

Nutritional status of Libyan children in 2000 compared with 1979

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الحالة التغذوية في الأطفال الليبيين بين عام 1979 وعام 2000
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الخلاصة: أجريت هذه الدراسة المستعرضة للتعرف على النمو والحالة التغذوية للأطفال الليبيين قبل سن الالتحاق بالمدرسة وللتعرف على الحالة الاقتصادية والاجتماعية لأبائهم في عام 2000 ومقارنة النتائج بنتائج دراسة مماثلة أجريت عام 1979. وقد شملت الدراسة 1614 طفلاً من الأطفال الأصحاء من الذكور والإناث ممن يقل عمرهم عن 5 سنوات في منطقتين من مناطق الجماهيرية العربية الليبية. وقد اتبعت طرق أخذ العينات العشوائية البسيطة وطرق أخذ العينات العنقودية لتصنيف المشمولين بالدراسة من الأطفال. وتم تسجيل الأوزان والأطوال وقياسات محيط الرأس ومحيط الذراع للأطفال، كما أجريت مقابلات مع أمهاتهم لسؤالهن حول صحة أطفالهن وحول الحالة الاقتصادية والاجتماعية للأسرة. وقد لوحظ تحسن يُحتد به إحصائياً في الحالة التغذوية لدى الأطفال عما كانت عليه عام 1979، ويمكن أن يعزى ذلك إلى عوامل من قبيل التنمية الاقتصادية والاجتماعية وطول فترة الإرضاع من الثدي.

ABSTRACT This cross-sectional study examined the growth and nutritional status of Libyan preschool children and the socioeconomic status of their parents in 2000 and compared the results with those of a similar study conducted in 1979. The investigation involved 1614 healthy children of both sexes under 5 years of age in two regions of the Libyan Arab Jamahiriya. Simple random sampling and cluster sampling techniques were used to enlist participants. Body weight, height, and head and arm circumference of the children were recorded and mothers were interviewed about their child's health and the socioeconomic status of the family. Significant improvements in nutritional status since 1979 were found that could be attributable to factors such as socioeconomic development, longer breastfeeding, greater availability of high energy foods, supplementation with semi-solid or solid foods and heavy government subsidy of basic foods.

Etat nutritionnel des enfants libyens en 2000 par rapport à l'année 1979

RESUME Cette étude transversale a examiné la croissance et l'état nutritionnel d'enfants libyens d'âge préscolaire et le statut socioéconomique de leurs parents en 2000 et a comparé les résultats avec ceux d'une étude similaire réalisée en 1979. L'étude concernait 1614 enfants des deux sexes âgés de moins de cinq ans, en bonne santé, dans deux régions de la Jamahiriya arabe libyenne. Des techniques de sondage aléatoire simple et de sondage par grappe ont été utilisées pour recruter les participants. Le poids corporel, la taille, le périmètre crânien et le périmètre brachial des enfants ont été enregistrés et les mères ont été interrogées au sujet de la santé de leur enfant et du statut socioéconomique de la famille. On a constaté d'importantes améliorations de l'état nutritionnel depuis 1979, lesquelles pourraient être attribuées à des facteurs tels que le développement socioéconomique, la durée plus longue de l'allaitement maternel, la plus grande disponibilité d'aliments très énergétiques, l'apport d'aliments de complément semi-solides ou solides et la forte subvention des produits alimentaires de première nécessité par le gouvernement.

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Received: 13/06/01; accepted: 02/09/01

Introduction

Anthropometric measurements such as weight, height, arm and head circumferences are widely used and are considered to be the best means of assessing growth patterns and nutritional status in children under 5 years of age in various communities. Health and nutritional problems during childhood are the result of a wide range of factors mostly related to unsatisfactory food intake, severe and repeated infections, or a combination of the two [1]. Studies of the nutritional status of members of the Libyan population are scarce. The first cross-sectional study of growth among urban preschool children in the Libyan Arab Jamahiriya was conducted in 1979 in Tripoli by Tajouri [2]. However, a nutritional survey, a major goal of nutritionists and the public health sector at the Ministry of Health for the last 20 years, has not been conducted before. Thus the present study investigated the change in nutritional status of Libyan children under 5 years of age between 1979 and 2000, to provide a picture of the current nutritional situation of this group and to determine the effects of socio-economic factors on their nutritional status.

Methods

The investigation involved 1614 healthy children of both sexes aged between 0 and 59 months and was performed between 1999 and 2000 in two regions of the Libyan Arab Jamahiriya, al-Jabel al-Garby and Tripoli. Mothers were interviewed using a questionnaire covering information about the child's health (e.g. general health, infected with measles or not, infected with diarrhoea or not in the two weeks before the interview) and the family's socioeco-

omic situation (e.g. education and occupational levels of the parents, family income, family size, parity, type of housing and area of residence). Children were examined during the interview and weight, height, and head and arm circumference were recorded.

Simple random sampling was used to obtain participants from child health centres, kindergartens and the delivery sections of obstetrics hospitals. A cluster random sampling technique using World Health Organization (WHO) methodology [3] was used to recruit participants from residential areas.

The results were compared with those of the 1979 Tajouri study. Both studies had similar objectives and used similar sampling and methodological techniques. They were also comparable in terms of other factors, such as sample size, recruitment of children by random selection, age group studied (0–59 months), geographical location (urban and rural populations), and the prevailing genetic, ethnic, cultural and climatic conditions. Both sets of inclusion criteria specified healthy, normal children recruited from maternal and child centres, obstetric hospitals and the like.

Although the same anthropometric measurements and sociodemographic variables were assessed and both studies were conducted under standardized conditions [4], the Tajouri study was conducted in Tripoli, whereas our study was carried out in Tripoli and al-Jabel al-Garby, two regions which contain both urban and rural areas. In general, 86% of the Libyan population lives in urban areas [5]. Compared to Tripoli, al-Jabel al-Garby has a rather poor socioeconomic level, which might have negatively influenced our findings. Some basic needs, however, such as low-priced foods as well as health services and educa-

tion, are available there and throughout the country. As we observed improvements in growth of children in 2000 compared with 1979, the effect of this sample difference could be assumed to be minimal.

Anthropometric measurements were obtained according to standardized procedures [6]. The principal parameters were weight and length/height. All children were weighed on an infant/baby scale with a maximum capacity of 20 kg (graduated in 100 g). Infants were weighed completely undressed whereas older children were in minimal underwear. Weight was recorded to the nearest 0.1 kg. Children less than two years of age were assessed for recumbent length to the nearest millimetre.

Two examinations were made using a plastic SECA-type baby length measure. One examiner held the child's head and applied gentle pressure to bring the top of it into contact with the fixed headboard while another extended the child's legs and brought the movable footboard to rest firmly against the child's heels with the toes in the correct position. Children over two years old were measured standing using aluminium SECA-type vertical rule. The child stood, without shoes, heels together and back straight, with his or her heels, buttocks, shoulders and head touching the device. Measurements were recorded to nearest 0.1 cm.

Data on age were obtained from family register booklets or vaccination cards. Age was recorded as the number of completed months between the birth date and the date of the interview.

We excluded a total of 141 children from the analysis: those whose birth length was less than 49 cm (33 infants) and those who had a birth weight under 2500 g (99 infants) as per other studies [7]. We calculated weight-for-age, height-for-age and weight for height Z-scores [6] using

NCHS/WHO reference population [4,6]. Children having Z-scores ≤ -6 or $\geq +6$ were also excluded (9 children) [7]. The final analyses were therefore conducted for 1473 children.

Descriptive statistics (means and percentages) were used to compare the socio-demographic characteristics between our study and the study of 1979. We used the same age groups as Tajouri for a more precise comparison. Curves of centile distribution were drawn to compare weight-for-age and height-for-age indices between the two studies for both sexes.

We tested for significant differences in both indices with the Student *t*-test in each age group. We also looked for differences in weight and height between boys and girls in our study using analysis of covariance with adjustment for age and sex/age interaction (Fisher test).

All statistical analyses were carried out with SAS software, version 8 [8].

Results

The distribution of children by age group and sex in the two study populations is given in Table 1. The percentages of the age groups in both samples were similar to each other.

The socioeconomic differences between the 1979 study sample and the present study sample are presented in Table 2. There were large differences in family income, level of parental education, family size and parental professional activity between the two studies.

Figures 1 and 2 and Table 3 give the distributions of weight-for-age for both sexes. The children in the present study were heavier than the children in the 1979 Tajouri. The mean weight difference between boys in our study and the 1979 study

Table 1 Distribution of children by age group and sex, 1979 and 2000

Age group (months)	1979 ^a				2000 ^b			
	Boys	Girls	Total no.	%	Boys	Girls	Total no.	%
0-0.10	35	35	70	3.2	21	13	34	2.3
0.2-1	84	84	168	7.6	39	36	75	5.1
2-4	134	129	263	11.9	73	80	153	10.4
5-8	117	123	240	10.9	75	57	132	9.0
9-14	133	132	265	12.0	78	72	150	10.2
15-20	127	115	242	11.0	66	61	127	8.6
21-29	134	112	246	11.2	94	75	169	11.5
30-39	117	107	224	10.2	90	85	175	11.9
40-49	108	113	221	10.0	117	99	216	14.7
50-60	143	123	266	12.1	123	119	242	16.4
Total	1132	1073	2205	100.0	776	697	1473	100.0

^aTajouri study [2].

^bThe present study.

was significant for the age groups 2-4 months and 21-39 months (*t*-test, *P*-values from 0.002 to 0.02). There was also a significant difference for girls for the age groups 5-8 months and 15-39 months (*t*-test, *P* < 0.002 to 0.007). Boys in our study had higher body weights than girls, (*F*-test, *P* < 0.004), which is in agreement with the Tajouri study.

Figures 3 and 4 and Table 4 give the distributions of height-for-age for both sexes. Compared with the Tajouri 1979 sample, both sexes in our study were taller. This was particularly so for the median and the 97th centile. The result of the *t*-test (test of means) indicated significant differences between the two studies for height from 2 months to 49 months for boys (*F*-test, *P* < 0.0001) and from 5 months to 49 months for girls (*P* < 0.0001). This means that the average child of 2000 was taller than the average child in 1979 at certain ages. The covariance analysis for height revealed that in our study boys were taller than girls (*F*-

test, *P* < 0.003), a result that is similar to the Tajouri study.

Discussion

To measure the weight or the height of a child is to measure his or her health. Follow-up of weight and height is therefore the best way to monitor the growth and health of children during different periods. The results of this study suggest that many socioeconomic improvements have occurred in Libyan society since 1979. Primarily these include increases in the average monthly income per capita, in the level of parental education and in the parental professional activity.

When compared with the results of Tajouri's 1979 study [2], our study suggests some interesting points regarding socioeconomic developments in the country, particularly concerning mothers. Mothers are the principal providers of health care

Table 2 Socioeconomic characteristics of the children's families in 1979 and 2000

Socioeconomic characteristic	1979 ^a	2000 ^b
Mean monthly income/family (LD)	178	272
Median monthly income/family (LD)	140	250
Mean monthly income per capita in (LD)	22.25	42.5
Mean family size	8	6.4
Father's education		
Never attended school	22%	5.3%
Primary school	41%	8.2%
Preparatory school	17%	25.2%
Secondary school	10%	43.6%
University	10%	17.7%
Mother's education		
Never attended school	59%	17.8%
Primary school	30%	16.8%
Preparatory school	4%	20.1%
Secondary school	5%	36.4%
University	2%	8.9%
Father employed		
Yes	100%	99.3%
No	0%	0.7%
Mother employed		
Yes	7%	31.9%
No	93%	68.1%

^aTajouri study [2].^bThe present study.

LD = Libyan dinar; 1 LD = 2.8 US\$.

for infants, children and other members of the family. The prevalence of illiteracy among mothers declined from 59% in 1979 to 17.8% in 2000. There was also a more than fourfold increase in the percentage of mothers who had university education (an increase from 2.0% to 8.9%). These changes may help to explain the improvements in growth and nutritional status among Libyan children. The higher immunization rate as indicated by the mother and child survey in 1995 [9], the availability of higher energy foods, female literacy and gross national product were the most im-

portant factors associated with lower prevalence of wasting and stunting among Libyan children. These findings agreed with results from other countries [10].

An unpublished study by the current authors (Hameida J, Biilot L, Deschamps JP, unpublished report) analysed Z-score indices using NSHC/WHO reference population. It indicated a less than 2% prevalence of underweight (weight-for-age Z-score) and wasting (weight-for-height Z-score) among Libyan preschool children. The prevalence of stunting (height-for-age Z-score below -2 SD) among Libyan chil-

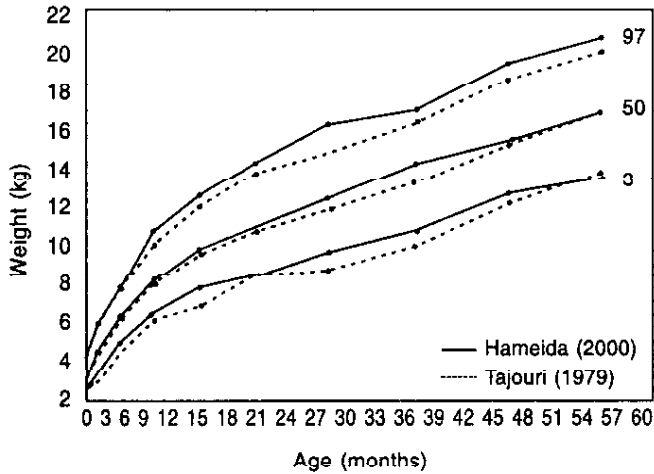


Figure 1 Centile distribution of weight-for-age of Libyan boys aged 0–59 months

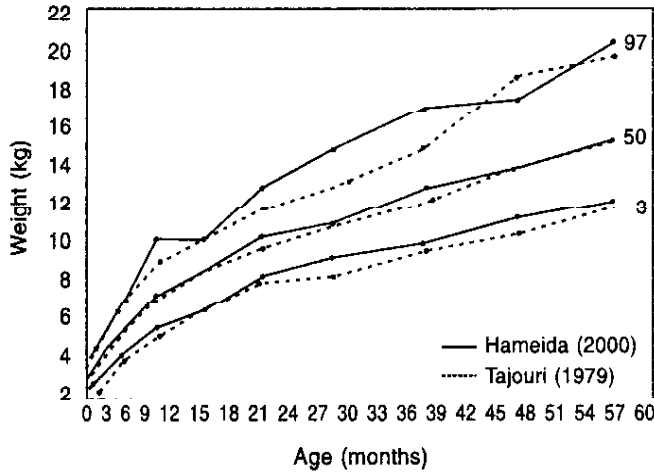


Figure 2 Centile distribution of weight-for-age of Libyan girls aged 0–59 months

dren however was 4.1%, whereas in 1979 preschool children were more retarded in their growth parameters. This growth retardation was more evident with the third centile, particularly in the lower socioeconomic groups, and pointed to nutritional factors as probable causes [2]. The nation

al Libyan study in 1995, which was not based on healthy children only, confirmed the presence of linear growth retardation (10.6%) below 2 SD Z scores of the NCHS/WHO population. Among Libyan children under 5 years of age, the prevalence of growth retardation, or stunting,

Table 3 Centile distribution of weight-for-age of Libyan children aged 0–59 months

Age group (months)	Weight-for-age centile ^a (kg)						Weight-for-age centile ^b (kg)					
	3rd		50th		97th		3rd		50th		97th	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
0–0.19	2.9	2.8	3.3	3.4	4.4	4.5	2.8	2.7	3.3	3.3	4.0	3.9
0.2–1.9	3.5	3.2	4.6	4.4	6.0	5.4	3.2	2.7	4.3	4.0	5.8	5.0
2–4	5.0	4.8	6.5	6.0	7.9	7.4	4.5	4.2	6.2	5.7	8.0	7.5
5–8	6.5	6.0	8.3	7.8	10.9	10.8	6.2	5.4	8.1	7.4	10.1	9.6
9–14	7.9	7.0	9.9	9.2	12.7	11.0	7.0	7.1	9.6	9.1	12.1	11.0
15–20	8.5	8.8	11.0	11.0	14.4	13.8	8.6	8.5	10.8	10.4	13.9	12.7
21–29	9.7	10.0	12.5	11.8	16.3	16.0	8.8	9.0	12.0	11.6	14.9	13.9
30–39	10.9	10.8	14.3	13.7	17.2	18.4	10.1	10.2	13.4	13.1	16.5	16.0
40–49	12.7	12.2	15.5	15.0	19.5	18.9	12.3	11.2	15.3	15.0	18.7	20.0
50–60	13.6	13.2	17.0	16.5	20.9	22.0	14.0	12.8	17.0	16.4	20.2	21.2

^aThe present study (2000).

^bTajouri study (1979) [2].

was different by region and area of residence [9]. Another study conducted elsewhere confirmed the presence of national

variability for stunting and wasting; this was explained by national factors and geographic region [10].

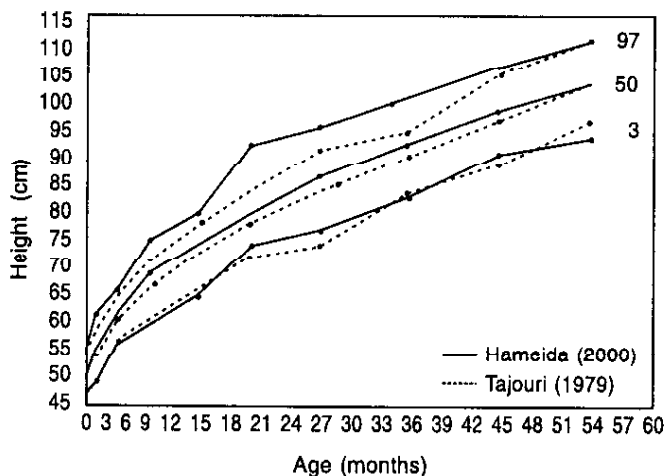


Figure 3 Centile distribution of height-for-age of Libyan boys aged 0–59 months

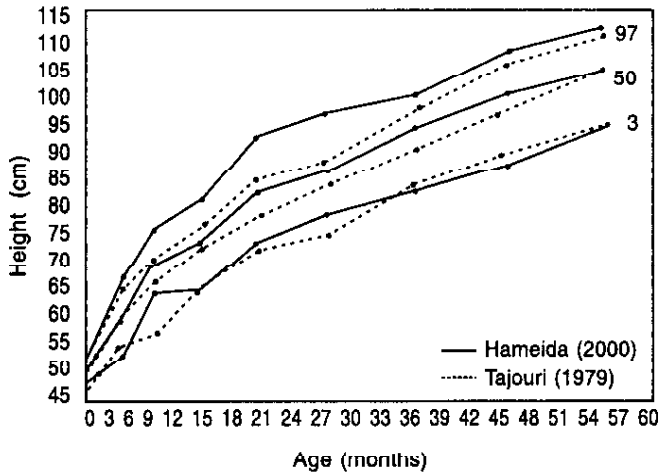


Figure 4 Centile distribution of height-for-age of Libyan girls aged 0-59 months

Linear growth retardation is well covered in the literature and the problem of stunting is considered to be multifactorial. Principal factors are energy intake, envi-

ronmental, genetic, ethnic, infection-related, intensity of parasitic infection and nutritional factors (e.g. deficiencies in zinc, protein intake, iron, copper, iodine or vita-

Table 4 Centile distribution of height-for-age of Libyan children aged 0-59 months

Age group (months)	Height-for-age centiles (cm) ^a						Height-for-age centiles (cm) ^b					
	3rd		50th		97th		3rd		50th		97th	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
0-0.19	49.0	49.0	50.0	49.0	55.0	53.0	48.3	46.4	50.9	50.5	54.3	53.3
0.2-1.9	50.0	50.0	56.0	54.0	62.0	58.0	50.3	49.1	54.6	53.5	59.5	57.0
2-4	57.0	53.0	62.5	60.0	67.0	67.0	57.1	54.3	61.5	60.0	65.4	64.4
5-8	61.0	64.0	70.0	69.0	76.0	76.0	61.7	56.9	67.7	65.9	72.6	70.2
9-14	66.0	65.0	75.3	74.0	81.0	81.0	67.6	65.5	73.5	72.1	78.5	76.3
15-20	75.0	73.0	81.0	82.0	93.5	92.0	73.0	72.0	79.2	77.6	85.1	83.9
21-29	78.0	78.0	88.0	86.5	97.0	96.0	76.3	74.8	84.7	83.6	92.8	88.4
30-39	84.0	83.0	93.8	94.0	103.0	100.0	84.7	83.7	91.7	90.2	96.1	97.0
40-49	92.0	87.5	100.0	99.5	108.0	108.0	90.3	88.9	97.9	97.4	107.0	106.0
50-60	95.0	94.0	105.0	104.0	113.0	112.0	97.9	94.4	105.0	104.0	113.0	111.0

^aThe present study (2000).

^bTajouri study (1979) [2].

min A). Food security at the national level also plays a role, as do social, economic and demographic factors (such as poverty and education) [10–12]. The variables that most significantly affected our results were child age and maternal education (Hameida J, Billot L, Deschamps JP, unpublished report). This is in agreement with literature from other developing countries, although the main cause or causes remain unclear [12].

The anthropometric data reported here and in 1979 strongly indicate that improvements have occurred in the growth patterns and nutritional status of Libyan children in the two past decades. The most notable differences, in weight and height, were greatest at certain ages and in certain centiles. We found that currently there is a long duration of breast-feeding among Libyan mothers. In 2000, 78% of mothers breastfed on demand and the mean duration of breastfeeding was 9 months. These practices should be protected, promoted and supported (Hameida J, Billot L, Deschamps JP, unpublished report). Traditionally, breastfeeding in the Libyan Arab Jamahiriya has been seen as an expression of a woman's fertility and fulfilment of her maternal instinct. A 1990 study reported that the average duration of breastfeeding among Libyan mothers was 5 months [13], suggesting that there has been an increase of 4 months since that time. This may be due to discontinuation of the free distribution of tinned milk powder that took place from 1970 to 1990 at maternal and child centres. The media may also have played a role in promoting and supporting breastfeeding. A study in 1997 reported that television was the second most influential factor in the practice of healthy behaviours, with family influence coming first [14].

Other factors associated with the decrease in the prevalence of stunting and

wasting among Libyan children may include greater availability of high energy foods (e.g. flour, rice, macaroni, couscous and oil), an increase in the immunization rate (93% of Libyan children have been vaccinated against measles), good knowledge and proper preparation of oral rehydration solution, appropriate supplementation with other types of foods (e.g. milk, cereals, fruits and vegetables) and improved female literacy [9]. In our study, 98% of the children had not had measles and there was also a lower incidence of diarrhoea observed in the 2 weeks prior to the interview (4.5%); it was 17% in 1995 [9].

In the Libyan Arab Jamahiriya, millions of Libyan dinars are being spent every year on health [15] and on subsidizing the principal foods (oil, rice, couscous, flour, tomato paste, sugar and macaroni) [16]. These foods account for a large proportion of the daily recommended carbohydrate allowance. The approach to primary health care adopted in the country after the 1978 Alma Ata Declaration has helped improve health care and promote the well being of children. The result has been a steady decline in the infant mortality rate from 65.4 deaths per 1000 births during the 1970s to 24.4 deaths per 1000 births during the 1990s. Mortality among children under 5 years has also decreased from 87 to 30.1 deaths per 1000 births during the same period [9].

In general the nutritional status of Libyan children has improved as a result of the policy of development adopted throughout the country in recent decades. The lower prevalence of wasting, stunting and under nourishment appears to reflect improved nutritional and socioeconomic conditions in the country.

When the results of the present study and others conducted in the Libyan Arab

Jamahiriya were compared with findings from other countries in the Eastern Mediterranean Region, the growth and nutritional status of Libyan children were satisfactory. For example, in 1995 the prevalence of stunting (below < -2 SD height-for-age) among the total population of children under age 5 years in the country was 10.6% [10]. In Morocco in 1992 the figure was 24.2%, in Tunisia in 1998 it was 8.3%, in Egypt in 1998 it was 24.89%; in Algeria in 1995 it was 18.3%, in Kuwait in 1995 it was 10.7%, in Jordan in 1997 it was 7.8% and in the Syrian Arab Republic in 1995 it was 20.8% [17].

Acknowledgements

The authors would like to thank Dr I. Ejbel, Dr K Ait, Mr E. Abourakis and Dr K. Al-Kajamiah for their kind help. They also gratefully acknowledge the help of the members of health committees at the regional and community level and all medical and paramedical staff from both regions. Thanks are due also to all the families for their kind assistance, for their patience during the interviews and for their generous hospitality in their homes.

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Training in the management of severe malnutrition

Malnutrition contributes to an estimated 60% of deaths in under-five children. This training course on hospital-based care of severely malnourished children responds to the urgent need to reduce paediatric deaths related to severe malnutrition in many developing countries. The objectives are to: reduce case fatality rate to less than 5 % among severely malnourished children and improve the rate of recovery of severely malnourished children. The course is intended for physicians, nurses and other senior health workers and operates in partnerships with national governments, WHO regional offices, WHO country offices, WHO collaborating centers, academic institutions, international agencies and nongovernmental organizations. More information can be obtained on the course from: Department of Nutrition for Health and Development, World Health Organization, 1211 Geneva 27, Switzerland, Tel: +41 22 791 2624/4342; Fax: +41 22 791 4156 and online at: http://www.who.int/nut/documents/manage_severe_malnutrition_training_fly_eng.pdf