Fighting Anaemia in Hebron

A case study

Terre des hommes Italia
Emergenza, sviluppo, diritti dell'infanzia.

EUROPEAN COMMISSION
Humanitarian Aid

ARD EL ATFAL / PALESTINE

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The escalation of violence and the confrontations which followed the outburst of the second *intifada*, in September 2000, together with severe indiscriminate measures taken by the Israeli government (military sieges imposed on Palestinian towns and villages, prolonged closures of Palestinian areas, restrictions on the movements of persons and goods, exclusion of Palestinian manpower from the Israeli labour market) put an abrupt end to the growth and partial improvement experienced by the Palestinian economy during the years 1997-2000.

In June 2001, in its *West Bank and Gaza Update*, the World Bank estimated that "one half of the population could fall below the poverty line by the end of 2001 unless the situation changes", while the Palestinian Central Bureau of Statistics (PCBS) estimated that already by the end of March 2001, "47,4% of Palestinian households on the West Bank had lost more than half of their income, while more than two million Palestinians were living below the poverty line, and more than 50% of Palestinian households had experienced a decrease in the quality of their food" (Palestinian Central Bureau of Statistics - PCBS: *"Impact of the Israeli Measures on the Economic Conditions of Palestinian Households (2nd Round: May-June, 2001)", July 2001).*

Due to the aggravation of the conflict, in 2002, the living conditions of the Palestinian population continued to deteriorate. The following factors were decisive to this trend:

1. The military re-occupation of all Palestinian towns on the West Bank (WB), which started at the end of March 2002.
2. The tightening of closures in Palestinian areas, coupled with curfews imposed on the population for entire weeks (often months).
3. The semi-collapse of the Palestinian Authority's institutions, targeted by military operations and weakened by severe damage to their physical structure and infrastructures. This resulted in: a) disruption of the service net provided to the population, especially in peripheral areas[1]; b) reduction of the PA's ability to cope with the increasing needs of a population deprived of job opportunities and freedom of movement, and subject to strained security conditions.
4. Disruption of the Palestinian economy, mainly due to a devastating combination of internal and external closures which led to: a) a decrease in the GNI per capita (-7.5% in 2000 and -23.2% in 2001); b) a decline in private consumption (-14% in 2001); c) the collapse of fixed investment (-82.2% in 2001); d) a further increase in unemployment (from 35% at the end of 2001 to 39% in the 1st quarter of 2002, including workers who did not look for a job any more)[2]; e) an increase in the poverty rate (60% according to UNSCO estimations)[3].

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[1] Cfr. "Health situation of Palestinian people living in the occupied Palestinian Territory" - Statement by Dr Gro Harlem Brundtland, Director General World Health Organization - Introduction 27 September 2002

[2] The World Bank Group, *West Bank and Gaza Update*, August 2002

[3] United Nations - Office of the United Nations Special Co-ordinator, *The Impact of Closure and Other Mobility Restrictions on Palestinian Productive Activities*, 1 January 2002-30 June 2002

Within this context, some regions and districts of the occupied territories, like the Hebron district, and in particular the Hebron governorate's rural areas, and the Jenin governorate, were affected more than others by the severe deterioration in living conditions. This was due to the following significant factors:

1. High poverty rates - According to a January 2001 World Bank document (The *World Bank, Poverty in the West Bank and Gaza, January 2001)* in 1997, Yatta was the second poorest location in the WB (with an incidence of poverty of 45%). In June 2001, the World Bank estimated that **one third** of the "new poor" in the West Bank (people who have fallen into poverty since October 2000) was concentrated in the governorate of Hebron. This means that at least 60% of the families in this area were poor.
2. High dependency on employment in Israel - According to unpublished PCBS data, between July and September 2000, 29% of employed Palestinians in Hebron governorate worked in Israel or in Israeli settlements (*PCBS, Employed persons (over 15 years) in Hebron governorate by place of work - July/September 2000*). Due to the denial of work permits and closures, the Palestinians in the area lost their jobs in Israel.
3. Severe isolation, due to the poor road network and security issues resulting in increased expenses for transportation in order to have access to vital services such as education and health, and fewer opportunities for access to possible international aid.

As early as May-June 2001, the Palestinian Central Bureau of Statistics (PCBS) pointed out that significant changes in nutritional behaviour were taking place among Palestinian families. These included:
- A decrease in the consumption of food in terms of quantity (reported by 40% of the households)
- A decrease in the quality of the food consumed (56.8% of the households)
- A decrease in the monthly consumption of meat (63.2% of the families)
- A decrease in the consumption of milk products (46.5% of the households).

Based on the alarming information above, Terre des hommes Italia, together with its Palestinian Partner Ard El Atfal, decided during the summer of 2001 to look further into the nutritional conditions of children living in the Yatta area. Several surveys were conducted on the nutritional status of children under 5 years old, the prevalence of Iron Deficiency Anaemia (IDA) among them, and changes in the families' nutritional habits. The results of these surveys suggested that the large majority of families could **not provide adequate, balanced and sufficient meals to their children, while 60% of children under 5 years old who underwent an Hb test** were found to be affected by different degrees of anaemia (mild or moderate).

On the basis of this information, in 2002 Terre des hommes Italia, and its Palestinian partner, Ard El Atfal, started a project completely funded by ECHO. The aim was to reduce the high level of Iron Deficiency Anaemia caused by the worsening of nutritional and health conditions among children under 5 years and pregnant or lactating women in Yatta Town and the surrounding 23 villages (Hebron governorate - Southern West Bank).

At the end of 2002, research and surveys conducted by authoritative institutions, namely the Palestinian Central Bureau of Statistics and the consortium formed by the Johns Hopkins University,

Al Quds University and CARE International, fully confirmed and supported the conclusions of the assessment performed by Terre des hommes Italy in September 2001 pointing out the existence of an emergency at nutritional level among children below 5 years of age and pregnant/lactating women, resulting in[4]:

1. High rates (7.8%) of Acute Malnutrition among children between 6 and 59 months old in the Palestinian Territories (PT), compared to the expected level of 2.28% found in normally nourished populations (Severe and Moderate Acute Malnutrition in the WB: 4.1%)
2. High rates (11.7%) of Chronic Malnutrition among children between 6 and 59 months old in the PT, compared to rates found in normally nourished populations (Severe and Moderate Chronic Malnutrition in the WB: 7.9%; Mild Chronic Malnutrition in the WB: 18%)
3. High prevalence of Anaemia (43.9%) among children between 6 and 59 months old in the PT
4. A deficient intake of several essential micronutrients (vitamins A, E and zinc).

Thanks to ECHO's grants, in 2003 and 2004, Terre des hommes Italia and Ard El Atfal Palestine developed the second and third phases of their project[5], in strict coordination with the Palestinian Ministry of Health - Hebron Department, expanding the target area so as to include the Southern and South-Western areas of the Hebron governorate, in addition to Yatta and the surrounding villages. The main components of the plan were the following:

1. Direct iron and vitamin A&D supplementation, based on therapeutic or preventive WHO (World Health Organisation) protocols, to all children between 6 and 24 months old living in the targeted areas
2. Provision of iron on a preventive basis to children between 24 and 59 months old
3. A medical follow-up for malnourished children, especially those affected by 2nd and 3rd degree malnutrition
4. Provision of quality supplementary food to poor families of anaemic/malnourished children, and to families with several children
5. A systematic health awareness campaign, with the focus on IDA and malnutrition, conducted among the families of the beneficiaries and schools in the areas.

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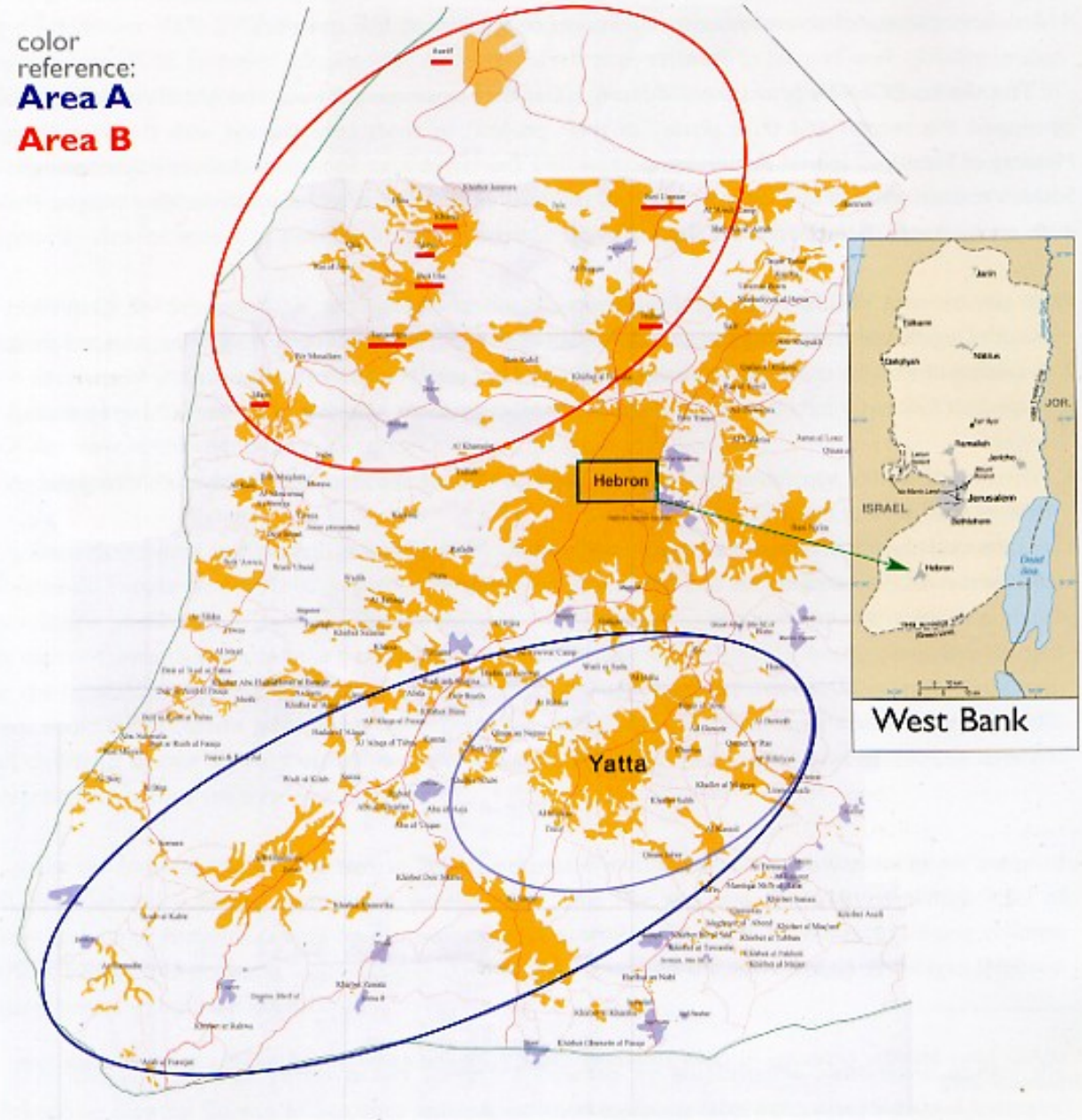
[4] USAID, Johns Hopkins University, Al Quds University, CARE, *Nutritional Assessment of the West Bank and Gaza Strip*, September 2002

[5] The project, in its third phase (2004-2005), supported 44,000 beneficiaries

The project at a glance

The collaboration between Terre des hommes Italia (Tdh It) and Ard El Atfal (AEA) started in 2002, targeting the town of Yatta and its surrounding villages. During the third phase of the project (August 2004-July 2005), it was expanded to include Sumu'a, Ramadin, adh-Dhahirieh and the surrounding villages. These areas are referred to as **Area A** of the project. As of March 2005, a limited action aimed at providing preventive iron supplementation to children between 24 and 59 months was implemented in 8 villages located in the Western area of Hebron governorate, **Area B** of the project.



Since 2002 in Area A (Yatta and the surrounding villages, and, between August 2004 and the end of July 2005, in the Southern and South-Western parts of the Hebron governorate), **the intervention included the following components:**

1. Direct iron and vitamin A&D supplementation based on therapeutic or preventive WHO protocols to all children aged between 6 and 24 months living in the targeted areas
2. Provision of iron on a preventive basis to children aged between 24 and 59 months
3. A medical follow-up for anaemic children, especially those affected by moderate and severe anaemia
4. A medical follow-up for malnourished children, especially those affected by 2nd and 3rd degree malnutrition
5. Provision of qualitative supplementary food to poor families of anaemic/malnourished children and to families with a large number of children.

In Area B (the Western part of the Hebron governorate), **from March 2005** the intervention included the provision of iron on a preventive basis to children aged between 24 and 59 months.

Between August 2004 and the end of July 2005, the following activities were conducted:

1. Area A (Yatta, Southern and South-Western parts of the Hebron governorate)

First contact: 4,950 families were visited by social workers, and 12,300 children under five years old were contacted (age groups: 0-6 months = 828; 6-24 months = 4,612; >24months = 6,698). 5,442 children were referred to the clinics (all between 6 and 24 months old, plus sick children of other ages), while the others received preventive iron prophylaxis for 3 months (if age >24 months).

Examination: 4,969 children were examined in the project clinics (91% of those referred):

- 35% were found not anaemic, 35% were slightly anaemic, 24% were moderately anaemic, and 6% did not have a haemoglobin test (because they were under 6 months old)
- 70% were found not malnourished, 18% were suffering from 1st degree malnutrition, 8% from 2nd degree malnutrition, and 2% from 3rd degree malnutrition.

Admission and follow-up: the 3,275 (66% of those examined) anaemic or/and malnourished children were admitted to the therapeutic phase of the project, where they received iron and vitamin supplementation, free treatment and care for common diseases, and food supplementation if necessary (466 children received food supplementation). Health education lectures were delivered to their families.
Following admission, 13,002 follow-up visits were performed; an average of 4.0 per child admitted. 38% of the follow-up visits were home visits, carried out because the mother missed the follow-up at the clinic. 2,965 children (91%) were followed till they were discharged by a doctor (average length of stay in the program: 122 days) (standard deviation=41), 91% of the children were in a good state of health. Other reasons for discharge were: change of residency (1.9%), self discharge (1.5%), referral to hospital (1.5%).

2. Area B (8 villages located in the Western part of the Hebron governorate)

6,194 families were contacted by social workers and provided with health education. 9,018 children between 6 and 59 months old were provided with preventive iron prophylaxis for 3 months.

Overall

- 17,162 children received preventive iron supplementation.
- 12,243 mothers received health education.
- 4,151 students were received health and nutritional sensitization.
- 3,275 children received medical/nutritional care and treatment
- 1,400 poor families received food supplementation for eight consecutive months.

A student's drawing participating to the competition on anaemia and its effects (ph. Isabella Balena)

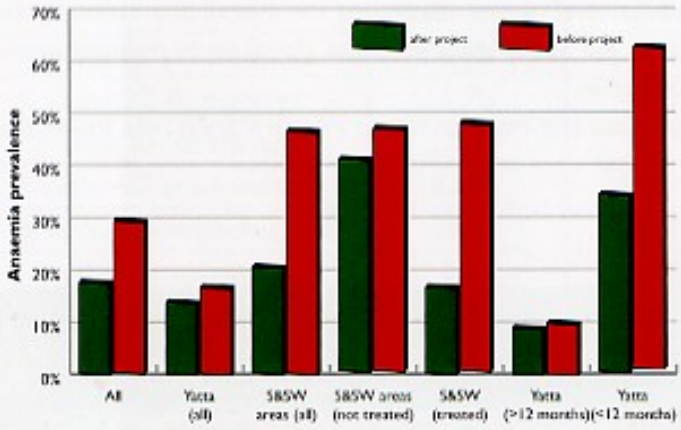
Impact of project on general population of children aged 6-59 months

1. Area A (Yatta, Southern and South-Western parts of the Hebron governorate)

The results of a random survey conducted in September 2004 and repeated in June 2005 in areas A & B showed (*see figure*):

before the project: a lower prevalence of anaemia in Yatta

after the project: anaemia reduced by more than 50% in Southern and South-Western areas due to improvement of treated children, and a reduction in anaemia in Yatta only for infants not treated in the previous year.



The comparison between anthropometrics indicators before and after the project showed (*see following table*) a dramatic improvement with regard to global acute malnutrition (GAM) and a low "weight for age" value that is statistically highly significant.

Children with low anthropometry (<2 S.D.)	Anthropometrics indicators	Yatta	Southern and South-Western areas	(Yatta/**other** areas)	
				Rate Ratio (IC 95%)	P value
Before project	Stature/Age	34/152 (22.4%)	13/114 (11.4%)	2.0 (1.1 - 3.5)	0.02
	Weight/Age	22/152 (14.5%)	7/114 (6.1%)	2.4 (1.0 - 5.3)	0.04
	Weight/Stature	9/152 (5.9%)	7/114 (6.1%)	0.96 (0.4 - 2.5)	0.9
After project	Stature/Age	24/150 (16.0%)	28/217 (12.9%)	1.2 (0.7 - 2.1)	0.4
	Weight/Age	6/150 (4.0%)	8/217 (3.7%)	1.1 (0.4 - 3.1)	1.0
	Weight/Stature	2/150 (1.3%)	3/217 (1.4%)	0.96 (0.2 - 5.7)	0.9

2. Area B (8 villages located in the Western area of the Hebron governorate)

In June 2005 a survey on a random sample showed that the prevalence of anaemia among the 128 children who had assumed iron supplementation was more than twice as low (10.2%) as that among the 109 children who had not received it (22.0%, p=0.01). 5.0% of the enrolled children were of "low stature for their age", 5.89% were "underweight for their age" and 2.5% were "underweight for their stature".

Conclusions

- In Yatta and the Southern and South-Western areas of the Hebron governorate (Area A of the project), anaemia prevalence was reduced by more than 50% in previously untreated members of the population and maintained at "normal" levels in those previously treated
- In Western areas of the Hebron governorate (Area B of the project), the provision of iron on a preventive basis reduced the level of anaemia among the overall population by more than 30%
- In Yatta and in Southern and South-Western areas, global acute malnutrition was reduced by around 70% in the target population
- The prevalence of anaemia and malnutrition in Western areas was lower than that found in other areas.

A student's drawing participating to the competition on anaemia and its effects (ph. Isabella Balena)

Improvement in nutritional status among children admitted

To evaluate improvement in nutritional status, we compared the Anthropometric indices (Stature/Age, Weight/Stature, Weight/Age) in Z-scores (standard deviations from the median using a NCHS/WHO international reference population[1]) at admission and at discharge, using *pair t test*.
While the percentage of children of low Stature/Age was similar at admission and discharge (17% versus 18%), the percentage of children of low Weight/Age decreased from 14.4% at admission to 4.5% at discharge (p>0.0001), and the percentage of children of low Weight/Stature decreased from 3.6% at admission to 0.8% at discharge (p>0.0001).
In the table below, the percentage of subjects with low anthropometric indices are presented according to clinical malnutrition status at admission (Gomez-Waterloo)[1].

		Stature/Age	Weight/Age	Weight/Stature
Not malnour. n°1,661	% under 2Z at admission	5.9%	1.3%	0.6%
	% under 2Z at discharge	6.9%	0.9%	0.4%
	P value for difference	0.1	0.1	0.4
1° degree n° 798	% under 2Z at admission	22.9%	13.4%	4.4%
	% under 2Z at discharge	25.7%	5.5%	1.0%
	P value for difference	0.06	<0.0001	<0.0001
2°-3° degree n° 405	% under 2Z at admission	51.8%	70.4%	17.6%
	% under 2Z at discharge	51.5%	17.0%	2.2%
	P value for difference	0.9	<0.0001	<0.0001

It is worth pointing out that the percentage of children of low Weight/Age and low Weight/Stature indices improved proportionally to the degree of malnutrition, with the greatest improvement among children admitted with 2nd and 3rd degree malnutrition followed by improvements among children admitted with 1st degree malnutrition. The percentage of children of low Stature/Age index was stable for all groups of children.
A similar pattern of greater improvement among more severely malnourished children is shown in the figure below which represents differences in the absolute Z score index at discharge (compared with that at admission) in the 3 different groups of children.

Conclusions

There was a dramatic improvement in nutritional status in all malnourished children targeted by the program. The improvement was greater for children admitted with more severe malnutrition who received specific nutritional support (food supplements, milk etc.).
As expected, the Stature/Age index did not improve, since the effect of chronic malnutrition on height can only be partially corrected, and not over a short time period[2].

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[1] WHO. Physical Status: the use and interpretation of Anthropometry. WHO_TRS_854. Geneva 1995
[2] Waterloo JC, Buzina R, Keller W, Lane JM, Nichaman MZ, Tanner JM. The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of 10 years. Bulletin WHO 1977; 55(4): 489-498

Improvement in haemoglobin levels among the children admitted

To quantify the improvement in the haemoglobin level and the prevalence of anaemia after treatment, 225 children were selected randomly from the children admitted to the treatment phase of the program. In addition to the test at admission, a haemoglobin test was repeated after 2 months of treatment (223 children), and after 3 months of treatment (110 children). Comparison with admission levels was performed by means of *pair t test*.

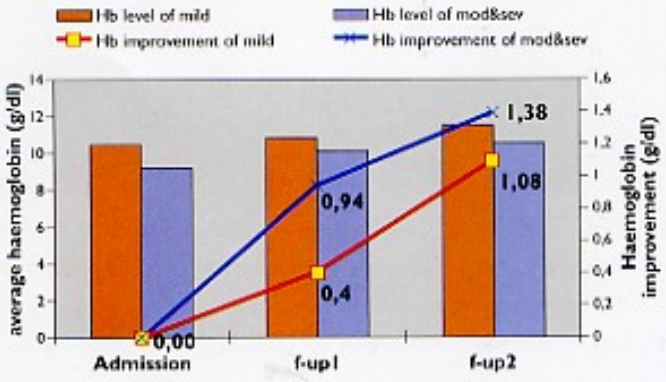
The table below contains descriptive data about the haemoglobin levels in children selected at 3 specific points in time:

Time	N°	Hb Mean (sd)	Hb Median	Hb range min - max	Hb 5° centile	Hb 95° centile	% children with Haemoglobin <11 and <10 g/dl
Admission	225	9.6 (0.8)	9.8	6.4 10.9	7.9	10.8	99% 62%
f-up1	223	10.4 (1.0)	10.5	7.3 13.0	8.6	11.9	66% 33%
f-up2	110	10.8 (1.0)	11.0	7.6 13.2	9.3	12.3	48% 17%

The average increase in the haemoglobin level was 0.75g/dL after 2-month course of treatment (CI 95%: 0.63-0.87, p<0.0001), and 1.27g/L after a 3-month course (CI 95%: 1.11-1.42, p<0.0001). After 3 months of treatment, the prevalence of children with a haemoglobin level below 11 g/dl dropped from 99% at admission to 48%, while the prevalence of children with a haemoglobin level below 10 g/dl decreased by more than 3 times (from 62% to 17%, p<0.0001).

The prevalence of children with moderate or severe anaemia dropped from 62% at admission to 17% after 3 months of treatment.

For the 138 children with moderate or severe anaemia at admission (Hb level <10gd/L), the improvement was greater: 0.94 g/dL after 2 months and 1.38 g/dL after 3 months (see *figure*).



Conclusions

Children undergoing treatment showed an impressive increase in haemoglobin levels and a reduction in the prevalence of anaemia. The improvement was greater for those with the lowest levels of haemoglobin at the start.

Anaemia prevalence and low levels of ferritin among 3 month-old babies of Yatta

Full-term infants are normally born with adequate iron reserves in the liver and haematopoietic tissue, due to the destruction of foetal red blood cells soon after birth. Anaemia is usually uncommon for babies below 6 months. However, when testing children we found a high prevalence of anaemia even at 6 months (around 70%), and this raised the concern that sideropoenia might be present at an early age, probably as a consequence of an iron deficiency in the mother.

We designed a survey with the aim of fixing baseline data about anaemia status in children below six months of age in the Yatta area. This would be used to estimate the correlation and association between haemoglobin and serum ferritin levels in children in relation with the levels in their mothers.
Two hundred children aged between 90 and 120 days attending MOH (Ministry Of Health) centres in Yatta for the vaccination due at three month of age were enrolled in the survey with their mothers. Anthropometrical measurements were taken, and a questionnaire with the the socio-demographic and health information related to the children and the laboratory tests performed (including haemoglobin and serum ferritin).
Anaemia definition: WHO considers all children with haemoglobin levels <11gr/dl to be anaemic. However these criteria have been questioned, since even the majority of children in industrialized countries fall below this level. We present data using the WHO classification and also using more conservative criteria proposed recently by Domellöf *et al* which considers anaemic babies with haemoglobin levels <10.5 gr/dl. Ferritin was considered low when <20 in children and <12 mcg/100ml in mothers.

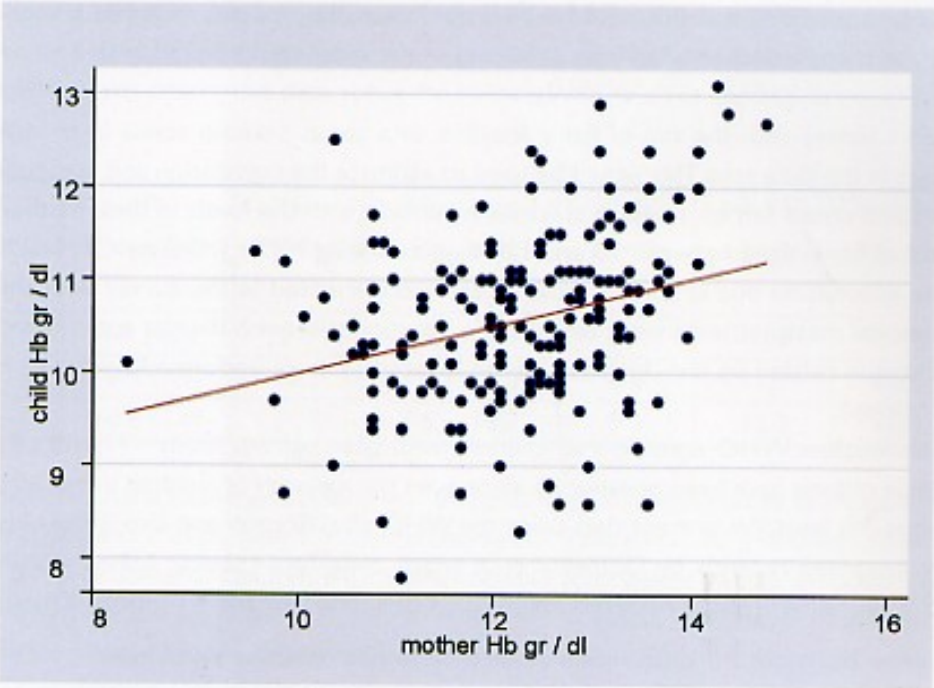
The table below illustrates the distribution of haemoglobin in babies at enrolment.

		Mean (sd)	Median	5°centile	Range
Children at 3 months	Hb	10.6 (0.9)	10.6	9.0	7.8-13.1
	Ferr.	97 (69)	78	19	3-399
Children at 6 months	Hb	10.4 (0.9)	10.5	8.7	6.9-12.3
Mothers at enrolment	Hb	12.2 (1.1)	12.3	10.3	8.2-14.7
	Ferr.	21 (16)	17	4	1-103

At the age of three months, 66.5% (*Confidence Interval* -CI 95%=60%-73%) of the children were already anaemic according to WHO criteria and, even if more conservative criteria were adopted (Hb<10.5gr.) 45% of the babies were found to be anaemic (CI=38%-52%). It should be noticed however that only 7% of the children had low ferritin levels and that there was no correlation between haemoglobin and ferritin levels (R Spearman=-0.1, p=0.3). Three months later, at 6 months of age, the anaemia percentage was similar.

36.5% of mothers were anaemic at enrolment and 32.5% had low ferritin levels, with a moderate correlation (R Spearman=0.46, p<0.0005).

A mild but statistically significant correlation between the level of haemoglobin in mothers and the level of haemoglobin in children was found (R Spearman=0.25, p<0.0005), as shown in the figure below. Among the 73 children with anaemic mothers, the mean haemoglobin value was 10.3 gr/dl, compared to the value of 10.7gr/dl for the 127 children with non-anaemic mothers (P value=0.13). The percentage of anaemia (Domellöf criteria) was 55%, compared to 39% (P value=0.035).



In conclusion, we found that a high percentage of babies were already anaemic at 3 months of age, as and there was also a high prevalence of anaemia and iron deficiency among lactating mothers.
The children of anaemic mothers were more likely to be anaemic, and we found a moderate correlation between the haemoglobin levels of mothers and children, suggesting that iron deficiency in mothers during pregnancy might be a cause or a con-cause of iron deficiency in their babies.

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Terre des hommes Italia Foundation is part of the International Terre des hommes Federation, a network of national organisations working for the rights of children and to promote equitable development without racial, religious, political, cultural or gender-based discrimination. Born in 1994, Tdh Italia is presently running 33 projects for emergency aid and development in 18 countries in Africa, Asia, Latin America and Middle East.

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ARD EL ATFAL / PALESTINE

Ard El Atfal (*children's earth*) Palestine (AEA) is a well established Palestinian NGO operating since years in the nutritional field in the remote villages of Hebron governorate.