Feasibility of integrating early stimulation into primary care for undernourished Jamaican children: cluster randomised controlled trial

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Abstract

Objectives To assess the feasibility of integrating early psychosocial stimulation into primary care for undernourished children and to determine the effect on children's development and mothers' knowledge and practices of childrearing.
Design Cluster randomised controlled trial.
Setting 18 clinics in three Jamaican parishes.
Participants 139 undernourished children aged 9 to 30 months and their mothers enrolled in intervention or control clinics.
Interventions Weekly home visits by community health aides for one year in addition to usual duties. Parenting issues were discussed with the mothers and play activities were demonstrated with the children using homemade materials.
Main outcome measures Children's scores on the Griffiths mental development scales and mothers' knowledge and practices of childrearing.
Results Children from the intervention group showed significant improvements in development: developmental quotient, 7.8 points (95% confidence interval 4.5 to 11.1); hearing and speech, 10.7 points (5.9 to 15.4); hand and eye coordination, 6.8 points (3.4 to 10.1); and performance subscale, 11.0 points (5.6 to 16.4). No improvements were shown on the locomotor subscale. The mothers from the intervention group showed improved knowledge and practices of childrearing. Change in body mass index and height independently affected change in development.
Conclusion Integrating parenting skills and early psychosocial stimulation for undernourished children into primary care was feasible and effective in improving the children's development and mothers' knowledge and practices of childrearing.

Introduction

Undernutrition in children usually leads to poor cognitive development and school achievement.[1] Undernutrition is associated with a poor home environment, which also affects development. Small controlled trials have found sustained benefits from early psychosocial stimulation of undernourished children.[2,3] We integrated psychosocial stimulation into the primary healthcare services for undernourished Jamaican children and examined the effect on the children's development and their mothers' knowledge and practices of childrearing.

Participants and methods

We recruited undernourished children from all 12 nutrition clinics in the urban areas of Kingston and St Andrew, Jamaica. We stratified the clinics into large and small, and numbered them. These were allocated to intervention or control according to a random number table. Fewer children were available than anticipated from the clinics' records, therefore we enrolled six clinics in the urban area of the adjacent parish of St Catherine. Four were randomly assigned to intervention and two to control to ensure similar numbers of children in each group, totalling 11 intervention clinics and seven control clinics. Inclusion criteria are listed on bmj.com. Overall, we recruited 70 mother-child dyads from intervention clinics and 69 from control clinics.

Outcome measures and intervention

The children's developmental levels were assessed with the Griffiths mental development scales at baseline and one year later.[4,5] We used four subscales—locomotor skills, hearing and speech, hand and eye coordination, and performance. These were averaged to give a global developmental quotient. Higher scores indicate better development. The children were assessed by one of two people, blinded to allocation group.

The children's weights and lengths or heights were measured by standard procedures. Mothers' knowledge and practices of childrearing were assessed by questionnaires at baseline and one year later. The questionnaire on knowledge was specifically developed for our study. It comprises 20 questions on feeding

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Table 1 Children's scores on Griffiths mental development scales and anthropometric measures, and mothers' knowledge and practices of childrearing at baseline and one year's follow up. Values are means (standard deviations)

Measure	Intervention group (n=65)	Control group (n=64)	Difference
Children			
Developmental quotient:			
Baseline	105.3 (9.3)	104.2 (11.0)	–1.14 (1.79)
Follow up	99.2 (9.0)	91.3 (8.4)	–7.97 (1.53)
Locomotor skills:			
Baseline	108.7 (11.0)	108.5 (12.6)	–0.19 (2.08)
Follow up	104.2 (12.2)	102.1 (14.2)	–2.05 (2.33)
Hearing and speech:			
Baseline	106.3 (11.7)	104.7 (13.7)	–1.55 (2.24)
Follow up	100.7 (15.4)	89.4 (13.9)	–11.28 (2.59)
Hand and eye coordination:			
Baseline	106.8 (9.7)	104.9 (11.4)	–1.89 (1.86)
Follow up	97.6 (10.7)	90.6 (8.9)	–6.98 (1.73)
Performance:			
Baseline	99.6 (12.7)	98.6 (13.1)	–0.97 (2.27)
Follow up	94.5 (15.3)	83.0 (10.9)	–11.51 (2.34)
Weight (kg)			
Baseline	8.5 (1.0)	8.6 (0.9)	0.03 (0.16)
Follow up	10.9 (1.2)	11.0 (1.1)	0.14 (0.19)
Height (cm):			
Baseline	76.8 (5.4)	76.8 (5.4)	–0.01 (0.95)
Follow up	88.3 (4.6)	88.2 (4.2)	–0.15 (0.78)
Body mass index:			
Baseline	14.5 (0.9)	14.6 (1.0)	0.07 (0.17)
Follow up	14.1 (0.9)	14.4 (0.9)	0.24 (0.16)
Mothers			
Knowledge of childrearing*:			
Baseline	25.0 (5.5)	24.6 (5.9)	–0.38 (0.99)
Follow up	31.0 (6.5)	23.2 (6.1)	–7.82 (1.14)
Childrearing practices*:			
Baseline	27.6 (9.9)	25.6 (8.9)	–2.03 (1.67)
Follow up	31.4 (9.7)	24.5 (11.5)	–6.92 (1.89)

*Intervention, n=64; control, n=61.

practices and activities likely to promote language and cognitive development in children. Higher scores are associated with better knowledge. The responses were summed (maximum score 70). The questionnaire on childrearing practices comprised 15 questions to assess how often the mother involved her child in a range of activities, such as singing and playing games. The items were summed (maximum score 62).

Table 2 Multilevel analysis of effects of intervention on children's Griffiths scores and anthropometric measurements, and mothers' knowledge and practices of childrearing

Measure	Regression coefficient, B (95% CI)
Children:	
Developmental quotient	7.80*** (4.51 to 11.08)
Locomotor skills	1.77 (–4.15 to 7.69)
Hearing and speech	10.68*** (5.92 to 15.44)
Hand and eye coordination	6.76*** (3.40 to 10.12)
Performance	11.02*** (5.63 to 16.41)
Weight (kg)	–0.17 (–0.47 to 0.13)
Height (cm)	0 (–0.68 to 0.68)
Body mass index	–0.24 (–0.64 to 0.16)
Mothers:	
Knowledge of childrearing	7.57*** (5.74 to 9.40)
Childrearing practices	5.00** (1.59 to 8.41)

Developmental measures adjusted for clinic, child's age, initial score, tester effect, father lives with child, and mother's education. Anthropometric measurements adjusted for clinic, child's age, child's sex, initial score, tester effect, father lives with child, and mother's education. Maternal measures adjusted for clinic, initial score, tester effect, father lives with child, and mother's education.
**P<0.01; ***P<0.001.

On enrolment a researcher visited the homes and collected information on socioeconomic background, mother's height, and her verbal IQ.[6]

Over one year the community health aides visited the homes weekly and demonstrated play activities. Homemade materials were used to reduce the cost of the intervention. The aides followed a structured curriculum.[7,8] Toys were left in the homes and exchanged at each visit. Parenting issues were discussed.

Statistical analysis

All analyses were conducted on an intention to treat basis. Multilevel multiple regression analysis was used to examine the effect of intervention, taking into account the hierarchical structure of the study. Clinic was entered as a random variable to account for the variance among clinics. Separate regressions were computed to examine the treatment effect on developmental quotient and each subscale score, mothers' knowledge and practices of childrearing, final weight, length, and body mass index. We entered the initial measure in each analysis to assess change. Covariates were offered and treatment group (intervention, n = 1; control, n = 0) entered in the final step.

Results

Overall, 129 children (93% of those enrolled) were assessed at the end of the study. Four mothers of children who had a repeat test completed did not complete the repeat questionnaire (three controls and one intervention), giving a total of 125 mothers (90% of the sample). The groups had similar characteristics on enrolment (table 1).

The intervention had significant benefits on the children's development: 7.8 developmental quotient points (95% confidence interval 4.5 to 11.1); hearing and speech, 10.7 points (5.9 to 15.4), hand and eye coordination, 6.8 points (3.4 to 10.1), and performance, 11.0 points (5.6 to 16.4; table 2). The intervention showed a significant benefit on mothers' knowledge of childrearing (7.6 points, 5.7 to 9.4) and childrearing practices (5.0 points, 1.6 to 8.4). Growth did not modify the effects of intervention, but change in length and body mass index predicted the developmental quotient.

Discussion

Government health aides based in primary healthcare centres in Jamaica successfully delivered an intervention to promote childhood development in addition to their usual duties. On average the children were visited every 10 or 11 days. The intervention had substantial benefits on development. The decline in developmental levels shown by children from control clinics is common in children from poor backgrounds,[9] and intervention reduced this decline. The benefits were greater than the average gain found in developed countries.[10] Benefits were shown in all subscales except that for locomotor skills. The improvements in

What is already known on this topic

Children who are undernourished usually have poor cognition and school achievement

Controlled trials have shown that psychosocial stimulation can have sustained benefits on their development

What this study adds

Child development activities were successfully integrated into primary healthcare services for undernourished Jamaican children

The intervention improved the children's development and their mothers' knowledge and practices of childrearing

mothers' knowledge and practices of childrearing may be important for the sustainability of benefits to children and their siblings.

National governments would need to commit some resources to enable child development activities to be integrated into primary healthcare services and for them to be sustainable. Additional training, a coordinator and materials would be required. We determined that each aide could visit 3-5 children in addition to usual duties, which would take about half a day. The cost and workload of similar paraprofessionals varies by country, and the number of children served would depend on this. As there was a limit to the number of children who could be visited, the programme would be most suitable for those at high risk.

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A memorable patient

A novel way to prevent tension pneumothorax

In October 1956 I was serving with the Royal Army Medical Corps at Connaught Military Hospital in Aldershot. This had been the Canadian hospital for the wounded from the second world war, but after the war the RAMC took it over. It became a chest hospital with several tuberculosis wards being occupied by military personnel or their families, along with some wards for other chest diseases.

One afternoon I was told to hurry to "Reception" to see a non-commissioned officer who had been shot during the Suez conflict and subsequently flown back home.

I was told that he had been shot in the chest while fighting Egyptians near the Suez Canal. The bullet had entered his right chest, just over the middle lobe of the lung, and had exited from his upper back, causing him to lose a substantial volume of blood and much of his scapula. The upper lobe had been removed (while he was given an arterial blood transfusion), and an attempt had been made to close the exit wound produced by the bullet, but it was evident that this had not been successful.

When I examined him I was able to look in through the wound while a nurse held a light to give me some idea of what was going on inside the chest. To my astonishment, I saw the right atrium contracting regularly on top of the diaphragm. The right lower and middle lobe were shrivelled and bereft of motion. He had been admitted to our hospital still smoking cigarettes, with fumes emerging from the defect in his back. A chest tube was inserted anteriorly and drained about 400 ml of pus. The size of the wound and "desecration" of the scapula made it difficult to close the leak in his back, especially when he lay down. The seepage gradually increased. Although he had been told to stop smoking, breaking the habit was too much for him.

He was subsequently transferred to a larger ward, where his temperature gradually fell and he slowly gained weight and became more active. In the early days his lungs were visible and we could see cigarette smoke emerging from the right main stem bronchus. I also noted clubbed fingers on his left hand but not on the right. Finger clubbing had interested me. Our corporal had clubbing of the left fingers and both his right and left toes, while his right fingers were partially ischaemic but of normal shape.

Six or so weeks after the patient's admission, Mr Kent Harrison, a surgeon from St Thomas's Hospital who visited Connaught Military Hospital weekly, stitched up the right main stem bronchus and managed to close the defect over the right scapula by shifting various muscles and transferring skin. The patient subsequently required a thoracoplasty but after two months returned home.

When I first saw him his injuries and his general state were such that I could not conceive of him pulling through, but I was mistaken. I gained much knowledge from his management, and in doing so learnt a great deal about chest medicine in an amazingly short time.

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