive greater priority.

Diarrhoeal disease still causes much mortality, morbidity and retarded growth. Nevertheless, the widespread adoption of oral rehydration therapy (oral rehydration solution and the use of home and other recommended fluids) plus feeding has had a major impact on morbidity and mortality in young children. It seems probable that these practices have also had a positive impact on children older than five years, if we assume that weight gains are maintained in such children with diarrhoea when they are adequately treated and that this happens fairly commonly among older children. Further studies are desirable on treatment practices in older children and the long-term developmental consequences of impaired growth following infection.

Table 2. **Mean daily energy and protein intakes by age and sex among Bangladeshi children aged 5 to 11 years**

Age[a] (years)	Sex	No.	Total energy kcal		Protein grams	
5	male	11	1351	(195)[b]	39	(5)
	female	9	1260	(138)	37	(7)
6	male	15	1307	(229)	41	(10)
	female	13	1268	(205)	35	(6)
7	male	10	1397	(315)	41	(15)
	female	10	1299	(131)	39	(8)
8	male	16	1495	(246)	44	(10)
	female	21	1308	(240)	39	(10)
9	male	16	1615	(225)	48	(8)
	female	14	1483	(196)	41	(6)
10	male	11	1646	(310)	49	(11)
	female	12	1411	(146)	40	(5)
11	male	13	1763	(225)	50	(7)
	female	11	1462	(247)	40	(6)

[a] At beginning of study.
[b] Values in parentheses are standard deviations.

Table 3. **Incidence[a] and duration[b] of non-dysenteric diarrhoea and upper respiratory infection over 12 months among Bangladeshi children aged 5 to 11 years**

Age[c] (years)	Sex	No.	Diarrhoea		Upper respiratory infection	
			Incidence	Duration	Incidence	Duration
5	male	11	3.8 (2)[d]	38 (29)	5.0 (2)	43 (40)
	female	9	3.2 (2)	18 (16)	4.4 (1)	27 (16)
6	male	15	2.9 (3)	21 (27)	4.7 (3)	37 (32)
	female	13	1.8 (1)	19 (19)	4.7 (1)	38 (30)
7	male	10	1.4 (1)	9 (9)	4.6 (2)	36 (31)
	female	10	1.7 (3)	12 (30)	4.7 (2)	37 (21)
8	male	16	2.7 (2)	18 (16)	4.8 (2)	34 (27)
	female	21	2.3 (2)	13 (12)	3.5 (2)	20 (21)
9	male	16	2.6 (2)	17 (14)	3.4 (2)	18 (18)
	female	14	0.9 (1)	7 (8)	3.5 (2)	27 (33)
10	male	11	2.0 (1)	12 (8)	3.9 (2)	22 (18)
	female	12	1.2 (1)	8 (10)	2.9 (2)	14 (21)
11	male	13	1.0 (2)	6 (9)	3.8 (1)	19 (13)
	female	11	2.2 (2)	14 (14)	2.7 (1)	15 (14)
Total	**male**	**92**	**2.4 (2)**	**17 (20)**	**4.3 (2)**	**29 (14)**
	female	**90**	**1.9 (2)**	**13 (16)**	**3.7 (1)**	**25 (14)**
Age trends β (± SE)			–0.2 (± .07)*	–0.3 (± .7)**	–0.3 (± .1)*	–4 (± 1)**

[a] Episodes per child over 12 months.
[b] Total days of illness per child over 12 months.
[c] At beginning of study.
[d] Values in parentheses are standard deviations.
* $P = 0.002$.
** $P = 0.001$.

Table 4. **Univariate linear regression of incidence[a] and duration[b] of non-dysenteric diarrhoea and upper respiratory infection on weight and height gains[c] among Bangladeshi children aged 5 to 11 years**

Illness	Weight gain		Height gain	
	β^d	*P*	β	*P*
Diarrhoea				
Incidence	–0.08552 (±0.0250)[e]	0.001	0.037755 (±0.0390)	0.3
Duration	–0.01040 (±0.0027)	0.0002	0.003825 (±0.0043)	0.4
Acute respiratory infection				
Incidence	–0.02618 (±0.0260)	0.3	–0.03131 (±0.0361)	0.4
Duration	–0.00324 (±0.0020)	0.1	–0.00185 (±0.0028)	0.5

[a] Episodes per child over 12 months.

[b] Total days of illness per child over 12 months.

[c] Coefficients of weight gain (kg) or height gain (cm) over 12 months.

[d] Regression coefficient.

[e] Values in parentheses are standard errors.

Table 5. **Multiple linear regression of incidence[a] and duration[b] of non-dysenteric diarrhoea on weight gain[c] among Bangladeshi children aged 5 to 11 years**

Model[d]	Incidence			Duration		
	β^e	*P*	R^2	β	*P*	R^2
A	–0.085 (± 0.025)	0.001	5.9	–0.010 (± 0.003)	0.0002	7.6
B	–0.063 (± 0.026)	0.01	11.5	–0.008 (± 0.003)	0.006	12.4
C	–0.060 (± 0.026)	0.02	13.6	–0.008 (± 0.003)	0.004	15
D	–0.050 (± 0.026)	0.05	12	–0.007 (± 0.003)	0.02	13
E	–0.045 (± 0.026)	0.08	13.9	–0.007 (± 0.003)	0.02	15.4

[a] Episodes per child over 12 months.

[b] Total days of illness per child over 12 months.

[c] Coefficients of weight gain (kg) over 12 months.

[d] A, unadjusted; B, adjusted for age and sex; C, adjusted for age, sex, land ownership; D, adjusted for sex, energy and protein intake; E, adjusted for age, sex, land ownership, energy and protein intake.

[e] Regression coefficient. Values in parentheses are standard errors.

It should be noted that the cross-sectional analytical design of the present study does not allow causal associations or the directionality of associations to be investigated. In young children, malnutrition may increase the duration or severity of diarrhoea, while diarrhoea may lead to malnutrition (*3*, *44*, *46*). In our study the association that was found could be interpreted in either direction or both directions. We controlled for dietary intake using year averages of energy and protein intakes; this measure may not have represented dietary intake in critical periods of growth. Recall bias could have occurred because of the one-month recall period for morbidity, resulting in reported figures underestimating true disease incidence or duration (*47*, *48*). Because only two illnesses were recorded at each monthly interview our estimates of disease frequency and duration may have underestimated the true values. Differential recall may have favoured both the reporting of more severe episodes rather than less serious ones and better reporting of episodes of disease that occurred close to the time of home visits than of those that occurred earlier (*47*). However, this probably did not bias our results unless visit days were associated with the occurrence of disease, which was unlikely. Since information on severity was not included in the analyses and severe and minor cases could therefore have been combined, the possibility exists that our study underestimated the true strength of associations. Information on socioeconomic status was limited to land owned by households; education, household possessions and other factors were not considered.

The strengths of the present study included the use of one-year prospective information to calculate growth rates, allowing us to examine the mid-term association between infectious disease and growth rather than just the immediate weight loss following infection. In addition, the use of one-year prospective information made it possible to examine the association between average duration of infection and growth.

The prevalence of stunting was similar for all ages, and we did not observe age differences in the *Z*-scores of weight or height rates of the children. None the less, *Z*-scores for weight-for-height and average *Z*-scores for weight-for-age were slightly better for older than younger children. The weight rate normally increases in the preadolescent period (*20*), and consequently positive *Z*-score increments would represent rate increases greater than those in the reference population. At the same time, fewer infections were reported in older children. It could be hypothesized that a decreased waste of energy and other nutrients due to a less frequent infectious disease burden was one of the mechanisms whereby these children were able to increase their weight even if their dietary intake was poor (*46*).

We found that diarrhoeal morbidity slowed growth in children well beyond the weaning age, suggesting that increased attention should be given to the study of the continuous impact of diarrhoea in children aged over 5 years. An understanding of the determinants of growth in school-age children in developing countries would maximize the health and developmental outcomes that are the target of international child survival strategies at younger ages. ■

Acknowledgements

We thank the following: Dr Tim Evans for access to the School-Age Health Research and Annotated Bibliography, compiled by the Harvard Center for Population Studies; Dr Ellen Kramer and Dr Anil Gumber for assistance in data management and analysis; Professor Walter Willett and Professor Meir Stampfer for scientific review; and Kate Crowley, Kathy Klingenberg, Brianna Jeffries and Deborah Street for word processing and manuscript production. The study was partly supported by the Fulbright Commission, and the Junta de Andalucía and the Fondo de Investigaciones Sanitarias in Spain.

Résumé

La diarrhée et les infections des voies respiratoires supérieures ont-elles une incidence sur la croissance staturo-pondérale des enfants de 5 à 11 ans au Bangladesh ?

L'association entre infections et retards de croissance n'est pas bien documentée chez les enfants d'âge scolaire des pays en développement. Ces enfants constituent actuellement près de 25 % de la population dans ces pays, et on s'attend à ce que ce groupe d'âge augmente à la fois en nombre absolu et en proportion. La prévention et le traitement rapide des maladies infectieuses, tout comme la correction de facteurs environnementaux et alimentaires inappropriés, peuvent constituer des interventions importantes pour assurer une croissance normale aux enfants d'âge scolaire. Nous avons mené une étude de cohorte prospective afin d'examiner l'association existant entre la maladie infectieuse et la prise de poids/l'augmentation de la taille chez des enfants bangladeshis âgés de 5 à 11 ans. L'analyse a porté sur 92 garçons et 90 filles. Les mesures anthropométriques ont été effectuées tous les quatre mois. On a employé deux indicateurs pour définir la vitesse de croissance : la prise de poids et l'augmentation de la taille pendant l'année d'observation. La variable dépendante était la pente de la droite de régression du poids ou de la taille de chaque enfant avec le temps. Les informations relatives aux infections comportaient les chiffres de l'incidence et le nombre total de jours de maladie dus à une diarrhée non dysentérique et à des infections des voies respiratoires supérieures. Les détails relatifs à l'incidence et à la durée des épisodes infectieux ont été obtenus en interrogeant les personnes qui s'occupaient des enfants lors de visites effectuées une fois par mois dans les foyers. On a employé au début de la période de 12 mois le poids pour l'âge et la taille pour l'âge dans des analyses multivariées afin de procéder à un ajustement sur l'état nutritionnel antérieur des enfants. Ces mesures ont été calculées par rapport à la population de référence de l'OMS/National Centre for Health Statistics.

On s'est servi des maladies survenues au cours de l'année d'étude afin d'anticiper la prise de poids et l'augmentation de la taille au cours de la même période. La nature de l'étude n'a pas permis d'analyser les effets saisonniers, mais plutôt d'examiner les rapports existant entre la prise de poids/l'augmentation de la taille et les maladies survenues pendant une année entière. Comme on a mesuré simultanément la croissance et la morbidité, on n'a pas pu établir de causalité unidirectionnelle. L'association entre la prise de poids/l'augmentation de la taille et les maladies a été analysée dans des modèles multivariés ajustés sur d'éventuels facteurs de confusion. Les pathologies les plus fréquentes ont été les infections des voies respiratoires supérieures (moyenne = 4 épisodes ou 27 jours par an), suivies par les diarrhées non dysentériques (moyenne = 2,3 épisodes ou 15 jours par an) et la dysenterie (moyenne = 0,2 épisode ou 2 jours par an). Le nombre d'épisodes et leur durée ont montré une diminution significative avec l'âge. Pendant cette période de 12 mois, les enfants ont en moyenne présenté un gain de poids de 1,3 kg et une augmentation de taille de 2,9 cm. Le nombre total de jours où ils souffraient de diarrhée a été associé négativement avec la prise de poids annuelle (coefficient de régression $\beta = -7$ g/jour, p = 0,02), après ajustement sur l'âge, le sexe, l'apport protéino-énergétique et le fait de posséder ou non un terrain. L'incidence de la maladie diarrhéique a été associée de façon significative à la prise de poids dans les modèles intermédiaires, mais seulement marginalement (p = 0,08) dans le modèle multivarié final. L'augmentation de la taille n'a pas été significativement associée à la durée ni à l'incidence de l'une quelconque de ces maladies. Pas plus l'incidence que la durée des infections des voies respiratoires supérieures n'ont été associées à la prise de poids ou à l'augmentation de la taille. Seule la diarrhée, et non les infections des voies respiratoires supérieures, est significativement corrélée à un retard pondéral chez les enfants d'âge scolaire.

Resumen

Relación entre las infecciones diarreicas y de las vías respiratorias superiores y el ritmo de aumento del peso y la talla en niños de 5 a 11 años de Bangladesh

La relación entre las infecciones y el retraso del crecimiento no está suficientemente documentada en el caso de los niños de edad escolar de los países en desarrollo. Esos niños representan actualmente un 25% de la población de tales países, y se prevé un aumento tanto de las cifras absolutas como de la proporción de la población de ese grupo de edad. La prevención y el tratamiento pronto de las enfermedades infecciosas, así como la corrección de los factores ambientales y alimentarios inapropiados, pueden ser intervenciones importantes para asegurar que los niños crezcan todo lo posible después de la etapa preescolar. Llevamos a cabo un estudio prospectivo de cohortes para analizar la relación entre las enfermedades infecciosas y la evolución del peso y la talla entre los niños de 5 a 11 años de Bangladesh; la muestra estudiada comprendía 92 muchachos y 90 muchachas. Se efectuaron mediciones antropométricas cada cuatro meses, empleándose dos indicadores para definir el ritmo de crecimiento, a saber, el aumento de peso y el aumento de talla experimentados durante el año de observación. La variable dependiente era la pendiente de la recta de regresión del aumento del peso o la talla de cada niño a lo largo del tiempo. La información sobre infecciones incluía datos sobre la incidencia y los días totales de enfermedad por diarrea no disentérica y por infecciones de las vías respiratorias superiores. La información relativa a la incidencia y duración de los episodios de enfermedades infecciosas se obtuvo, con ocasión de las visitas mensuales a los hogares, preguntando al respecto

a quienes habían cuidado de los niños. El peso para la edad y la estatura para la edad al comienzo del periodo de estudio de 12 meses se utilizaron en los análisis multifactoriales para ajustar los datos en función de la situación nutricional previa del niño. En estos cálculos se adoptaron como referencia los datos pertinentes del National Centre for Health Statistics (NCHS)/OMS.

Las enfermedades sufridas durante el año de estudio se emplearon para predecir los aumentos de peso y de talla durante ese periodo. El diseño del estudio no permitió analizar los efectos estacionales, pero sí la relación entre los aumentos de peso y de estatura y las enfermedades sufridas durante la totalidad de un ciclo anual. Dado que las mediciones del crecimiento y de la morbilidad fueron simultáneas, no pudo establecerse una relación de causalidad unidireccional. La relación entre los aumentos de peso y de estatura y las enfermedades sufridas se analizó mediante modelos multifactoriales que incluían ajustes para las posibles variables de confusión. Las infecciones más frecuentes fueron las de las vías respiratorias superiores (media = 4 episodios o 27 días al año), seguidas de las diarreas no disentéricas (media = 2,3 episodios o 15 días al año) y de la disentería (media = 0,2 episodios o 2 días al año). El número de episodios y su duración disminuían considerablemente con la edad. A lo largo del periodo de 12 meses los niños ganaron 1,3 kilos de peso y crecieron 2,9 centímetros como promedio. Se observó una relación negativa entre el número total de días con diarrea y el aumento anual de peso (coeficiente de regresión β = –7 g/día, P = 0,02) tras los ajustes efectuados en función de la edad, el sexo, el aporte proteinocalórico y la tenencia de tierras. La incidencia de enfermedades diarreicas influyó significativamente en la evolución del peso en los modelos intermedios, pero sólo ligeramente (P = 0,08) en el modelo multifactorial final. No se observó ninguna relación significativa entre el aumento de la estatura y la duración o la incidencia de cualquiera de esas enfermedades. Ni la incidencia ni la duración de las infecciones de las vías respiratorias superiores tenía efecto en el aumento de peso o de estatura. La diarrea, al contrario de las citadas infecciones respiratorias, resultó ser un factor estrechamente correlacionado con el retraso del aumento de peso entre los niños después de la etapa preescolar.

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