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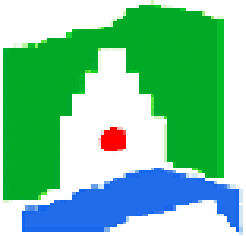

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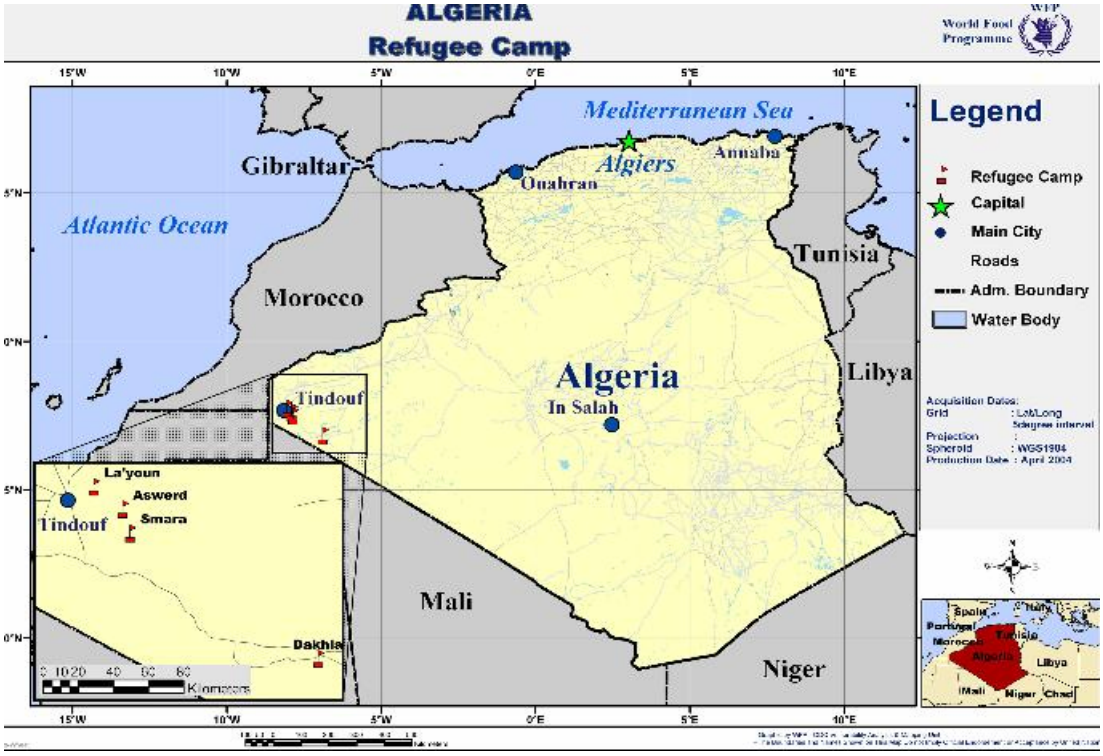
Prevalence of goitre and evaluation of food intake among Saharawi refugees in camps in Tindouf, Algeria

March 2008



A collaborative study by:

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Summary

In January/February 2007 a cross-sectional survey was conducted in the Saharawi refugee camps. The main objective of this survey was to identify the causes of goitre through assessing the iodine status, identifying sources of iodine and assessing the dietary intake. Totally 421 children (6-14 years) and 405 women (5 – 45 years) were randomly selected from 96 households. The prevalence of goitre was estimated by palpation, ultrasound was used to determine thyroid volume (Tvol) and a casual urine sample was collected from each participant to analyse urinary iodine. In addition anthropometric measurements (weight and height) were preformed and a pre-coded questionnaire for background information and food intake was collected. A HemoCue B-Haemoglobin analyser was used to measure the level of haemoglobin.

1. The prevalence of goitre was high; in total 11 % of the children and 18 % of the women had goitre. The highest prevalence of goitre among the children was found in El Aiune (22 %) and for the women in Smara (26 %). *Those children and women who are classified as having goitre by palpation should be followed up by further medical expertise.*

2. Excretion of iodine in urine was also high, 79 % had an excretion higher than 300 µg iodine per litre of urine which is categorised as excessive. *Yearly control of the excretion of iodine in urine in school children should be implemented.*

3. The highest content of iodine in water was found in the sources for El Aiune and Ausserd. In Smara where they got water from a purifying reverse osmotic plant, the level of iodine was acceptable and the children have probably benefited from that. *The high level of iodine in the drinking water from the wells in El Aiune area, which provide both El Aiune and Ausserd camps, can be harmful and there is a need to purify the water.*

4. The main sources of iodine among women seem to be water, locally produced milk, salt and tea water. Salt and tea contributed in small amounts but the local milk gives reasons for concern. Not only was the iodine content high but looking to what the animals are eating, especially the goats eating plastic, cartons (re-circulated paper) and whatever they find, we can suspect that the milk (and meat?) contain organic compounds such as dioxin, PCB and PVC and heavy metals. *The problem around animal husbandry has to be investigated further to be sure that advising people to do animal husbandry and using milk and meat is safe.*

5. In total 26 % of the children were stunted and too small for their age. This is due to inadequate food intake over long time. *The children have to be secured against malnutrition*

through adequate food basket and supplementary feeding. This is a responsibility for all involved in the work with the Saharawi people.

6. The BMI among the women (15 - 45 years) in the camps had a similar distribution as in western countries; too many were overweight or obese, and few were underweight. Those who were underweight were not more anaemic than those who were overweight; 3 % of the underweight and 12 % of the overweight/obese were all severely anaemic. *Thus BMI was not an indicator for neither low or high Hb status and one of the problems is that being overweight does not mean that people can not be malnourished, for example anaemic. This shows that BMI can not predict anaemia in this population.*

7. When it comes to anaemia, 46 % of the non-pregnant women were anaemic. According to WHO (2001), a prevalence of anaemia of more than 40 % is considered as a significant public health problem. While the BMI could not predict the anaemic status it seems as if a woman had a child or if she was breastfeeding or not, could. Those who had children were significantly more anaemic then those who had not given birth; those breastfeeding had a significantly lower median Hb than those not breastfeeding and 64 % of the pregnant women were anaemic. *The results indicate that the problems of anaemia still are serious especially for the mothers, and further investigation of this complex problem is necessary to find and verify the causes so that recommendations for action can be given.*

8. The year 2006 was characterized by gaps in the food pipeline and disagreement between the UN and Saharawi authorities about the numbers of beneficiaries. This has probably affected the fact that more households this time said that they had experienced a lack of food compared to 2004-2005. There were also differences between the camps, Dakla was special in all the cases; either they had used the food item more or less than the others. Fewer persons in Dakla had used potatoes, canned fish and barely and more had used milk and egg than in the other camps. *The reason why should be explored.* One important thing that had started in 2006 was the distribution of fresh vegetables and fruit. *It is important to realize that the food basket must be adequate and that the fresh food is an important contributor. It is highly recommended that this continues. It is also necessary that the pipeline and distribution function properly.*

9. Individual assessment of the food intake revealed that both children and women usually had three main meals; breakfast in the morning such as soup, bread, biscuit, milk, leftover food and tea; lunch around 13-14 o'clock with hot dishes and dinner in the evening around 21-23 o'clock also hot dishes. Children also told that they had fortified biscuits at school before

lunch, which secure that the biscuits are used as a supplement and not replacing the breakfast or the lunch. *This is very important and it is recommended that distribution of the biscuits continue in the same way, and not as a replacement for breakfast or lunch. If so happens the children will eat less and their situation will deteriorate.*

10. The analysis method DDS (Dietary Diversity Score) was used to analyse the individual food intake data for both children and women. First 14 food groups were chosen to represent the different food items. Less than 50 % of the women and children had had intake of dairy products (28 % of the women, 22 % of the children), local milk (w-34 %, ch-23 %), fruit (w-38 %, ch-46 %), canned fish (w-42 %, ch-46), liver (w-2%, ch-1 %) and egg (w-9%, ch-8 %). More than 90 % had had intake of cereals, other vegetables than carrots, tea/sweets/drinks and oils (only women, 76 % of the children), while from 50 - 60 % of both women and children had had intake of vitamin A rich vegetable (carrots), lentils and meat, and 55 % of the women had had fortified food and 73 % of the children. Some of the differences were significant; more women had had dairy products, local milk and tea, while more children had had fruits, sweets and fortified foods. There were also significant differences between the camps in the most of the food groups. The exceptions were for women lentils, tea/sweets/drinks and oils/fat and for children other fruits, fortified food and oil/fat. When converting the data from the 14 food groups to Diet Diversity Score (DDS) only 11 food groups was used; cereals, total dairy (all type of milk and milk products together), vitamin A rich fruit and vegetables, other vegetables, other fruits, lentils, canned fish, meat, liver, egg, fortified food. The maximum number of food groups eaten from, during one day, was 8 and only 9 % of the women and 6 % of the children had done that. The most of both women and children had eaten from 5 - 7 food groups and there were no significant differences between the women and children, neither between the camps.

11. When 50 % of population is eating from only half of the possible available food groups and none eat from more than 8 of 11 possible, this food pattern can be characterized as monotone and unhealthy. When dividing the women into 3 groups with low, medium and high DDS, the haemoglobin values were significant higher in the third group. *This can indicate that higher DDS for women, i.e. more diversity food intake, leads to a better haemoglobin status. This result support the theory that diversity of food intake lead to better health. It is important to assess food intake and use the results to promote the importance and necessity of food variety for the Saharawi population, especially because they are in a refugee situation and depended on food aid from outside.*

1. Introduction

In 1999, when the children from the Saharawi refugee camps arrived for summer holiday in Spain, the Spanish Health Services collected urine samples from 100 of the children. The iodine content in the urine was measured and only a few of them showed normal levels; the majority had too high levels (personal communication with the Saharawi Minister of Health). This led to recommendations from Norwegian Church Aid (NCA) to stop using iodine-fortified salt or iodine fortification in other generally distributed food items until the situation had been further analyzed. In 2002 a nutritional survey[1] explored the magnitude of the goitre and iodine problem to some extent; visible goitre was examined in 589 adolescents and urinary iodine excretion (UIE) from 122 adolescents was analysed. The mean prevalence of visible goitre in the camps was 7 %, but one of the camps (Smara) had a prevalence of 14 %. The median UIE was 1200 μg/L, ranging from 60–3900 (optimal UIE levels are 100–199 and possible excess >299 μg/L)[2]. Such high levels of iodine have been reported only in a few places in the world. Goitre is usually a problem of iodine deficiency. In the Saharawi population the contrary may be the case. Available data indicate thus that the population is suffering from goitre because of excess iodine intake. The only known physiological role for iodine in the human body is its inclusion in the thyroid hormones[3]. Thyroid hormones play a major role in growth and development of the brain and the central nervous systems, and control of several metabolic processes in the body. Both too little and too much iodine intake thus may have negative and serious consequences for the health.

The unsolved goitre problem has worried the Saharawi authorities. In 2004 the Saharawi Ministry of Health requested Akershus University College (AUC) and NCA to conduct an iodine study to assess the prevalence of goitre in the population and search for the possible causes of the problem.

The aim of this research was to assess the prevalence of goitre, measure the iodine intake, including drinking water, tea etc. and thus point to the probable most important source of dietary iodine and suggest measure to mitigate the situation.

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[1] UNHCR/WFP/ICH (2002). Anthropometric and Micronutrient Nutrition Survey, Saharawi Refugee Camps.
[2] WHO/ICCIDD/UNICEF (2001). Assessment of the iodine deficiency disorders and monitoring their elimination. A guide for programme mangaers. Second edition. Geneva: WHO document WHO/NHD/01.1.
[3] WHO/FAO (2004). Vitamin and mineral requirements in human nutrition: Joint FAO/WHO Expert Consultation on Human Vitamin and Mineral Requirements. 2nd ed. Geneva.

2. Background

Refugees from Western Sahara have been displaced to a harsh desert area in Southwest Algeria, since Morocco occupied their country in 1975. With help from the UN, a cease-fire was achieved in 1991 with the purpose of holding a referendum among the Saharawis, whether they wanted self-determination or not. This referendum has not yet been held and approximately 165.000 people are still living in four refugee camps in the desert.

The refugee setting creates problems for their living conditions including for their food, nutrition and health situation. They are totally dependent of aid from abroad. WFP[4] and UNHCR[5] are providing food aid[6] together with ECHO[7] and different NGOs[8,9].

Sources of iodine

The content of iodine in food and water depend on the iodine content in the adjacent soil. The iodine present in the upper crust of the soil is carried to the sea by repeated flooding. Seawater and seafood are therefore relatively high in iodine. In industrialised countries the most important sources of iodides are dairy products (because of iodine supplement to the fodder and the iodine-containing sterilizers to the milking equipment). Also grains and cereals can contain iodine, depending on the level of iodine in the soil. Other sources are of iodine intake is iodised salt and iodate-containing dough conditioners. In the context of food aid, certain food items are fortified with iodine like blended cereals, biscuits, specific sprinkles to spread on porridge, gruel, rice etc and other supplements [10].

In the refugee camps milk is an important source of dietary iodine. Most of the households have domestic animals such as goats or camels, but not much food is cultivated. The IDD[11] report from 1998 stated that the iodine content in old water sources for the refugee camps El Aiune, Smara and Ausserd was 724 µg/L (water distributed from an external well in Rabouni) and 934 µg/L (water distributed from a well in Aiune). Before drilling wells at new places for the water supply for Aiune and Smara, NCA analysed the new sources in 2001 and found 390 and 250 µg iodine/L respectively. This was considered as high but acceptable and UNHCR and

[4] WFP - World Food Program
[5] UNHCR – United Nations High Commissioner for Refugees
[6] Foods as cereals, lentils, sugar, salt, oil and tea.
[7] ECHO - European Commission Humanitarian Aid Office
[8] NGO – Non Governmental Organization
[9] ECHO and NGOs have been giving additional food items such as pasta, canned fish, barely and maize products.
[10] WHO(1996). Trace elements in human nutrition and health. World Health Organization, Geneva.
[11] IDD – Iodine Deficiency Disorder

NCA drilled new boreholes for the two camps. This indicates that the soil is rich in iodine, which can give elevated level of iodine in local foods, salt, and drinking water.

3. Objectives

The main objective of this study is to identify the causes of goitre through assessing the iodine status, identifying sources of iodine and assessing dietary intake.

Specific objectives:

a) Describe the prevalence of goitre in children 6-14 years and women 15-45 years.

b) Describe urinary iodine excretion in children 6-14 years and women 15-45 years.

c) Specify the level of iodine in food and water.

d) Assess the food and nutrient intake in the target groups, especially the iodine intake.

e) Assess the nutritional status in children 6-14 years and women 15-45 years.

f) Determine if there is an association between iodine intake, iodine excretion and goitre.

g) Propose measures to improve the iodine status.

4. Methods, material and data collection

A cross-sectional survey was conducted during January and February 2007 near Tindouf in the Algerian desert. The target population was 165.000 refugees living in four refugee camps. The prevalence of goitre was estimated by palpation, ultrasound was used to determine thyroid volume (Tvol) and a casual urine sample was collected from each participant to analyse urinary iodine. In addition anthropometric measurements (weight and height) were done and a pre-coded questionnaire for background information and food intake was collected. A HemoCue B-Haemoglobin analyser was used to measure the level of haemoglobin (see table 1 for more details).

The study population was 421 children (6-14 years) and 405 women (15-45 years). They were randomly selected from 4 camps; Smara, El Aiune, Ausserd and Dakla.

Table1 Target population and the study variables

Age group	Sex	Study variables	Number of persons
6-14	Male/female	Thyroid size, Urinary iodine, Height/weight, Questionnaire, 24 hours recall without amounts	421
15-45	Female	Thyroid size, Urinary iodine, Height/weight, Questionnaire, 24 hours recall with amounts Capillary blood samples	405
Totally			826

For more details about the sample selection, methods, staff training, development of the questionnaires (annex 3) and data management, please see annex 1.

5. Results regarding goitre, iodine and nutritional status

This chapter first presents the results of the prevalence of goitre, iodine in urine, iodine in water, salt and milk, followed by nutritional status measured as BMI[12] and Haemoglobin.

Prevalence of goitre and thyroid volume

The prevalence of goitre was measured by palpation in children (6-14 years) and women (15-45 years) (see figure 1).

[12] BMI = Body Mass Index (Weight in kg/Height in metre^2)

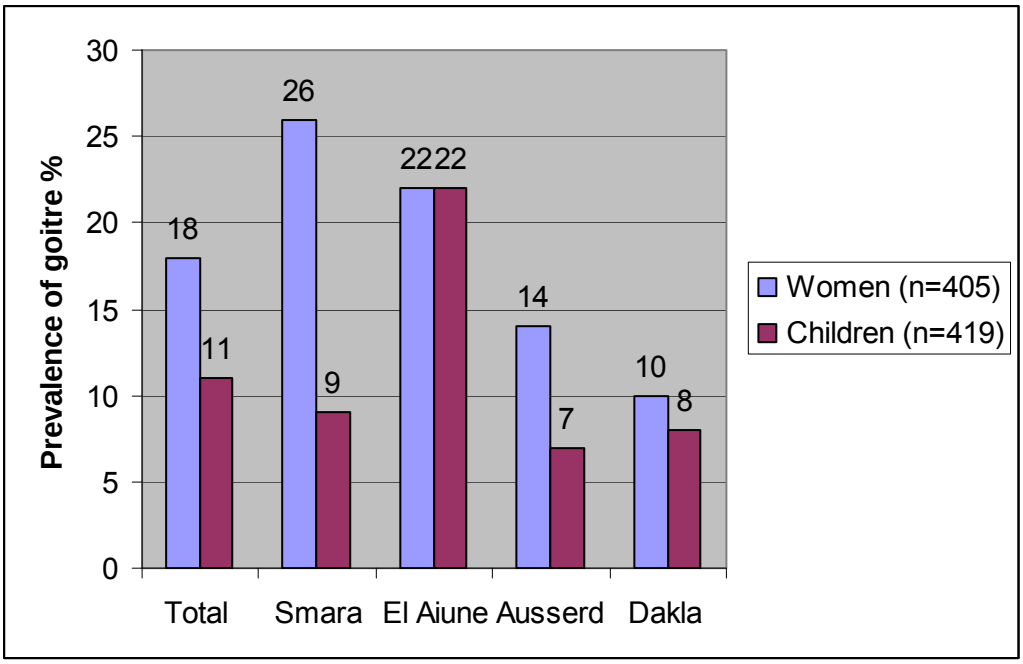

Figure 1 Prevalence of goitre among women and children from the Saharawi refugee camps, January/February 2007.

In total 11 % of the children had goitre. Children from El Aiune had the highest prevalence of visible goitre, 22 %, while Ausserd and Dakla had the lowest (7 and 8 % respectively). The prevalence was significantly higher in El Aiune than in Smara, Dakla and Ausserd.

In total 18 % of the women had goitre. Women from Smara had significantly higher prevalence (26 %) than Dakla (10 %) and Ausserd (14 %). No significant difference was found between Smara and El Aiune.

The volume of the thyroid gland was measured with ultrasonic equipment. Table 2 shows that totally 56 % of the children had enlarged thyroid volume, based on international reference values for age[13]. No significant differences were found between boys and girls. The prevalence of enlarged thyroid volume based on age was significant higher in El Aiune than in Smara and Ausserd. No significant difference was found between El Aiune and Dakla.

[13] Zimmermann et al. (2004). New reference values for thyroid volume by ultrasound in iodine-sufficient schoolchildren: a World Health Organization/Nutrition for Health and Development Iodine Deficiency Study Group Report. Am J Clin Nutr. 2004 Feb;79(2):231-7.

Table 2 Prevalence of enlarged thyroid gland in women and (15-45 years) and children (6-12 years*) from the Saharawi refugee camps, February 2007

Camps	Prevalence of enlarged thyroid gland		
	Children (n=333) Tvol/age %	Women (n=405) Tvol >12.5ml %	Women (n=405) Tvol >15/18ml %
Smara	48	18	3
El Aiune	74	37	11
Ausserd	46	14	3
Dakla	59	18	3
Total	56	22	5

* n=333 (the reference values are for children 6-12 years old, 88 children between 13-14 years old are excluded)

For women, totally 22 % had enlarged thyroid volume (cut-off 12.5 ml)[14]. The prevalence of enlarged thyroid volume was significantly higher in El Aiune than in the three other camps. When the cut-off was set to 15/18ml[15], 5 % of the women had enlarged thyroid volume.

Those children and women who are classified as having goitre by palpation should be followed up by further medical expertise. This initiative should come under the new strategy for Saharawi National Nutrition Programme which is launched these days.

Excretion of iodine in urine

Median urinary iodine excretion (UIE) was 510 µg/L (min-max was 54 - 3640 µg/L), which largely exceeds WHO's cut-off value for excessive iodine intake of 300 µg/L. In the total sample, 0.7 % had UIE <100 µg/L, while 79 % had UIE >300 µg/L and 14 % had UIE >1000 µg/L. UIE was significantly higher among children than among women. Table 3 shows that the median UIE was >300 µg/L in all four refugee camps.

The excretion of urinary iodine for both children and women (table 3) was highest in El Aiune (906 µg/L and 725 µd/L respectively) with maximum values of 3594 µg/L, 3640 µg/L

[14] Maravall et al. (2004). Reference values of thyroid volume in a healthy, non-iodine-deficient Spanish population. Hormone & Metabolic Research, 36(9), 645-649.
Gomez et al. (2002). Pituitary-thyroid axis, thyroid volume and leptin in healthy adults. Hormone & Metabolic Research, 34(2), 67-71.
[15] 15-18 years 15 ml and > 18 years 18 ml (Gutekunst et al. (1986). Goitre epidemiology: thyroid volume, iodine excretion, thyroglobulin and thyrotropin in Germany and Sweden. Acta Endocrinol (Copenh). 1986 Aug;112(4):494-501.

respectively. Lowest excretion of urinary iodine was found in Dakla (102 µg/L, 285µg/L respectively) and the differences were significant.

The median urinary iodine excretion for all the children was 565 µg/L, and there were significant differences between Smara and El Aiune and Ausserd, but not between Smara and Dakla. Also most of the women, 74 %, had high levels of excretion of iodine in urine (>300 µg/L). This indicates that the intake of iodine has been high for both children and women.

Table 3 Excretion of iodine in urine among women (15-45 years) and children (6-14 years) from the Saharawi refugee camps, February 2007

Camps	Excretion of iodine, µg/L median (min – max)	
	Children (n=416)	Women (n=398)
Smara	362 (170-1208)	330 (110-1889)
El Aiune	906 (284-3594)	725 (168-3640)
Ausserd	848 (261-1892)	663 (189-2148)
Dakla	358 (102-742)	285 (54-738)
Total	565 (102-3594)	466 (54-3640)

Urinary iodine excretion above 300 µg/L is considered as excessive and can give rise to adverse health consequences as iodine-induced hyperthyroidism and autoimmune thyroid diseases. *Yearly control of the excretion of iodine in urine in school children should be implemented and an action under the Saharawi National Nutrition Programme.*

The main sources of iodine among the women

Samples of drinking water, tea water, salt and milk were analysed to explore the content of iodine[16]. Figure 2 shows which food and drinks that contributed most to the intake of iodine among the 405 women who participated in the survey.

[16] Also other food items were collected, but because of difficulties with the analysis methods, are they still not analysed.

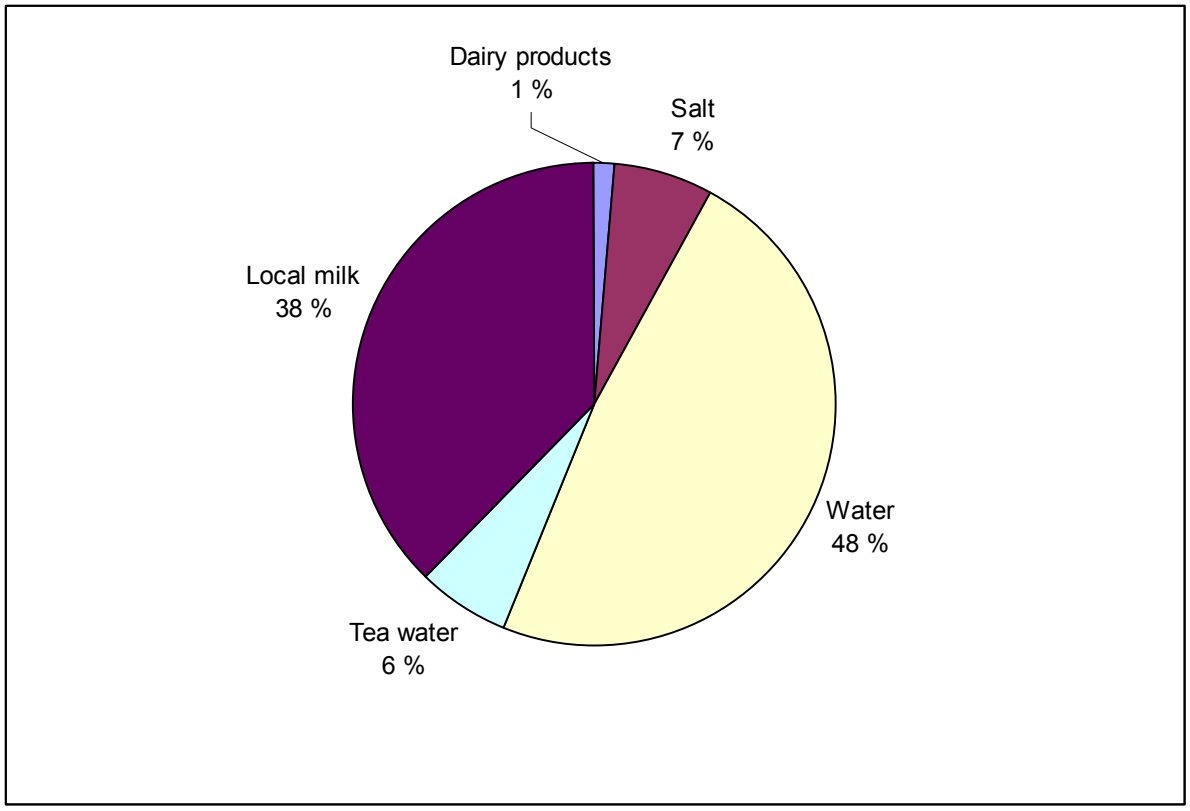

Figure 2. The main sources of iodine among women (15-45 years) from the Saharawi refugee camps, January/February 2007

All women had drunk water, 98 % had eaten salt, 87 % drunk tea and 36 % had drunk local milk (goat and camel). Twenty eight percent had drunk and eaten Algerian produced dairies such as milk and cheese. The analyses showed that water and local milk contributed most to the daily intake of iodine.

Iodine content in drinking water

In most of the household one water sample was collected and analysed. Water from the main wells in the different camps, was also analysed. The water from the wells was not only analysed for iodine but also fluoride and other parameters. For more information regarding the chemical content, please look at annex 2. Table 4 shows the content of iodine from household water samples and water samples from the wells. The analyses corresponded well in El Aiune, Dakla and Ausserd, but not in Smara.

Table 4 Iodine in drinking water at household and camp level in the Saharawi refugee camps, January/February 2007

Camps	Iodine in drinking water at household level, µg/L median (min – max) (n=92)	Iodine in drinking water from well at camp level, µg/L
Smara	87 (55-127)	37
El Aiune	299 (231-545)	294
Ausserd	301 (55-418)	261
Dakla	70 (55-96)	69
Total	108 (55-545)	165

Smara has the last three years received purified water from a reverse osmotic plant. The differences in the iodine content between the water at household level and well level was probably due to the fact that the samples were taken on different days. The sample collection in the households was done from 03. - 06.02.07 and the sample from the plant were taken 12.02.07. It looks like the plant did not function optimal during the survey days; because samples taken the 12.02.07 before and after purification showed that the plant functioned very well with average 90 % of reduction of unwanted substances (Annex 2). During the survey days in Ausserd the differences between the water samples from the well and the households were big, as well as the differences between the households. The lowest content (55µg/L) was found in one household; the next lowest was 192µg/L but the median was 301 µg/L, which indicates that the content of iodine in general was high. Variations of iodine content in water were also seen among the households in El Aiune. Why these differences is not known.

All the households in all camps had water with much higher content of iodine than regular drinking water in other countries. Normal content of iodine in drinking water is less than 15µg/L and sea water usual has 50µg/L. Recommended intake of iodine is 150µg/d for women, men and children > 10 years, and for children 6-9 years the recommendation is 120µg/day. People usually do not get enough iodine through drinking water but intake of 2-3 litre water per day in the camps will exceed the recommended amount in El Aiune and Ausserd and maybe

Dakla, but not in Smara. The Scientific Committee on Food in the European Union[17] has proposed 600 µg/d of iodine as the safe upper level for adults while The Food and Nutrition Board, USA[18], sets the tolerable upper limits of the daily iodine intake for adults as 1100 µg.

In Smara the prevalence of goitre among women was high and the prevalence among children was low. Both children and women had the same level of urinary iodine. The excretion of iodine was also lower than for the samples from El Aiune and Ausserd. This probably indicates that the different prevalence of goitre between women and children are due to the fact that the water source in Smara changed 3 years ago. The children have benefited from this by not developing severe goitre but the women have developed goitre over years and it will not be reversed.

The high level of iodine in the drinking water from the wells in El Aiune area, which provide both El Aiune and Ausserd camps, can be harmful and there is a need to purify the water.

But as figure 2 show there are other sources of iodine in the camps that also contributed to the total iodine burden.

Tea water

Samples of tea water from Tindouf were collected in 51 households in the camps and the median content of iodine was 148µg/L (min 29 max 367). A person that is drinking 3 times 3 glasses of tea per day (approximate 26ml x 3 x 3= 234 ml) will have an intake of approximate 35µg iodine/day from the tea. Eighty seven percent of the women said they had drunken tea and the average amount was 90 ml (max 237 ml) which gives 13µg iodine/day. That will only give a small contribution to the iodine intake (see figure 2).

Salt

There were different types of salt in the area, from fine and coarse to rock salt. In Algeria the salt is fortified from the authorities, but the women in the households said that they got salt from both Algeria and Mauritania, both as rock salt and fine salt. What was special is that rock salt usually do not contain much iodine (often less than 0.7µg/g) but the rock salt (n=53) used in the camps had median 4.4µg iodine/g, (min 0 - max 33.2µg/g). The fine salt (n=28) had median 11.8 µg/g (min 0 – max 50.8µg/g). It was no differences between the camps. Usually

[17] SCF (2002). Opinion of the Scientific Committee on Food on the tolerable upper intake level of iodine (expressed on 26 September 2002). European Commission. Health and Consumer Protection Directorate General.
[18] FNB (2006). Dietary Reference Intakes: The Essential Guide to Nutrient Requirements. Editors: Otten JJ, Hellwig JP and Meyers LD. Food and Nutrition Board, Institute of Medicine, National Academy of Sciences, USA.

fortified salt has between 20 – 40µg/g and it is difficult to say if the fine salt was fortified or if it was from naturally sources. Most of the women (98 %) had eaten salt but not much. Figure 1 shows that salt only contribute to the iodine intake in minor grade.

Milk

Samples of camel (n=3) and goat (n= 16) milk were taken as well as 3 samples of a mixture of both camel and goat milk. Content of iodine in camel milk ranged from 540µg iodine/L milk to 11980µg/L. Even the lowest value (540g/L) was higher than any water source and the camel farmer was identified. He explained that they used the same drinking water for the camels as for the human population. That is maybe the reason why the iodine content was not higher. The camel farmer of the high value sample was not identified. Also the goat milk had high values; the lowest was 70µg/L and the highest was 13070µg/L (median 370µg/L). The farmer of the high value goats was identified and they could tell that the animals got water from an old local well. Only one of the household in the survey said that they had camels but 85 % of the households had goats or sheep. This relative new animal husbandry gives reasons for concern. Not only was the iodine content high but looking to what the animal in general was eating, especially the goats eating plastic, cartons (re-circulated paper) and whatever they find, we can suspect that the milk (and meat?) contain organic compounds such as dioxin, PCB (polychlorinated biphenyls) and PVC (polyvinylchloride) and heavy metals such as Pb (lead) and Hg (mercury).

The problem around animal husbandry has to be investigated further to be sure that advising people to do husbandry and using milk and meat is safe. Also this should be an initiative under the new strategy for Saharawi National Nutrition Programme.

Nutritional status

The nutritional status was measured by height, weight and haemoglobin among women and height and weight among the children.

In total 26 % of the children (6 -14 years) were stunted (low height for age) and there were no significant difference between the camps. Sixteen percent of the children were under weight (low weight for age), and 1 % were wasted (low weight for height) and Ausserd had a significant higher proportion of these malnourished children. The results of the nutritional status show that the situation of acute malnutrition (wasting) usually improve when the children get older, but the situation of being too short (stunted), continue. The children got stunted because they have a long term situation of inadequate food intake.

The children have to be secured adequate food during the whole childhood. They should be protected against malnutrition through adequate food basket and supplementary feeding. This is a responsibility for all involved in the work with the Saharawi people and will be one of the main issues in the Saharawi National Nutrition Programme.

For the women BMI (body mass index) was calculated. BMI is an indicator on the body size. Normal BMI from 18.5 to 25 means that if a person has a size that is in this range them are in less risk to get ill. Lower (to skinny) or higher (to fat) are both giving risk for different illness.

The BMI was categorised as underweight (BMI<18.5) Normal range (BMI 18.5-24.99), overweight (BMI 25-29.99) and obese (BMI ≥30). For the women the number of under- or overweight is shown as categories of BMI in figure 3.

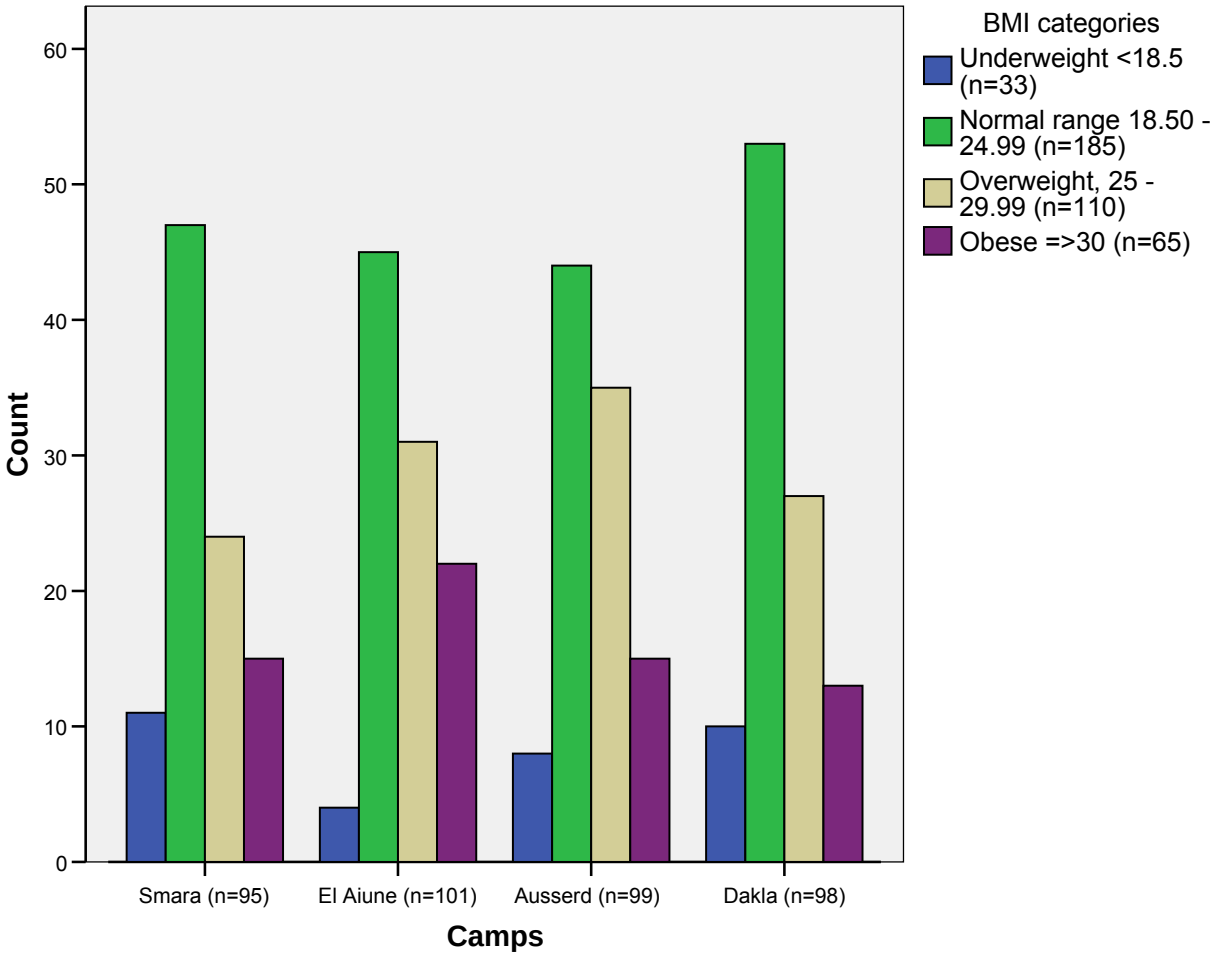

Figure 3 Number of non-pregnant women (15-45years) in each of the four camps shown in different BMI categories, Saharawi refugees, January/February 2007

Nearly half of the non- pregnant women, 185 (47 %) had a BMI in the normal range (18.5 – 24.99). Thirty three (8%) were possible undernourished (BMI < 18.5) while 110 (28 %) of the

women were overweight and 65 (16 %) were obese (BMI>30), all together 44 % (175) were categorized as too fat, see figure 3. There were no significant differences between the camps. The BMI among the women in the camps had a similar distribution as in western countries; too many were overweight or obese, few were underweight.

The median Haemoglobin level among non-pregnant women was 12.2 g/dl (min 4.4 – max 16.5). Table 5 shows that 46 % of the non-pregnant women were anaemic with 7 %, 25 % and 14 % classified with respectively severe, moderate and mild anaemia. There were no significant differences between the camps. According to WHO (2001), a prevalence of anaemia of more than 40 % is considered as a significant public health problem.

Table 5 Percent of non-pregnant women (15-45 years) in the different categories of anaemia, Saharawi refugees, February 2007

Camps	Categories of anaemia Percent of non-pregnant women (15-45 years)			
	Severe <8 g/dl	Moderate 8 -10.9 g/dl	Mild 11-11.9 g/dl	Normal ≥12 g/dl
Smara n=95	5%	16%	13%	66%
El Aiune n=102	10%	23%	16%	52%
Ausserd n=99	6%	34%	13%	46%
Dakla n=97	8%	26%	13%	50%
Total n=393	7%	25%	14%	54%

Figure 4 shows that of those 7 % (27 woman) that was severe anaemic (see also table 5), 3 % (9 woman) of the group of underweight (BMI < 18.5) also suffered from severe anaemia, while 3 % (5) of the group of obese and 9 % (8) of the group of overweight, also were severe anaemic. There was no significant difference between the groups, and the underweight women did not have a higher risk of being anaemic; more than half of the undernourished was not anaemic. *Thus BMI was not an indicator for neither low or high Hb status and one of the problems is that being overweight does not mean that people can not be malnourished, for example anaemic. This shows that BMI (or fat or skinny) can not predict anaemia in this population.*

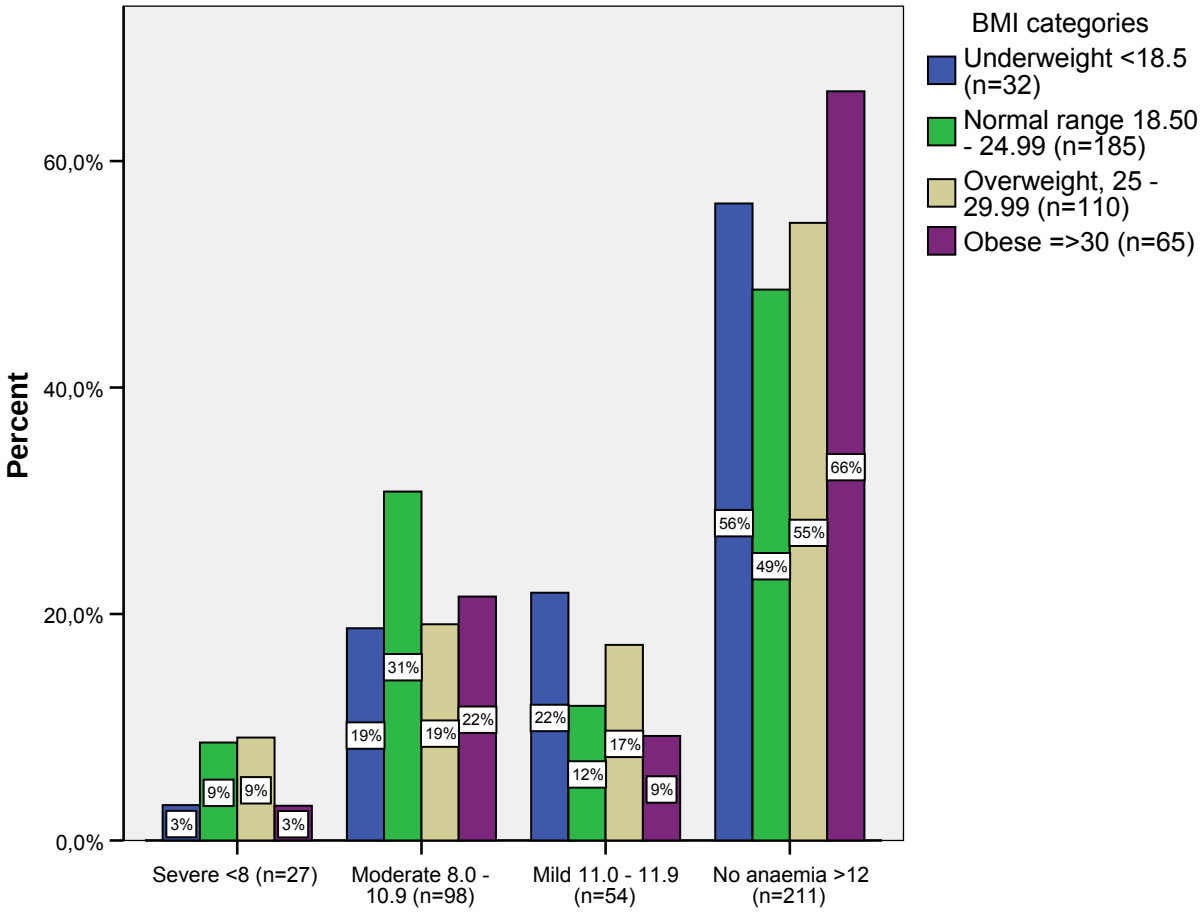

Figure 4 Number of non-pregnant women (15-45years) in the 4 Hb categories and 4 BMI categories, Saharawi refugees, February 2007

While the BMI could not predict the nutritional status it seams that if a woman had a child or breastfeed or not, could. Table 6 shows the differences between the women with and without children, and pregnant and breastfeeding women.

Table 6 Percent of women (15-45 years) in the different categories of anaemia, Saharawi refugees, January/February 2007

	Median Hb g/dl (min-max)	**Categories of anaemia Prevalence of anaemia among women (15-45 years)**			
		Severe <8 g/dl*	Moderate 8 -10.9 g/dl	Mild 11-11.9 g/dl	Normal ≥12 g/dl
Non-pregnant women in total n=393	12.2 (4.4-16.5)	7%	25%	14%	54%
Women without children n=178	12.3 (5.5-16.3)	5%	21%	13%	61%
Women with children n=225	11.8 (4.4-16.5)	10%	29%	14%	47%
Women that breastfeed n=78	10.8 (6–16.1)	14%	39%	15%	32%
Pregnant women n=11	10.9 (6.1-12.5)	9%	46%	9%	36%

* Cut-off value for severe anaemia among pregnant women is <7g/dl

Table 6 shows that the women who had children were significantly more anaemic then those who had not given birth, with median Hb of 11.8g/dl (min 4.4 - max 16.5) and 12.3 (5.5-16.3) respectively. Nineteen percent of the women were breastfeeding in the study period. Their median Hb was 10.8 g/dl (min 6 - max 16) and this was significantly lower than for those that did not breastfeed. Sixty-eight percent of the breastfeeding women were anaemic and 14% of those severely anaemic. Three percent (11) informed that they were pregnant and 64% of these were anaemic. Totally among the women (n=405), 7% (33) had Hb at 15 g/dl or more and 55% of these had children.

The results indicate that the problems of anaemia still are serious especially for the mothers, and further investigation of this complex problem is necessary to find and verify the causes so that recommendations for action can be given. This will also be one of the main issues in the Saharawi National Nutrition Programme.

6. Food situation

General ration at household level

The survey was undertaken in January/February 2007 and the previous year 2006 was characterized by gaps in the food pipeline and disagreement between the UN and Saharawi authorities about the numbers of beneficiaries. This resulted in lack of food in long periods during 2006. In January 2007 only 8 kg wheat, 1 L oil, 2 kg lentils, 1 kg rice, 1 kg spaghetti, 0.370 kg tuna was distributed per person and 0.200 kg yeast, 0.150 kg tea and 1.710kg potato per family. All the households which participated in the survey claimed that the rations were not sufficient. Ninety-six households answered questions about their food situation. Table 7 shows sufficiency of various food items in the ration for January/February 2007, according to the households. Ninety percent of the households said that they had shortage of rice, 69 % of sugar, 62 % of oil and 46% had shortage of lentils. This was worse than in 2004[19] when 78 % said they had shortage of rice, 66 % of sugar, 58 % of oil and 47 of lentils.

Table 7 Food items that were not sufficient in the food ration for the Saharawi refugees in January/February 2007

Lack of food item	Percent of household
Rice	90*
Sugar	69*
Oil	62*
Lentils	46
Wheat	13
Tea	10

*Significant difference tested with Kruskal-Wallis Test ($p<0.05$) between the camps

There were differences between the camps; for rice all the household in El Aiune said they had shortage while 78 % in Smara said the same. For sugar the picture was different; in Smara and Ausserd 95 % said they had shortage of sugar, in El Aiune 60 % and in Dakla 37 %. Also for oil there were significant differences between the camps; 72 % in El Aiune said they had shortage, while in Smara only 30 % said the same. For the other food items there were no significant differences between the camps. This was the people's own experience of shortage and can be caused of many things; real differences in the distribution, few children in a household that affect the quantity of food in a negative way because the ration is given after how many they are in the households without regarding their age, maybe some don't feel the

[19] NCA/Akershus University College (April 2005). Base-line and assessment study of the nutritional situation in two regions in the Saharawi Refugee Camps, Tindouf, Algeria

shortage of a food item so strong because they don't use the product as much as others, and finally maybe some has better coping strategies than others. *The reason why different food items come into shortage should be explored further.*

In 2006 it was reported that the quality of the lentils was reported to be very bad that people could not eat their 66 g/day ration. This made the need of other food items very urgent. The distribution of fresh food such as potato, onion and some fruit once a month has contributed to the variation of the food intake, which is very important even though it should be given bigger quantities. The intention is that each person is given per day 30 g potato, 30 g carrot, 15 g onion and 40 g fruit. For comparison, the common advice is to eat at least 500 -750 g vegetable and fruit per day.

The households were also asked if they had eaten certain food items in the household the last 2 weeks. Table 8 shows that all households had used wheat, sugar and tea, and 96 % had used rice and 88 % lentils. Around 97 % had used meat, 91 % canned fish, and around 90 % had used potato and tomato and 84 % carrot. Orange was eaten by 20 % and only few percent had used other fruits. Milk, egg and barley had been used by 65-67 % and there were significant differences between the camps. Also for use of potatoes, carrots, tomatoes, canned fish and dates, there were significant differences between the camps. Dakla was special in all the cases; either they had used the food item more or less than in the other camps. For potatoes, carrot and tomatoes 95-100 % of the households in Smara, Ausserd and El Aiune had used the foods but only 70 - 80 % in Dakla. The same was shown for canned fish which was used by 95 -100 % in the other 3 camps but only by 75 % in Dakla. These differences can be due to the time of distribution of the food items and the time of the survey; the survey started in Dakla in the end of January and distribution of potatoes were the same days in Dakla. But this shows how vulnerable people are and how much the distribution effect the food intake. The other food items that differed were barley, milk and egg which are not in the rations. In Dakla 32 % of the households had used barely in contrast to 80 % in the other camps. Use of milk was high in Dakla; 92 % said they had used milk (all types of milk and yogurt) the last 2 weeks, while in El Aiune 64 %, in Smara 52 % and in Ausserd 40 % of the household said they had used milk. Also eggs were significantly more used in Dakla (89 %) than in El Aiune and Ausserd (ca 70 %) and 35 % in Smara. These results can not be compared with those from 2004/2005 because then it was asked about which food items they had used only the day before. These results show however that the situation is not the same for all the camps all the time.

It is important to realize that the food basket must be adequate and that fresh food is an important contributor. It is highly recommended that this continues. It is also necessary that the pipeline and distribution function properly.

Table 8 Food items used in 96 Saharawi refugee's household in January/February 2007

Food items available	Percent of household
Wheat flour	100
Sugar	100
Te	100
Oil	98
Bread	97
Meat	97
Rice	96
Spaghetti	96
Onion	94
Potato	91*
Canned fish	91*
Tomato	89*
Lentil	88
Carrot	84*
Barely	67*
Egg	67*
Milk	65*
Gofio	46
Margarine/butter	43
Date	27*
Orange	20
Banana	13
Cheese	8
Pepper	5
Apple/pear	5
Coca/Fanta etc	3
Biscuit	3
Juice	2
BP5	0
WSB	0

*Significant difference tested with Kruskal-Wallis Test ($p<0.05$) between the camps

Food intake at individual level

Method

The food and water intake was measured by asking about the intake the last 24 hours (24 hours recall). For the women both the food items and the quantity were recorded but for the children only the food items were recorded. For more information about the method, please look at the method chapter (Annex 1).

By comparing the results of the 24 hours recall and the excretion of iodine, it became clear that we had not managed to record the correct intake of food and water. Approximately 90 % of the iodine intake should be excreted in the urine; we found that the median excretion of iodine in the women was 466 µg/L, whereas the iodine intake was measured to be 155 µg/L which was far to low. Also the measured energy intake was very low. We therefore had to admit that the quantity of the measured food and nutrients was not exact. But the survey gave a good picture of the food variety both for women and children. A simple way to show and evaluate the quality of the food intake is to count how many food groups the persons had eaten. This is done in the following chapters.

Food pattern

The most of the women (97 %) eat at three times per day. The morning meal (between 6.30 and 11.30 o'clock) consisted of food like soup, milk/yoghurt, bread, left-over food, biscuits and/or tea. Lunch was mainly taken from 12 to 16 o'clock consisting of bread and something warm such as lentils, rice, spaghetti, meat or canned fish, and dinner from 20 to 24 o'clock was very similar to the lunch. Twenty-two percent said that they also had something between the meals, mainly tea, milk and soup.

For the children, 95 % had eaten something before they went to school or kindergarten and 97 % had eaten something at school, most of them (92 %) fortified biscuits. Children ate lunch and dinner at the same time as the adults and the foods were also similar, with some exceptions.

The most common eating pattern was that men and women ate from separate plates, according to 77 % of the households.

It is important that the fortified biscuits for the school children are given at school before lunch. This secure that the biscuits are used as a supplement and not replacing the breakfast or the lunch. *This is very important and it is recommended that distribution of the biscuits continue in the same way, and not as a replacement for breakfast or lunch. If so happens the children will eat less and their situation will deteriorate.*

Dietary Diversity Score (DDS)

Diet diversity - i.e. the number of foods consumed across and within food groups over a reference period – is widely recognized as being a key dimension of diet quality.[20] The concept is that variety of foods in the diet helps to ensure adequate intake of essential nutrients and promotes good health.

The women and children that participated were asked about their food intake the day before the interview (24 hours recall). This data has been used to confirm if a food was eaten or not. The amount of food was not taken into consideration; if they had eaten a small amount of tomato in a sauce or a lot of tomato does not matter, or for example for milk; if they had drunk pure milk or diluted milk or just a small amount in the soup, it was counted as milk. How many times during the day did not either count; both one time was counted as yes as well as two or three times were counted as yes. By counting how many food groups a person has eaten gives the index of dietary diversity score (DDS). The same food groups were used for both the children from 6 to 14 years and the women from 15 to 45 years. The food groups selected are:

1. Cereals and food made from grain (such as wheat, rice, barley, gofio, bread, muffins, biscuits, spaghetti, couscous)
2. Dairy products (milk (as powder and Candia, yoghurt, cheese but NOT local goat or camel))
3. Local goat and camel milk
4. Vitamin A rich vegetables and fruit (> 130 RE/100 g) (such as carrot, pumpkin)
5. Other vegetables (such as potato, onion, green/red pepper, tomato, cucumber, lettuce, beetroot)
6. Other fruits (such as oranges/mandarin/lemon, dates, banana, apple, pear, watermelon, juice, marmalade)
7. Lentils, beans, peas and nuts
8. Canned fish (such as tuna, sardine, mackerel)
9. Meat (such as camel, goat, chicken, beef)
10. Liver
11. Egg
12. Tea, coffee, sugar, candy, choloade, coca, fanta etc
13. Fortified food (such as some of the wheat flour and oil from WFP, fortified biscuits for the children)

[20] Arimond et al (2007). Validation of dietary diversity as a measure of the micronutrient adequacy of women's diet. FANTA/AED

14. Oils and fat (such as camel fat, margarine, oil)

Table 9 shows the food groups and how many percent of the women that had eaten from the different groups the day before they were interviewed (24 hours recall). The table dived also the women in camps to show the differences between the camps.

Table 9 Percent of women (15 -45 years) who had consumed the various food groups the day before interview, in total and per camp, Saharawie refugee camps January/February 2007

Food groups	Percent total N=405	Percent Smara N=97	Percent El Aiune N=103	Percent Ausserd N=102	Percent Dakla N=103
1. Cereals and food made from grain	98*	100	100	93[2-4-6]	99
2. Dairy products	28*	36	33[1]	24[2]	20[3-5]
3. Local goat and camel milk	34*	39	26[5]	28[6]	42
4. Vitamin A rich vegetables and fruit	55*	55	51[4]	67	49[6]
5. Other vegetables	94*	99	89[1]	97[4]	90[3-6]
6. Other fruits	38*	26[1-2]	44	43	37
7. Lentils, beans, peas and nuts	50	45	56	47	50
8. Canned fish	42*	42	32[5]	30[6]	62[3]
9. Meat	59*	57[2]	55[4]	71	54[6]
10. Liver	2*	5	0[1]	1	0[3]
11. Egg	9*	7	12	4[4-6]	12
12. Tea, coffee, sugar, candy, choloade, coca, fanta etc	95	93	96	97	94
13. Fortified food	55*	71	55[1]	42[2]	52[3]
14. Oils and fat	95	95	97	94	92

*Significant difference Mann-Whitney Test $p<0.05$ between the camps, 1=between Smara and El Aiune, 2=between Smara and Ausserd, 3=between Smara and Dakla, 4=El Aiune and Ausserd, 5=El Aiune and Dakla, 6=Ausserd and Dakla

The table 9 shows that there were differences between the camps for most of the food groups, except oil, lentils, and drinks. For cereals and cereals products 98 % of the women in total eat from this group but it was significant fewer women in Ausserd that had eaten from that group than in the other camps. For dairy products (except local milk) in total 28 % of the women consumed something from that group, but significantly more often by the women in Smara than the others. When it comes to local goat and camel milk (consumed by 34 %), Dakla had the highest number of women who had drunk that. Vitamin A rich vegetables (carrots) was

consumed by 55 % of the women but most often in Ausserd while other vegetables (94 % in total) were most often used in Smara but also in Ausserd. Fruits were not eaten so much, by 38 % in total, and were more often eaten in El Aiune and Ausserd and less in Smara. In total 50 % of the women said they had eaten lentils the day before and there were no differences between the camps. Canned fish was eaten by total 42 % of the women, significant more often eaten in Dakla. Meat was eaten by 59 % of the women, significant most often in Ausserd. Liver was only eaten by 2 % and most of them in Smara. Because we only asked for the food intake for one day, these differences are normal; usually people either eat meat or fish and not necessarily the both at the same day. Eggs were not much eaten (9% in total) but most often in El Aiune and Dakla. Fortified foods (eaten by 55 % in total) were eaten by significantly more women in Smara than in all the other camps. The food items were fortified flour and oil from WFP, mostly used in bread, not Wheat Soya Blend or BP5. Not many had eaten fortified biscuits either; those were given to the children at school. Significantly fewer women from Ausserd had eaten fortified food, and the main reason for that seemed to be that the bakery was not functioning and the bread came from Tindouf. All bakeries in the camps used some fortified wheat and oil.

The food group intake for the children (table 10) shows other differences between the camps than for the women (table 9). There were no significant differences in the groups of other fruits, liver, fortified foods and oils. For cereal and cereal products 97 % of the children in total had eaten from that food group but it was significantly fewer children in Dakla that had eaten from that group than in the other camps. Dairy products were consumed by 22 % of the children in total. Children in Smara (as well as the women) had significantly more often consumed dairy products than children in the other camps, but children in Smara had also consumed dairy products more often than the women in Smara, in contradiction to the other camps were women consumed dairy products more often than the children. Consumption of local goat and camel milk for the children was more often in Dakla (as for the women) but the children had in general more rarely consumption than the women in all the camps. Vitamin A rich vegetables (carrots) were eaten by 52 % of the children, and it was most often used in Ausserd. Other vegetables were used in total by 96 % of the children, 100 % used in Smara and 96 % in El Aiune and significantly less used in Dakla. There were no differences between the camps in eating fruits, in total 46 % of the children did that. In total 52 % of the children said they had eaten lentils the day before and there were big differences between the camps, in contradiction to the women were there were no differences. The children in Dakla had eaten lentils twice as

those in Smara and significantly more often that all the other camps, while children in Smara had eaten significantly rarely that all the other camps. Canned fish was eaten by a total of 46 % and significantly more often in Dakla. Meat was eaten by a total of 56 % of the children; significantly rarely in Dakla, and only few children in Smara ate liver. Children did not eat much egg either, most often in El Aiune as for the women. Things as tea, candy, chocolate was used by a total of 76 % of the children, but there were significant differences between the camps. Children in Dakla had significantly rarely consumption than the others. Fortified foods were eaten by a total of 73 % of the children and there were no differences between the camps. When the children were asked if they eat fortified biscuits at school, 92 % of them said yes. The differences we saw here is due to the fact that when we asked about the day before on a Saturday, the day before was Friday and the children had not been at school and not gotten their biscuits.

Table 10 Percent of children (6-14 years) who had consumed the various food groups the day before interview, in total and per camp, Saharawie refugee camps January/February 2007Food groups

Food groups	Percent total N=421	Percent Smara N=107	Percent El Aiune N=102	Percent Ausserd N=105	Percent Dakla N=107
1. Cereals and food made from grain	97*	100	100	97	93[3-5]
2. Dairy products	22*	46	20[1]	11[2]	10[3]
3. Local goat and camel milk	23*	24	17[5]	16[6]	36
4. Vitamin A rich vegetables and fruit	52*	50[2]	47[4]	65	45[6]
5. Other vegetables	96*	100	97	94	93[3]
6. Other fruits	46	39	49	48	47
7. Lentils, beans, peas and nuts	52*	34[1-2-3]	53[5]	51[6]	70
8. Canned fish	46*	33[2-3]	38[5]	49[6]	65
9. Meat	56*	60	66	58	42[3-5-6]
10. Liver	1	3	0	0	0
11. Egg	8*	7	15	5[4]	6[5]
12. Tea, coffee, sugar, candy, choloade, coca, fanta etc	76*	86	73	80	65[3-6]
13. Fortified food	73	75	73	73	72
14. Oils and fat	94	96	94	91	96

*Significant difference Mann-Whitney Test $p<0.05$ between the camps, 1=between Smara and El Aiune, 2=between Smara and Ausserd, 3=between Smara and Dakla, 4=El Aiune and Ausserd, 5=El Aiune and Dakla, 6=Ausserd and Dakla

There were significant differences between women and children when it comes to intake of some food groups. For dairy products and local milk, the women had significant more often intake than the children. When dairy products and local milk was combined, still significantly more women (56 % in total) had consumed this more often compared with 40 % of the children. Milk and milk products are important both for women and children but especially for the young children and pregnant and breast feeding women. But before promoting local milk one has to be sure that it is a safe product. For fruits, children had significant more often intake than women but it was rare for both groups and it should be promoted to use more of it for all. For tea, candy, chocolate etc women had more often intake and it was women that drank tea (87 %, children 26 %) and children that ate candy and chocolate (children 36 %, women 1%). Six percent of both the women and children had consumed coca, fanta etc. It is important that these high calorie (energy) but low nutrient (vitamin and minerals) foods do not replace more

healthy foods and if people are overweight, they should avoid these foods as much as possible. More children than women ate fortified foods and a problem with the fortified biscuits that the children got is that they are fortified with iodine, which is already overloaded in the population. But in a situation were intake of essential nutrients is inadequate, use of adjusted fortified foods or supplements could be considered.

When converting the data from intake of any food from the 14 food groups shown in table 9 and 10 to Diet Diversity Score (DDS) only 11 food groups was used; cereals, total dairy (all type of milk and milk products together), vitamin A rich fruits and vegetables, other vegetables, other fruits, lentils, canned fish, meat, liver, eggs, fortified foods. Groups with tea, candy etc and oils were excluded, because none of them contribute to what is defined as health/necessary foods or nutrients. In table 11 the DDS for both women and children is put into the same table. The first column shows the DDS i.e. the **numbers** of food groups eaten and for example 1 % of the women had eaten food from only 2 food groups, 5 % of the children have eaten from 3 food groups and so on.

Table 11 Dietary Diversity Score (DDS) for women (15 – 45 years) and children (6-14 years), and how many percent that had eaten from the numbers of groups, Saharawi refugee camps January/February 2007

Dietary Diversity Score	Percent of women (15 – 45 years) N=405	Percent of children (6-14 years) N=421
1	0	0
2	1	0
3	6	5
4	13	10
5	27	31
6	28	26
7	16	23
8	9	6
9	0	0
10	0	0
11	0	0

The maximum number of food groups that the same person has eaten from was 8 of 11 possible and it was 9 % of the women and 6 % of the children that has done that. Most of both women and children had eaten from 5 - 7 food groups. The mean (±SD) DDS for the women was 5.6

(±1.3) and for the children 5.7 (±1.2). There were no significant differences between the women and children, neither between the camps.

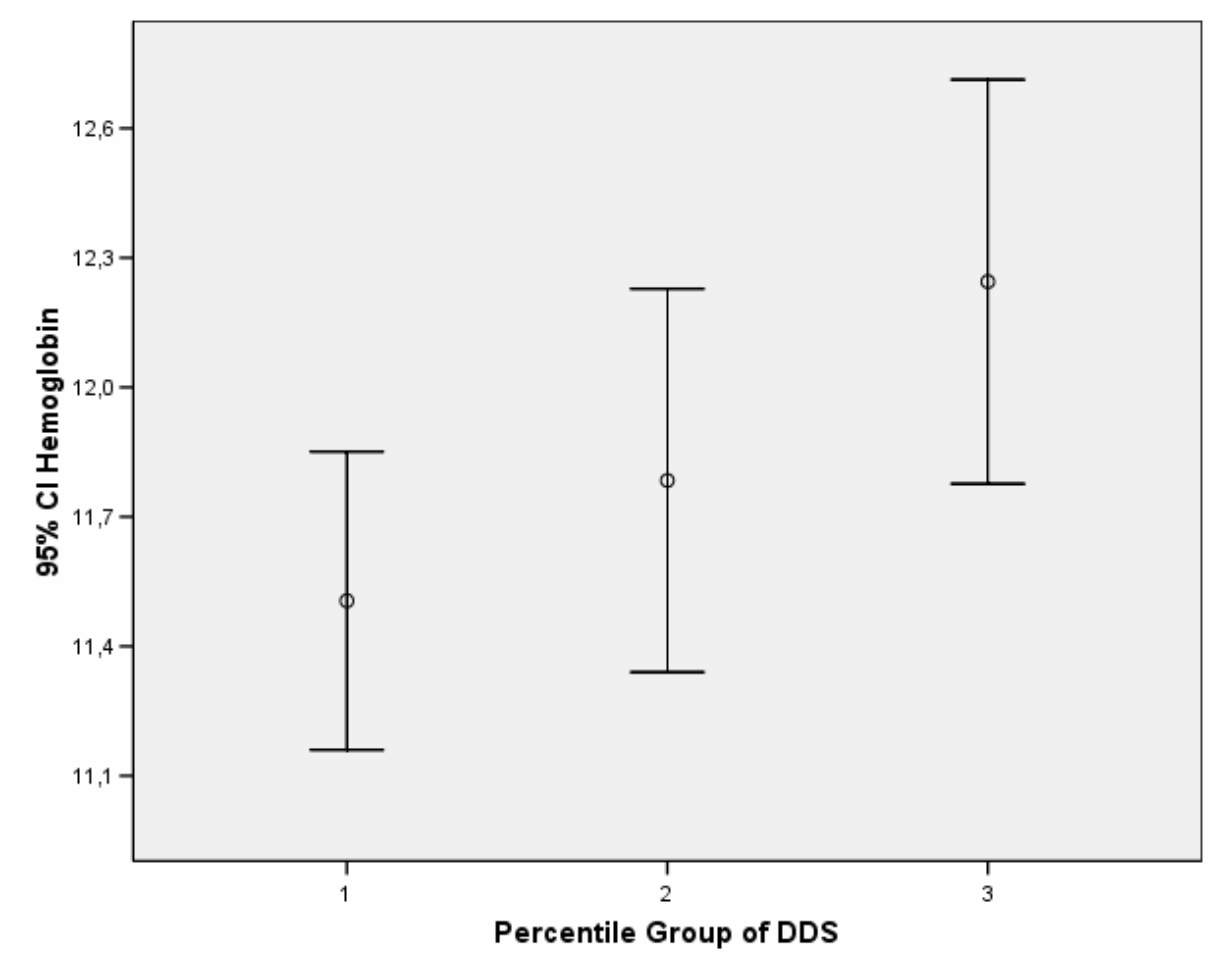

Figure 5 Effect of women's DDS, divided in three groups, on haemoglobin status, Saharawi refugee camps, January/February 2007

Figure 5 shows that when dividing the women into 3 groups with low, medium and high DDS, the haemoglobin values were significantly higher in the highest group (T-Test p=0.01). This can indicate that higher DDS for women, i.e. more diversity food intake, leads to a better haemoglobin status. *This result supports the theory that diversity of food intake can lead to better health. When 50 % of a population is eating from only half of the possible available food groups and none eat from more than 8 of 11 possible, this food pattern can be characterized as monotonous and unhealthy. It is important to assess food intake and use the results to promote the importance and necessity of food variety for the Saharawi population, especially because they are in a refugee situation and depend on food aid from outside.*

7. Background information

The survey included 96 household from the 4 camps and in total there were 405 women (15-45 years) and 421 children (6 – 14 years). The household size was in average 11 persons with minimum 4 and maximum 30 persons. Seventeen percent had no children less than 5 years. Average number of children less than 5 years in the other households was 2 (min 1 and max 8).

Eight percent of the households had access to a vegetable garden, all of them in Dakla.

Most of the selected households had animals, 87 %; 100 % in Dakla, 92 % in El Aiune, 75 % in Ausserd and 74 % in Smara. One household in Dakla had camels, 85% had goats (from 1 to 16), 32 % had sheep (from 2 to 10), one household in Ausserd had chicken and one family in Dakla had a donkey. Most of the households used the milk or meat products themselves but 22 % also sold the products.

Most of the households had tent and brick rooms (94 %) but 26 % did not have latrine and most of those were in Dakla.

Fifty-seven percent of the women had stayed in the camps all their life, 33 % had lived in Vest Sahara, 5 % had lived as Bedouins and the rest (5 %) had lived in Algeria, Mauritania, Tifariti and Tindouf. Sixty- four percent had been outside the camps on holiday (mostly in Spain and Italy), or studies (most of them in Algeria). Of the children, 93 % had stayed in the camps their whole life and 66 % had been on holiday abroad; most of them in Spain but also some in Italy and Algeria.

When asking the children's mother, 10 % said that the child had been bothered with diarrhoea during the last 2 weeks and 28 % had had fever or coughing.

In table 12 there is some more background information about the women and breastfeeding habits.

Table 12 Background information about the women in Saharawi refugee camps January/February 2007

Women	**Total in N=405**
Age, year, mean (min – max)	29 (15-45)
Marital status, % (numbers)	
– Not married	39 (158)
– Married	54 (220)
– Divorced	5 (19)
– Widow	2 (7)
Education, in % (numbers)	
– None	10 (41)
– 1st to 3rd grade	11 (43)
– 4th to 6th grade	27 (110)
– 7th to 9th grade	35 (60)
– 10th to 12th grade	15 (60)
– Higher education	2 (9)
Courses in the camps	26 (105)
Language other then Hasania/Arabic, % (numbers)	
– Spanish	
– French	13 (52)
– English	0.2 (1)
	1 (4)
Working outside the house, % (numbers)	32 (130)
How many women have children, % (numbers)	56 (225)
How many children, mean (min-max)*	3.6 (1-12)
How many usually breastfeed, % (numbers)*	98 (205)
How many months usually of breastfeeding, mean (min-max)*	21 (2-24)
Breast feed somebody else's child, % (numbers)*	70 (150)
When usually starting breastfeeding*:	
– within 30 min, in % (numbers)	39 (88)
– within 6 hours, in % (numbers)	39 (87)
– within 12 hours, in % (numbers)	17 (38)

*Only those women that had children

Table 12 shows that 39 % of the women were not married but the most of these (95 %) were less than 20 years. In a group of the women from 15 -45 years half of them had less than 7th grade, of these 10 % had none education and 11 % had up to 3rd grade. The survey shows that half of the women (52%) had been given education outside the camps[21]. Of those that had taken courses in the camp only 14 % were in the groups of education up to 6th grad.

Fifty-six percent of the women had children and only one of those was less than 20 years. The breastfeeding habits seemed good: nearly all women had breastfeed and 70 % had also

[21] It is only education up to 6th grade in the camps.

breastfeed somebody else' child. The survey showed also that most of the breastfeeding started within 6 hours but showed also that 83 % of the women gave sugar water and 3 % gave water with oil, before starting breastfeeding. Here is potential for improvement.

8. Conclusion and recommendations

Goitre and iodine

The prevalence of goitre among the Saharawi refugees was high; in total 11 % of the children and 18 % of the women had goitre. For children the highest prevalence was found in El Aiune (22 %) and for women in Smara (26 %). *Those children and women who are classified as having goitre by palpation should be followed up by further medical expertise. This initiative should come under the new strategy for Saharawi National Nutrition Programme which is launched these days.*

Excretion of iodine in urine was also high; 79 % had higher concentration than 300 µg iodine per litre of urine which is categorised as excessive. *Yearly control of the excretion of iodine in urine in school children should be an action under the Saharawi National Nutrition Programme.*

The highest content of iodine in water was found in the sources for El Aiune and Ausserd. In Smara where they got water from a purifying reverse osmotic plant, the level of iodine was acceptable and the children have probably benefited from that. *The high level of iodine in the drinking water from the wells in El Aiune area, which provide both El Aiune and Ausserd camps, can be harmful and there is a need to purify the water.*

The main sources of iodine among women seem to be water, locally produced milk, salt and tea water. Salt and tea contributed in small amounts but the local milk gives reasons for concern. Not only was the iodine content high but looking to what the animals are eating, especially the goats eating plastic, cartons (re-circulated paper) and whatever they find, we can suspect that the milk (and meat?) contain organic compounds such as dioxin, PCB and PVC and heavy metals. *The problem around animal husbandry has to be investigated further to be sure that advising people to do it and using milk and meat is safe. Also this should be an initiative under the new strategy for Saharawi National Nutrition Programme.*

Nutritional status

In total 26 % of the children were stunted and too small for their age. This is due to inadequate food intake over long time. *The children have to be secured against malnutrition through*

adequate food basket and supplementary feeding. This is a responsibility for all involved in the work with the Saharawi people and will be one of the main issues in the Saharawi National Nutrition Programme.

The BMI among the women (15 - 45 years) in the camps had a similar distribution as in western countries; too many were overweight or obese, and few were underweight. Those who were underweight were not more anaemic than those who were overweight; 3 % of the underweight and 12 % of the overweight/obese were all severely anaemic. *Thus BMI was not an indicator for neither low or high Hb status and one of the problems is that being overweight does not mean that people can not be malnourished, for example anaemic. This shows that BMI can not predict anaemia in this population.*

When it comes to anaemia, 46 % of the non-pregnant women were anaemic. According to WHO (2001), a prevalence of anaemia of more than 40 % is considered as a significant public health problem. While the BMI could not predict the anaemic status it seems as if a woman had a child or if she was breastfeeding or not, could. Those who had children were significantly more anaemic then those who had not given birth; those breastfeeding had a significantly lower median Hb than those not breastfeeding and 64 % of the pregnant women were anaemic. *The results indicate that the problems of anaemia still are serious especially for the mothers, and further investigation of this complex problem is necessary to find and verify the causes so that recommendations for action can be given. This will also be one of the main issues in the Saharawi National Nutrition Programme.*

Food situation

The year 2006 was characterized by gaps in the food pipeline and disagreement between the UN and Saharawi authorities about the numbers of beneficiaries. This has probably affected the fact that more households this time said that they had experienced a lack of food compared to 2004-2005. There were also differences between the camps. Dakla was special in all the cases; either they had used the food item more or less than the others. Fewer persons in Dakla had used potatoes, canned fish and barely and more had used milk and egg than in the other camps. *The reason why should be explored.* One important thing that had started in 2006 was the distribution of fresh vegetables and fruit. *It is important to realize that the food basket must be adequate and that the fresh food is an important contributor. It is highly recommended that this continues. It is also necessary that the pipeline and distribution function properly.*

Individual assessment of the food intake revealed that both children and women usually had three main meals; breakfast in the morning such as soup, bread, biscuit, milk, leftover food and tea; lunch around 13-14 o'clock with hot dishes and dinner in the evening around 21-23 o'clock also hot dishes. Children also told that they had fortified biscuits at school before lunch, which secure that the biscuits are used as a supplement and not replacing the breakfast or the lunch. *This is very important and it is recommended that distribution of the biscuits continue in the same way, and not as a replacement for breakfast or lunch. If so happens the children will eat less and their situation will deteriorate.*

The analysis method DDS (Dietary Diversity Score) was used to analyse the individual food intake data for both children and women. First 14 food groups were chosen to represent the different food items. Less than 50 % of the women and children had had intake of dairy products (28 % of the women, 22 % of the children), local milk (w-34 %, ch-23 %), fruit (w-38 %, ch-46 %), canned fish (w-42 %, ch-46), liver (w-2%, ch-1 %) and egg (w-9%, ch-8 %). More than 90 % had had intake of cereals, other vegetables than carrots, tea/sweets/drinks and oils (only women, 76 % of the children), while from 50 - 60 % of both women and children had had intake of vitamin A rich vegetable (carrots), lentils and meat and 55 % of the women had had fortified food and 73 % of the children. Some of the differences were significant; more women had had dairy products, local milk and tea, while more children had had fruits, sweets and fortified foods. There were also significant differences between the camps in the most of the food groups. The exceptions were for women lentils, tea/sweets/drinks and oils/fat and for children other fruits, fortified food and oil/fat. When converting the data from the 14 food groups to Diet Diversity Score (DDS) only 11 food groups was used; cereals, total dairy (all type of milk and milk products together), vitamin A rich fruit and vegetables, other vegetables, other fruits, lentils, canned fish, meat, liver, egg, fortified food. The maximum number of food groups eaten from, during one day, was 8 and only 9 % of the women and 6 % of the children had done that. The most of both women and children had eaten from 5 – 7 food groups and there were no significant differences between the women and children, neither between the camps.

When 50 % of population is eating from only half of the possible available food groups and none eat from more than 8 of 11 possible, this food pattern can characterized as monotone and unhealthy. When dividing the women into 3 groups with low, medium and high DDS, the haemoglobin values were significant higher in the third group. *This can indicate that higher DDS for women, i.e. more diversity food intake, leads to a better haemoglobin status. This*

result support the theory that diversity of food intake lead to better health. It is important to assess food intake and use the results to promote the importance and necessity of food variety for the Saharawi population, especially because they are in a refugee situation and depended on food aid from outside.

9. Methods and sample

The area for the data collection was in the Sahara desert southwest in Algeria. The target population is 165.000 refugees from the occupied country Western Sahara who are living in four refugee camps in the area of Tindouf, Algeria. The study population was children 6-14 years and women from 15-45 years and they constitute approximately 40 % of the refugee population.

Study design

A cross-sectional survey was conducted during January and February 2007 in the four refugee camps Smara, El Aiune, Ausserd and Dakla, in the Algerian desert. The data collection was done among the refugees in their homes (tents) by two teams who spent 14 days in the period 20.01.07-12.02.07.

Sample size

The required sample size was calculated using EpiInfo Statcalc on the experience of expected prevalence of goitre (7%) and desired precision (5%). The following formula was used in the sample size calculation:

$$n = \frac{z^2 \cdot p(1-p)}{m^2} \cdot Deff$$

where:

n = sample size

z = standard normal deviation corresponding to α=0.05 (1.96)

p = estimated population proportion of defined conditions (7%)

m = expected precision (0.05)

$Deff$ = design effect (1)

Based on this calculation, the sample size should be at least 103 children and 103 women from each camp. In the study, 405 women (15-45 years) and 422 children (6 – 14 years) from the camps Smara, El Aiune, Ausserd and Dakla were randomly selected.

Sampling

There were no available lists of the population in the camps; therefore, the sample selection was done by multistage cluster sampling. In 2006, ECHO had estimated that the total number of households in the camps were 31,339 households, of which 27 % were small household (1-3

persons), 41 % median households (4-6 p) and 32 % big households (>7 p). This meant approximately 7,800 households per camp (the camps are assumed to be similar in size). An earlier study had found that the average household size was 6.5 persons (NCA 2005) so it was assumed that approximately 80 households per camp were needed. Each camp is organised in 6 districts (dairas) and this gave 13 households per daira (80/6=13).

The dairas were used as the first cluster and 13-15 households were randomly selected from each daira. This was done by firstly to register the centre of the daira (*dispenseria*), and then drive randomly to the edge of the daira. There, one started to count households and the 40th household reached was chosen. Thereafter, one drove randomly around and chose each 40th household. The chosen households were the next cluster and all eligible subjects in the households were included. The selection of households continued until the number of both children and women were reached. This was done the day before the survey, to prepare the participations and give them a container for urine collection. Each container was marked with the date and the number of the household, and the person's name in Arabic.

Thyroid size

Goitre was graded according to the classification presented in Table 7. The subject to be examined stood in front of the examiner, who looked carefully at the neck for any sign of visible thyroid enlargement. The subject was then asked to look up and thereby to fully extend the neck. The examiner palpated the thyroid by gently sliding the thumb along the side of the trachea (wind-pipe) between the cricoids cartilage and the top of the sternum. If necessary, the subject was asked to swallow (e.g. some water) when being examined, and the thyroid will move up on swallowing. The size of each lobe of the thyroid was compared to the size of the tip (terminal phalanx) of the thumb of the subject being examined.

Table 7 Simplified classification of goitre by palpation according to WHO 1994

Grade 0	No palpable or visible goitre.
Grade 1	A goitre that is palpable but not visible when the neck is in the normal position.
Grade 2	A swelling in the neck that is clearly visible when the neck is in a normal position and is consistent with an enlarged thyroid when the neck is palpated.

Interpretation

Table 8 gives the epidemiological criteria for establishing IDD severity and is based on goitre prevalence in school-aged children. The terms mild, moderate, and severe are relative and should be interpreted in context with information from other indicators. It is recommended that

a total goitre rate (TGR, number with goitres of grades 1 and 2 divided by total examined) of 5% or more in schoolchildren 6-12 years of age should be used to signal the presence of a public health problem, called endemic goitre. The cut-off point of 5% allows both for some margin of error of goitre assessment, and for goitres that may occur in iodine-replete populations due to other causes such as goitrogens and autoimmune thyroid diseases.

Table 8 Epidemiological criteria for assessing the severity of IDD in school-aged children

Degrees of IDD, as percentage of the total of the number of children surveyed				
	None	Mild	Moderate	Severe
Total goitre rate	0.0-4.9%	5.0-19.9%	20.0-29.9%	30 %

Ultrasonic equipment

When the prevalence of visible goitres is small, ultrasonography provides a more precise measurement of thyroid volume compared with palpation[22].

The thyroid volume was determined by a portable ultrasound (Sonosite Titan) 5-10 MHz using a linear transducer, internally focused at 3.9 cm, with a diameter of 38 mm. Measurements was performed while the subjects recline with the neck hyper extended. A transducer was applied to the neck and since air does not transmit ultrasound, it had to be coupled to the skin with a gel. The method of Brunn et al (1981)[23] was used to perform longitudinal and transverse scans allowing the measurements of the depth (d), the width (w) and the length (l) of each lobe. The thyroid volume is the sum of the volumes of both lobes and the volume of the isthmus is not included. The volume of the lobe is calculated by the formula: V (ml) = 0.479 x d x w x 1 (cm).

[22] Zimmermann et al. (2003). Thyroid size and goiter prevalence after introduction of iodized salt: a 5-y prospective study in schoolchildren in Cote d'Ivoire. Am J Clin Nutr. 2003 Mar;77(3):663-7.

[23] Brunn et al. (1981). Volumetric analysis of thyroid lobes by real-time ultrasound (author's transl). Dtsch Med Wochenschr. 1981 Oct 9;106(41):1338-40.

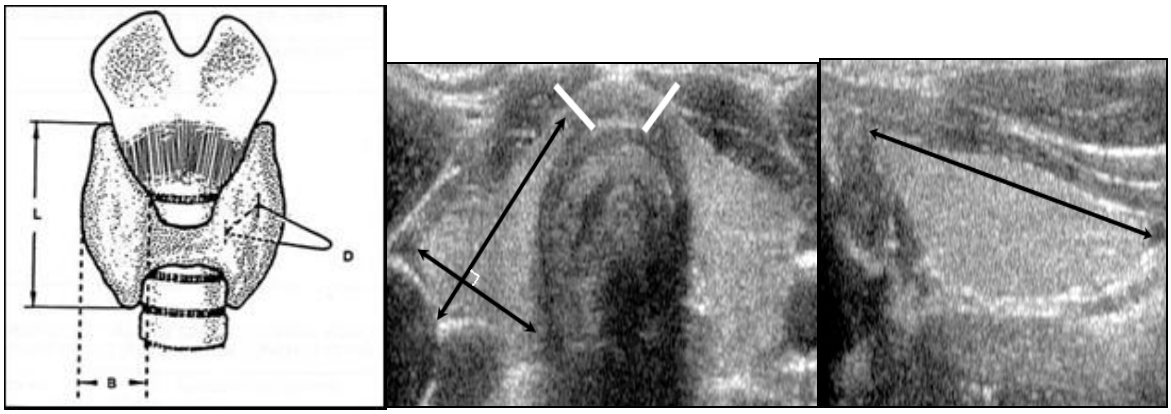

Figure 5 The length, depth and width of the thyroid lobes

Interpretation

Results of ultrasonography from a study population should be compared with normative data. A thyroid gland will be called goitres when its value will be above the 97th percentile of the volume found in an iodine-replete population used as control. Current WHO/ICCIDD upper limits for thyroid volume in children aged 6-12 years by sex will be used to define the presence or absence of goitre. In adults no universal reference values for thyroid volume measured by ultrasonography of iodine sufficient populations are presently available[24].

Urinary iodine

Most iodine absorbed in the body eventually appears in the urine (90 %). Therefore, urinary iodine excretion is a good marker of recent dietary iodine intake. In individuals, urinary iodine excretion can vary somewhat from day to day and even within a given day. However, this variation tends to even out among populations. Studies have convincingly demonstrated that a profile of iodine concentrations in morning or other casual urine specimens (child or adult) provides an adequate assessment of a population's iodine nutrition, provided a sufficient number of specimens are collected. The urine samples was analysed according to the Sandell-Kolthoff reaction; small samples of urine (10 ml) were digested with ammonium persulfate at 90-110 o C. Iodide is then the catalyst in the reduction of ceric ammonium sulfate (yellow) to the cerous form (colourless). The decrease in yellow colour over a fixed time period is then measured by a spectrophotometer and plotted against a standard curve constructed with known amounts of iodine.

[24] Zimmermann et al. (2004). New reference values for thyroid volume by ultrasound in iodine-sufficient schoolchildren: a World Health Organization/Nutrition for Health and Development Iodine Deficiency Study Group Report. Am J Clin Nutr. 2004 Feb;79(2):231-7.

Interpretation

Table 8 Epidemiological criteria for assessing iodine nutrition school children

Median urinary iodine (µg/l)	**Iodine intake**	**Iodine nutrition**
< 20	Insufficient	Severe iodine deficiency
20-49	Insufficient	Moderate iodine deficiency
50-99	Insufficient	Mild iodine deficiency
100-199	Adequate	Optimal
200-299 >300	More than adequate Excessive	Risk of iodine-induced hyperthyroidism Excessive risk of adverse health consequences (iodine-induced hyperthyroidism, autoimmune thyroid diseases)

Identifying level of iodine in food and water

From each household samples of the water, salt, milk and other foods that have been eaten/drunk the day before was collected. The households were asked to give away small samples of the food that they have had as meals.

Because each camp has bakeries where people get their bread, samples from these places also was collected.

The water supply in the camps has changed during the thirty years. Now all the camps have rather new water sources; two of them have water from wells drilled by NCA during the period of 2001-2003, one has a new water source from 2004 and the last camp has reverse osmosis treated water, since 2005. Because we wanted the history of iodine intake, it was necessary to take samples from both old and new water sources. These samples were analysed for other parameters than iodine as well.

For analysing iodine content in food, salt and water, different methods was used. Sandell-Kolthoff reaction has been preferred for iodine determinations in biological material but now, for foodstuffs, has emerged as a useful method. Milk and the water samples from the main wells are analysed with the ICP-MS (Inductively Coupled Plasma - Mass Spectrometry). Water

from the households were analysed by Sandell-Kolthoff reaction and salt was analysed by using the standard iodometric titration.

Assessment of the food and nutrient intake in the target groups

A 24 hour recall of the food eaten and drunk the day before was executed. Women and children was asked about the first food and drink intake the day before, and then consecutive intake for the rest of that day. For the women the quantity was assessed by asking the amounts and weighing the same food and drink items as they have consumed (or in some cases substitutes) on an electronic scale. It was also necessary to collect information about the recipes for the dishes that they have eaten. The food items were weighed raw and there were developed conversions factors from raw food to boiled food. For the children the quantity was not measured; they were only asked about the frequency of the food intake. Since the recipes for the dishes consumed in the households were collected, information about the food intake would be of good quality and the information will be used to calculate dietary diversity scores and the proportion of the food intake but not the intake at nutrition level. The mother or another caretaker helped children less than 12 year to answer the 24-h recall. In this report the food intake, dietary diversity score or the food security has not been evaluated but this will be done in a separated report.

Even though the water intake was assessed the method did not manage to give valid results to predict the iodine intake in µg, but the main sources of iodine was probably found. This will be reported in a separated report.

Measuring height and weight

Height and weight will be measured using standard anthropometric procedures (WHO 1995). For measuring the weight, light indoors cloth will be allowed, but not shoos. The weight will be recorded to the nearest 100 g and the height to the nearest mm. There will be used portable electronic scales and height boards. These parameters allow us to estimate the prevalence of malnutrition and to assess if there are associations between iodine status and nutritional status.

Measuring of Hemoglobin

For measuring the haemoglobin in women a field haemoglobin analyser (HemocueTM) was used. The haemoglobin was measured to the nearest 0.1 g/dL.

Table 9 shows different cut-off points used to define the categories of anaemia.

Table 9 Different categories of anaemia

	Non pregnant (above 15 years)	Pregnant (above 15 years
Severe	<8 g/dl	<7 g/dl
Moderate	8 -10.9 g/dl	7-9.9g/dl
Mild	11-11.9 g/dl	10-10.9 g/dl
Normal	≥12 g/dl	≥11 g/dl

The category of public health significance of anaemia based on prevalence estimate in table 9, is shown in table 10[25].

Table 10 Public health significance of anaemia

	Prevalence of anaemia (%)
Severe	>or= 40
Moderate	20.0 – 39.9
Mild	5.0 – 19.9
Normal	< or= 4.9

[25] WHO (2001). Iron Deficiency Anaemia. Assessment, Prevention, and Control – A guide for programme managers

Norwegian Church Aid and Akershus University College, 05.06.2007					Muestras											
					1. Dakla, pozo J'freifia, 22.01.07	2. Dakla, OBL-2, 22.01.07	3. Dakla, pozo falina, 22.01.07	4. Dakla, pozo viejo, 22.01.07	5. El Ajun, pozo 1 HT-13, Tanke, 17.02.07	6. El Ajun, pozo 2 HT-12, NCA, 28.01.07	7. El Ajun, pozo 3 GL-1, Ausserd, 28.01.07	8. Agua de té de Tindouf, 05.02.07	9. Smara, SA-10, osmosis - bruto, 12.02.07	10. Smara, SA-10, osmosis - proceso, 12.02.07	11. Tifariti, 15.02.07	12. Rabouni, SA-07, 17.02.07
Parametres fhysico-chemiques		**Unidad**	**Norma Argelia**	**Norma UE**												
Ph	pH		6,5-8,5	6,5-9,5	8.19	7.79	7.76	7.65	8.28	8.08	8.19	8.53	7.95	7.48	7.85	7.99
Conductive		mS/m	280	<250	165	165	141	207	274	224	219	85.8	408	46	363	364
Alkali		mmol/l			3.412	3.127	1.921	2.238	5.68	5.722	6.05	6.93	4.339	0.451	3.026	4.325
Turbidite		v/860 FNU	5	<1	7.47	0.6	1.27	0.18	0.88	0.6	0.27	1.93	76.8	0.5	0.42	0.51
Color		mg Pt/l		<20	1.9	<1	2.3	<1	<1	<1	<1	<1	<1	<1	<1	<1
Parametres polución																
Fosforo	Tot P	µg/l P		<7	98	1	61	1	11	3	6	25	41	2	<1	4
Fosfato	PO_4	µg/l P			85	<1	55	<1	2	3	5	20	44	<1	<1	3
Nirogeno, total	tot N	mg/l N			6.97	1.45	5.9	1.76	25.07	18.37	18.37	4.5	29.8	3.81	5.44	25.07
Nitrato	NO_3	mg/l N		<10	6.1	1.15	5.7	1.5	20.5	16	16	4	27.5	3.55	5.25	23.5
Mineral global																
Cloruro	Cl	mg/l	500	<200	264	249	248	290	396	306	294	35.8	788	75.4	959	588
Sulfato	SO_4^{2-}	mg/l	400	<100	166	265	150	478	463	346	316	58.8	563	49.1	116	700
Karbono,orgánico C	TOC	mg/l		<5	0.77	<0,20	0.69	<0,20	0.61	<0,20	<0,20	0.31	0.46	<0,20	<0,20	<0,20
Calsio	Ca	mg/l	200		39.5	136	84.7	193	151	138	130	67.9	237	20.7	334	258
Magnesio	Mg	mg/l	150		2.8	14.6	7.8	23.6	101	83.1	80.9	41.4	91.6	7.9	48.1	93.1
Sodio	Na	mg/l	200		298	182	175	203	282	214	211	57.3	485	49.5	291	391
Parametres indeseado																
Hierro	Fe	mg/l	0.3	<0,2	0.0357	0.002	0.0072	0.01	0.0034	0.014	0.013	0.006	0.0973	<0,001	0.057	0.0655
Manganeso	Mn	mg/l	0.5	<0,05	0.0041	0.0598	0.0007	0.0018	<0,0003	<0,0003	<0,0003	0.0007	0.0031	<0,0003	0.028	0.0011
Fluoruro	F	µg/l		<1500	5950	590	370	465	2150	1900	1950	740	1750	160	2350	1800
Silico	Si	mg/l			19.2	7.17	8.03	7.8	17.8	17.4	19.7	19.8	18.2	1.58	14.9	16.8
Salado		‰			1	0.7	0.5	0.9	1.3	1	1.9	0.2	2.1	0	1.8	1.9
Yodo	**I**	**µg/l**	**Normalemente agua de mar 50 µg/l**		**280**	**69**	**32**	**87**	**352**	**294**	**261**	**143**	**403**	**37**	**35**	**422**
			Normalemente agua potable <15 µg/l													

Annex 3

Questionnaire 1 Household

98 = I have not asked
99 = They don't know

Iodine survey in the Saharawi camps January - February 2007

Questionnaire about the family background

1. **Date**.... .... ☐☐.☐☐.☐☐
2. **Camp and Daira** .... ☐☐
   1=Smara, 2=El-Ajun, 3=Ausserd, 4=Dakla, (Daira according to a list)
3. **Household id** .... ☐☐☐
4. Time the interview 5a) start ☐☐-☐☐ 5b) Stop☐☐-☐☐
5. Gender of Head of household .... ☐☐
   1=Man, 2=Women
6. Age of head of household..... ..... ☐☐ years
7. How many people live in this household here and now (count those at 12october school in the area but not those that are abroad or other places in Algeria)? ..... ☐☐
8. How many children are under 5 years? .... ☐☐
9. Was the food ration that you received last time enough? ..... ☐☐
   0=No, 1=Yes

   9.1. If no, what did you run out of? ....

   ....

   9.2. When did you received the last ration ....

10. Which of the following foods or drinks have you consumed in the household the last two weeks? .... ☐☐
    (Ask all foods and drinks and mark YES with **X**)

10.1.Wheat flour..... ☐	10.17.Tomato ..... ☐
10.2.Rice..... ☐	10.18.Apple/pear..... ☐
10.3.Gofio..... ☐	10.19.Banana..... ☐
10.4.BP-5 ..... ☐	10.20.Dates..... ☐
10.5.WSB ..... ☐	10.21.Orange..... ☐
10.6.Spaghetti ..... ☐	10.22.Juice ..... ☐
10.7.Barley ..... ☐	10.23.Coke, fanta etc. .... ☐
10.8.Lentils/beans..... ☐	10.24.Milk/yoghurt ..... ☐
10.9.Bread..... ☐	10.25.Cheese ..... ☐
10.10.Biscuits ..... ☐	10.26.Eggs..... ☐
10.11.Meat ..... ☐	10.27.Butter/margarine .. ☐
10.12.Sardine/tuna..... ☐	10.28.Oil..... ☐
10.13.Potato ..... ☐	10.29.Sugar ..... ☐
10.14.Carrot..... ☐	10.30.Tea..... ☐
10.15.Onion ..... ☐	10.31.Other: .....
10.16.Pepper ..... ☐	

Questionnaire 1 Household

98 = I have not asked
99 = They don't know

11. Who did usually eat from the same plate in this household? .....
....

12. According to the tradition are there any foods that some in the family can not eat? .... ☐☐
0=No, 1=Yes

12.1. If Yes, which foods..... .....

12.2. Whom in the family..... .....

13. What kind of medicine does the family use when they are ill?..... ☐☐
0=None, 1= Traditional, 2= Modern, 3= Both

14. Does the household have access to a vegetable garden (family or public)? ..... ☐☐
0=No, 1=Yes

14.1. If yes, Which products ....
....

14.2.What does the family do with the products? .... ☐☐
1= use them in their own household, 2= sell (or give away), 3= both use them and sell

15. How many animals have the household:

15.1. Goat ..... ☐☐☐

15.2. Sheep ..... ☐☐☐

15.3. Camel ..... ☐☐☐

15.4. Hens or chicken ..... ☐☐☐

If you have animals

15.5.What does the household with the meat/egg/milk? ..... ☐☐
1=use them in their own household, 2= sell (or give away), 3= both use them and sell

16. How many tents have the household available?..... ..... ☐☐

17. Does the household have a kitchen in separate room?... ..... ☐☐
0=No, 1=Yes

18. Does the household have a latrine..... ..... ☐☐
0=No, 1=Yes

19. How many brick rooms does the household have (except kitchen and latrine)? ..... ☐☐

Were from is the household getting water:

20. From where to you get the water for making the .... ☐☐
1= a sweet water source in Tindouf, 2= a sweet water source in Dakla, 3= bottle water, 4= other .....

20.1.For how long have you used this water? .... ☐☐ years

21. From where do you get the drinking water? (write)..... .....

21.1.For how long have you used this water? .... ☐☐ years

If less than 1 year, ask:

21.2.Where do you get the water from before ……

22. From where do you get the water for making food .... ☐
1= same as for drinking, 2=other ....

22.1.If other, for how long have you used this source..... ..... ☐☐ years

98 = I have not asked
99 = They don't know

Iodine survey in the Saharawi camps January - February 2007

Questionnaire to the females (15-45 years)

23. **Date**.... .... ☐☐.☐☐.☐☐

24. **Id number** .... ☐☐☐-☐☐

25. Time the interview: ..... 3a) start ☐☐-☐☐ ..... 3b) stop☐☐-☐☐

26. How old are you .... ☐☐ years

27. Have you lived in the Saharawi refugee camps your whole life? ..... ☐☐
0=No, 1=Yes

If No

27.1. Where did you lived before ....

28. Who many years have you lived in this camp..... ..... ☐☐ years

28.1.If you lived in other camps before? 6.1a) Where……6.1b) Period……. .....

6.2a) Where……6.2b) Period .....

29. Have you been away from this camps for holiday, education, medical treatment ..... ☐☐
0=No, 1=Yes

29.1.If Yes, for Holiday……7.1a) Where…… 7.1b) How long……

29.2.If Yes, for Education…… 7.2a) Where…… 7.2b) How long……...

29.3.If Yes, Treatment……. 7.3a) Where……..…. 7.3b) How long……

29.4.If Yes, Other, what ……..7.4a) Where…… . 7.4b) How long……...

30. Marital status: .... ☐☐
0=Not married, 1=Married, 2=Divorced, 3=Widowed

31. How long education do you have .... ☐☐
0=None, 1=less than 6th grade, 2=up to 6th grade, 3=7 to 9th grade, 4=10 to 12th grade, 5=higher education

32. Have you attended any courses in the refugee camps?... ..... ☐☐
0=No, 1=Yes
If Yes

32.1. a Which.....10.1b) How long .....

32.2. a Which.....10.2b) How long .....

33. What language do you talk, read or write? (mark with X)

33.1.Hasanía ..... 11.1a)talk ☐

33.2.Arabic ..... 11.2a)talk ☐ .....11.2b)read ☐..... 11.2c)write ☐

33.3.Spanish ..... 11.3a)talk☐ .....11.3b)read ☐..... 11.3c)write ☐

33.4.Other (which?)..... 11.4a)talk☐ .....11.4b)read ☐..... 11.4c)write ☐

34. Are you working at the moment? .... ☐☐
0=No, 1=Yes

34.1.If yes, with what?.....

35. Do you have children .... ☐☐
0=No, 1=Yes

IF NO go to question 20

36. If YES How many children do you have?

36.1.a) alive .....☐☐ 14.1. b) dead ..... ☐☐

98 = I have not asked
99 = They don't know

37. Are you breastfeeding now? ..... ☐☐
0=No, 1=Yes

38. Do you usually breastfeed our children? ..... ☐☐
0=No, 1=Yes

38.1. **If No**, why not? .....

If Yes:

38.2. For how long time do you usually breastfeed your children ..... ☐☐ months

38.3. When you stop breastfeeding, what is usually the reason? ..... ☐☐
1=still breastfeeding, 2=new pregnancy, 3=no milk, 4=child refused, 5=child too old, 6=other.....

39. Have you breastfeed another child (wet nursing)? ..... ☐☐
0=No, 1=Yes

40. How long time after birth do you usually start breast feeding your child? ..... ☐☐
1=within the first 30 min, 2=within the first 6 hours, 3=within the next 6 hours (the first day), 4=within the second day, 5=within the third day, 6=other…….

41. .Do you usually give your child anything to drink before you started breastfeeding? . ☐☐
0=No, 1=Yes **If yes**, what? (Mark with X)

41.1. Sugar water ..... ☐☐

41.2. Goat milk ..... ☐☐

41.3. Oil water ..... ☐☐

41.4. Other .....(what) .....

42. How do you usually breastfeed your children .... ☐☐
1=on demand, 2=at fixed intervals, 3=both

43. How old were your children when she/he got other thing than milk/water, (solid food like soup, biscuit, bread, egg, vegetables etc.) was introduced? ..... ☐☐
1=still only breastfeeding, 2=1-2 months, 2=3-4 months, 3=5-6 months, 4=7-8 months, 5=9-10 months, 6=11-12 months, 7=13 or more

44. Are you pregnant now? (do not ask the women that are not married) ..... ☐☐
0=No, 1=Yes

45. Have you used any medicine last two weeks? .... ☐☐
0=No, 1=Yes

23.1. If Yes, what kind…….

24. Do you have any disease .... ☐☐
0=No, 1=Yes
If yes

24.1. Which ....

25. What is the weight? ....☐☐,☐ kg

25.2. What is the weight of the cloths, ☐ 1 kg, ☐ 2 kg

26. What is the height? ....☐☐☐,☐ cm

Iodine survey in the Saharawi camps January - February 2007
Questionnaire to the children 6-14 years

1. **Date** ..... ☐☐.☐☐.☐☐
2. **Id number** ..... ☐☐☐-☐☐
3. **Gender** ..... ☐☐
   1= Male, 2= Female
4. Time the interview ..... 4a) start ☐☐-☐☐ .....4b) stop☐☐-☐☐
5. How old is the child? ..... ☐☐ years
6. Id number of the mother ☐☐ Mother not in the survey (mark with X) ☐
7. Has the child lived in this camp the whole life ..... ☐☐
   0=No, 1=Yes, If No, where did he/she live before?

   7.1a) Where…….....7.1b) Period……
   7.2b) Where…….....7.2b) Period
8. Has the child been away from this country for holiday, school or medical treatment or other ..... ☐☐
   0=No, 1=Yes

   8.1. If Yes, for Holiday…….8.1b) Where…… ..... 8.1c) How long……

   8.2. If Yes, for School……...8.2b) Where…… ..... 8.2c) How long……

   8.3. If Yes, for Treatment……..8.3b) Where……..... 8.3c) How long……

   8.4. If Yes, Other, what ……8.4b) Where…… ..... 8.4c) How long……
9. Is he/she attending a kinder garden or school? .... ☐☐
   0=No, 1=Kinder garden, 2=School

   9.1. If yes, how many hours per day .... ☐☐ hours

   9.2. Is he/she eating or drinking anything while at kinder garden or at school? ..... ☐☐
   0=No, 1=Yes

   9.3. If yes, ask and mark with X

   9.3.1… a)Biscuit ☐ b)Porridge ☐ c)Bread ☐ d)Water ☐e)Fruit ☐Other, what…….

   9.4. If school, ... ☐☐
   1 = 1 to 6th grade school, 2= more than 6th grade, 3=other, what?.....
10. Ask the mother if the child has had diarrhea, more than 3 loose stools/day, in the past 2 weeks? .... ☐☐
    0=No, 1=Yes
11. Ask the mother if the child has had an illness with fever or cough or difficulty breathing in the last two weeks? ..... ☐☐
    0=No, 1=Yes
12. Ask the mother if the child has used any medicine last 2 week ..... ☐☐
    0=No, 1=Yes

    12.1. If Yes, what kind……
13. What is the child's weight? ..... ☐☐,☐ kg

    13.1. What is the weight of the cloths ☐ ½ kg, ☐ 1 kg, ☐ 2 kg
14. What is the child's height? ..... ☐☐☐,☐ cm