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Against the Odds: Psychomotor Development of Children Under 2 years in a Sudanese Orphanage

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Summary

Providing abandoned children the necessary medical and psychological care as possible after their institutionalization may minimize developmental delays. We describe psychomotor development in infants admitted to an orphanage in Khartoum, Sudan, assessed at admission and over an 18-month follow-up. Psychological state and psychomotor quotients were determined using a simplified Neonatal Behavior Assessment Scale (NBAS), the Brunet–Lezine and Alarm distress baby (ADBB) scale. From May–September 2005, 151 children were evaluated 2, 4, 9, 12 and 18 months after inclusion. At admission, ~15% of children ≤1 month had a regulation impairment according to the NBAS, and 33.8% presented a distress state (ADBB score >5). More than 85% (129/151) recovered normal psychomotor development. The results of the program reinforce the importance of early detection of psychological disorders followed by rapid implementation of psychological case management to improve the development of young children in similar institutions and circumstances.

Key words: psychomotor, psychological, development, orphan, foster care, adoption.

Background

Findings across time and studies consistently show the negative impact of institutionalization on children's intellectual, physical, behavioral and social emotional development [1–4]. Current estimates show that institutionalized infants loose about 1 month of linear growth for every 3 months in institutional care, with behavioral development exhibiting similar dramatic reductions [5, 6]. Most recent information on cognitive and motor development in orphans comes from children under 4 years housed in Romanian state-run institutions [4, 6–10]. To date, little operational research has focused on comprehensive medical and psychological care for orphans in Africa; children neither orphaned to HIV/AIDS, nor conflict, nor eligible for international adoption, but living within their countries.

In 2003, the international nongovernmental organization Médecins sans Frontières (MSF) began a nutritional and medical care program within the orphanage of Mygoma in Khartoum in collaboration with Sudanese authorities. At the same time, MSF organized a psychological care program for orphans

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and helped create a network of Sudanese partners to increase foster care and adoption. As a first priority, children were returned to their families when circumstances permitted.

A preliminary assessment conducted in May 2005 revealed that the prevalence of a psychomotor delay as determined by the global development quotient (Brunet–Lezine [11] scale) of children living in Mygoma orphanage was 25% in children under 16 months, and 19% in those between 16 and 31 months. To explore these findings further, a prospective longitudinal study was conducted with the objective of determining psychomotor development and interaction capacities of children at admission and during their stay in the orphanage.

Methods

The study site was the Mygoma orphanage, Khartoum, Sudan. All children under 1 month old, admitted from May to October 2005, were included and followed with regular evaluation at 2, 4, 9, 12 and 18 months after admission. At each visit, if a child's health allowed, with priority given to their medical and nutritional care, children had a psychological examination to determine their level of development and withdrawal behavior.

For children under 2 months, behavioral state was determined using a simplified Neonatal Behavior Assessment Scale (NBAS) [12]. This scale assesses a baby's strengths, adaptive responses and vulnerabilities, according to four dimensions (autonomy, motor function, organization and response to stimulation). Each dimension had corresponding items with each item coded in three classes: 1 'worrying', 2 'acceptable' and 3 'optimal'. For children aged 2–30 months, a global development quotient was calculated using the Brunet–Lezine scale [13]. Four dimensions of development (postural, coordination, language and socialization) were assessed and then infants classified into two groups: 'psychomotor delay' if the global development quotient was <70 and no psychomotor delay ≥ 70.

Withdrawal behavior of all children was assessed using the Alarm Distress Baby (ADBB) scale [14]. Facial expression, eye contact, general level of activity, self-stimulation gestures, vocalizations, briskness of response to stimulation, relation and attraction were assessed and a global score between 0 and 32 was given. A global score >5 was considered an alarm threshold.

Specific psychological or physiotherapeutic care, consisting of individual therapy, group therapy, physiotherapy and/or speech therapy, was provided to children having delay behavioral problems. Outings and regular activities were also performed outside the orphanage (horse back riding, swimming and picnic). All staff (nannies) were trained by Sudanese psychologists and an expatriate psychologist to provide attention, social stimulation and reciprocity in social communication. Scheduling, location and staffing of activities were designed for continuity aiming to foster a stable environment.

Data were collected on standardized questionnaires that included demographic information (estimated age at admission, sex); birth weight, origin of the child (found on the street, abandoned at the hospital after delivery, abandoned at the orphanage by the mother or another family member); environment of the child since admission (hospitalization, contact with the mother, number of transfers within the orphanage without medical reason); psychomotor development and withdrawal behavior and psychological care of the child (group therapy, garden therapy, individual therapy, individual physiotherapy, individual speech therapy).

Data were entered using EpiData version 3.1 (EpiData Association, Odense, Denmark) and analyzed with EpiInfo version 6.04 (CDC, Atlanta, GA, USA). Baseline and follow-up characteristics of the children were expressed as percent and continuous variables as mean (SD) or median (Inter quartile range). Comparison of risk factors was performed using chi-squared or Fisher's exact test.

Ethical considerations

The report presented here uses routine monitoring data from the collaborative MSF and Ministry of Health program. The program in the orphanage was conducted with the Ministry of Health via a memorandum of understanding, which is the usual procedure for nongovernmental organizations operating in these contexts. No supplementary interventions were conducted for the analysis presented here. All data were entered anonymously and identifiers were coded. No ethnic or identifying information was entered.

Results

Between 5 May and 18 September 2005, 151 children were admitted to the Mygoma orphanage and included in the study. Among them, 88 were boys and 63 girls (sex ratio $= 1.4$). At admission, the median age was 3.4 days (range: few hours to 26 days). Fifty-seven children (37.7%) had a birth weight <2500 g. Ninety-one (66.4%) had a medical pathology at first examination, mainly septicemia (48.3%) and watery diarrhea (28.6%) (Table 1). For 29.1% of them (44/151), admission at the orphanage was the same day as birth. Most were found in the street (70.2%) and brought to the orphanage by the police (94.0%) (Table 1).

At admission, 148 children were evaluated using the NBAS and ADBB scales. The proportion of children with a worrying NBAS score ranged from 1% to 13% irrespective of the dimension assessed, except for irritability (38.5%) (Table 2). Twenty-two

children (14.9%) had a worrying score in three or more dimensions and were considered high risk. For withdrawal using the ADBB scale, 33.8% (50/148) had a score considered as an alert (ADBB global score >5) and 14.2% (21/148) had a score >10.

TABLE 1
Baseline characteristics of recruited children (n = 151), Mygoma orphanage, Khartoum, Sudan, 2005

	N (%)
Boys	88 (58.3)
Age at the admission in days	1.0 (0–5)[a]
Weight at admission in g	2660.3 (484.8)[b]
Low birth weight (<2500 g)	57 (37.7)
Origin of the child before admission (*n* = 141)	
Found in the street	99 (70.2)
Abandoned at the hospital	27 (19.1)
Abandoned at the orphanage	8 (5.7)
Other origin	4 (2.8)
Brought to the orphanage	
By the police	142 (94.0)
By the mother	9 (6.0)
Medical pathology at first examination (*n* = 137)	91 (66.4)
Septicemia	44 (48.3)
Watery diarrhea	26 (28.6)
Conjunctivitis	20 (22.0)
Jaundice	13 (14.3)
Respiratory infections	5 (5.5)

[a]Median (inter quartile range).
[b]Mean (SD).

Among the different domains assessed, we observed that 26.3% of the babies had unusual behavior (classified as mild, clear and severe) concerning self-stimulating gestures.

During follow-up, 90, 37, 24, 23 and 7 children were, respectively, assessed at the 2, 4, 9, 12 and 18-month visit. Among the 129 children successfully discharged from the orphanage and whose information was available, 20 children were adopted, 79 went to foster families and 7 returned to their families (Fig. 1).

Twenty-three died at the orphanage, most during the first 2 months of life (95.6%). The main cause was sepsis (18/22, 81.8%), followed by diarrhea (2/22, 9.1%). Among children remaining in the orphanage at the end of the 18-month follow-up, 15 were not assessed because they were too sick or hospitalized at the moment of the assessment visit.

Regarding the Brunet–Lezine scale, the number of children with a global score <70 (psychomotor delay) decreased from 16 (17.8%) to 2 (8.7%) between the 2-month and the 9-month visit, and then increased to 4 (57.1%) at the last visit (Table 3). Psychomotor delay was distributed heterogeneously over the four different dimensions (postural, coordination, language and socialization) (Table 3).

Regarding the ADBB, the number of children with a score >5 was relatively stable throughout follow-up, except for the 9-month visit where more than half of the children had a score >5 (Table 4). Among children with a global development quotient <70 at the 2-month visit, 81.3% had an ADBB score >5 and 75% a score >10.

At the 2-month examination, a low birth weight (<2500 g) was statistically associated with a low

TABLE 2
Neonatal behavior assessment at admission (n = 148), Mygoma orphanage, Khartoum, Sudan, 2005

Dimension	Items	Worrying *n* (%)	Acceptable *n* (%)	Optimal *n* (%)
Autonomy		15 (10.1)	74 (50.0)	59 (36.9)
Motor function				
	Muscle	3 (2.0)	43 (29.0)	102 (69.0)
	Rooting	13 (8.8)	45 (30.4)	90 (60.8)
	Sucking	0 (0.0)	26 (17.6)	122 (82.4)
	Hand grasp	0 (0.0)	33 (22.3)	115 (77.7)
	Pull-to-sit	9 (6.1)	80 (54.1)	59 (39.9)
	Crawling reflex	5 (3.4)	33 (22.3)	110 (74.3)
Organization				
	Habituation light and sound	16 (10.9)	54 (36.7)	77 (52.4)
	Irritability	57 (38.5)	73 (49.3)	18 (12.2)
	Consolability	4 (2.7)	58 (39.2)	86 (58.1)
	State regulation	9 (6.1)	62 (41.9)	77 (52.0)
Response				
	Response to face and voice	15 (10.1)	79 (53.4)	54 (36.5)
	Response to face	19 (12.8)	74 (50.0)	55 (37.2)
	Turning to voice and rattle	2 (1.3)	87 (58.8)	59 (39.9)
	Tracking red ball	15 (10.1)	47 (31.8)	86 (58.1)

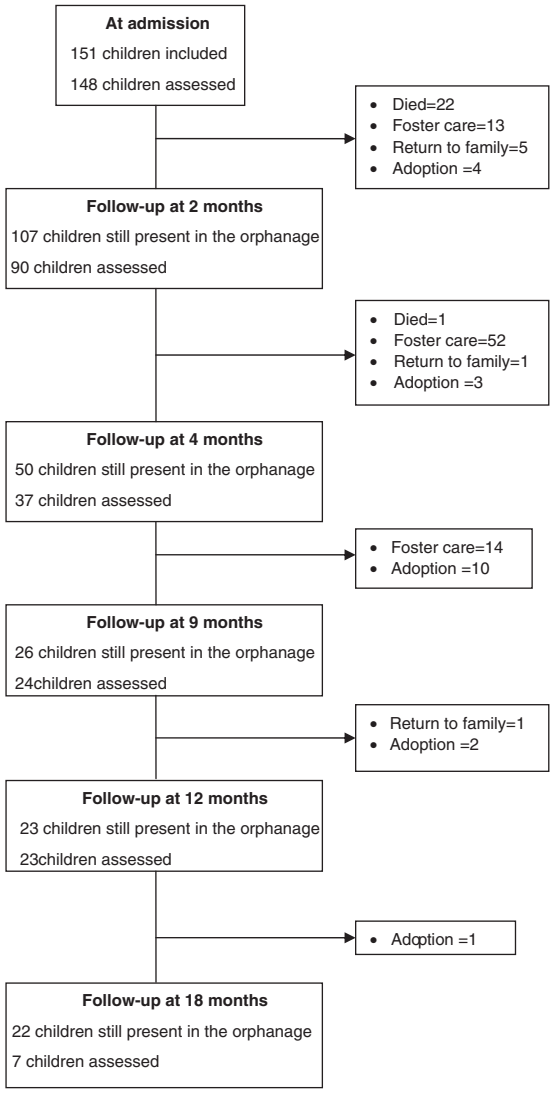

FIG. 1. Cohort profile ($n = 151$). Mygoma orphanage, Khartoum, Sudan, 2005.

global development quotient (<70) [relative risk (RR) = 4.11; 95% confidence interval (95% CI) 1.43–11.75). No other significant association was found between potential anamnestic, clinical and environmental risk factors and psychomotor development delay (Table 5) at the other visits.

Throughout follow-up, 34 (44.2%) children required more specific psychological or physiotherapeutic care, mostly because of developmental delay or behavior problems (15/22, 68.2%). Therapy occurred mainly during the first 4 months of stay (21/34, 61.7%). Psychological case management consisted mainly of individual therapy (82.3%) and group therapy, such as garden or horse therapy (23.5%).

Discussion

To our knowledge, this is the first description of the psychomotor developmental delay at admission and before discharge of children living in a Sudanese orphanage. Although the focus of this study was to identify the potential benefits of psychological case management on improving development, the program itself was comprehensive, attentive to the individual needs of the child and focused both on ensuring children received appropriate medical and adapted psychological care. Mortality in children was high, 23 deaths, and were due principally to sepsis and to delayed adequate medical attention.

Length of stay in an institutionalized setting such as an orphanage has been identified as an important factor in delayed psychomotor development [3, 15]. Fortunately, few children remained in the orphanage at 18 months as they returned to their families, were placed in foster care or were adopted. This, however, limits our ability to make inferences about the long-term impact of the rapid detection and case management program as these children fortunately were not seen for a follow-up visits. Children remaining in the orphanage at 18 months were in poorer health than those who returned to their families, placed in foster families or adopted. Although the adoption and foster processes were not dependent

TABLE 3
Psychomotor development delay using the Brunet–Lezine scale, during the 18 months follow-up, Mygoma orphanage, Khartoum, Sudan, 2005

	Number of children (%) with developmental delay (DQ <70) at the visit of the				
	2 months	4 months	9 months	12 months	18 months
Global development	16 (17.8)	5 (13.5)	2 (8.7)	5 (21.7)	4 (57.1)
Postural development	18 (20.0)	4 (10.8)	2 (8.3)	7 (30.4)	5 (71.4)
Coordination development	11 (12.2)	7 (18.9)	3 (12.5)	2 (8.7)	4 (57.1)
Language development	28 (31.1)	3 (8.1)	2 (8.7)	6 (26.1)	3 (42.9)
Socialization development	18 (20.0)	12 (32.4)	3 (12.5)	5 (21.7)	5 (71.4)
Total of children assessed	90 (100)	37 (100)	24 (100)	23 (100)	7 (100)

TABLE 4
Interaction capacities assessed by the Alarm Distress Baby scale during the 18 months follow-up, Mygoma orphanage, Khartoum, Sudan, 2005

ADBB score	Number of children (%) at the visit of the					
	admission	2 months	4 months	9 months	12 months	18 months
Score >5	50 (33.8)	30 (33.3)	13 (35.1)	12 (50.0)	7 (30.4)	0 (0)
Score >10	21 (14.2)	18 (20.0)	7 (18.9)	5 (20.8)	3 (13.0)	0 (0)
Total of children assessed	148 (100)	90 (100)	37 (100)	24 (100)	23 (100)	7 (100)

TABLE 5
Risk factors and psychomotor development delay at the 2 months visit (n = 90), Mygoma orphanage, Khartoum, Sudan, 2005

Potential risks factors	Number of children with a GDQ <70	Percentage of delayed children?	RR	95% CI
Sex				
Male	10	20.0		
Female	6	15.0	1.33	0.53–3.36
Age at admission				
≤1 week	15	18.8		
>1 week	1	1.0	1.88	0.28–12.72
Low birth weight				
<2500 g	12	31.6		
≥2500 g	4	7.7	4.11	1.43–11.75
Origin of the child				
Found in the street	12	18.8		
Other	2	9.5	1.97	0.48-8.09
Hospitalization since admission				
Yes	7	18.9		
No	5	16.1	1.17	0.41–3.33
Contact with the mother since admission				
Yes	1	33.3		
No	12	16.2	2.06	0.38–11.05
Change of rooms since admission				
Yes	6	16.2		
No	10	22.2	0.73	0.29–1.82

GDQ, global development quotient.

upon the measured developmental level of the child, it is possible that well-developed children were more likely to return to or find homes. Although perhaps an implicit bias, those remaining in the orphanage at the end of the follow-up were those at most need of support.

Interventions in orphanages [16] or even short daily stimulations [17] can improve the cognitive development of children in such institutions [18]. Studies have shown that the effect of the intervention does not depend on their nature (focused or broad), but on their duration and on the child's age; interventions before 12 months are more effective than after. Similar effects have been found for children's physical growth and attachment security [19, 20]. This effect was the same for randomized control trials or other designs. When orphanages are the only means of survival, group settings where the staff provides stable and consistent personal time, and address early and consistently the emotional needs and psychological development of the children have been shown to be more effective than a group setting with an authoritative style of management (explicit rules and well-defined schedules) [21]. As past research has focused on older children and specifically orphans of war, the program reported on here adds additional support to the approach.

Only low birth weight was statistically associated with a psychomotor development delay after a stay of 2 months in the orphanage. Prematurity and very low birth weight (around 1000 g) were previously shown to be indirectly related to less optimal

developmental outcomes at 4 months of age [22]. No association was found between other known potential anamnestic, clinical and environmental risk factors and delayed development, probably because of the modest sample size.

In our study, we examined the psychomotor development in abandoned children living in a Sudanese orphanage, using standardized and validated scales on US and European children. It is important to take into account differences in the cultural, historical, social and political contexts when interpreting the findings of this study. However, this study highlights the feasibility of using the ADBB scale in similar contexts; as long as local professionals are employed [23]. The ADBB scale may be used as a simplified and shorter screening tool, in addition to neurological and pediatric examination, to identify at risk infants who should be monitored with repeated assessments or need specific psychological support or stimulation.

Early detection and comprehensive psychological case management of orphans should be seen as a viable and necessary component of care provided in similar institutions. Child-centered and consistent care can help assuage developmental delays in unaccompanied or abandoned children. Here, children benefitted from both comprehensive medical and psychological care and most returned to their adopted, foster or natural families. Clearly, the principle risk factor is institutionalization itself, but implementation of appropriate preventive actions and psychological care may improve the psychomotor development of young orphan children.

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