

**Food Security Information System for Tubas, Hebron and Bethlehem  
Governorates (FSIS)**

**Household Blood Surveillance Report**

**Tubas Governorate**



*Conducted by*

**Applied Research Institute-Jerusalem (ARIJ)**



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### **Blood survey in Tubas Governorate**

The present survey was aimed at determining main malnutrition relevant deficiencies (MRD) in Tubas Governorate and analyzing the level of deficiency in relation to age and sex variables and localities. Total Blood samples collected were 689 from the most vulnerable eight localities targeted during the project period. Of these 682 were collected from persons of either sex, and 7 samples were from pregnant women. The age of the study participants ranged from 4 days to 100 years (Photos 1,2,3)<sup>1</sup>.

The results of blood tests analysis helped in assessing the nutritional status of the patients and determining the main MRD. Out of all the selected persons participated in the study, 15.1% had hemoglobin deficiency and 32.7% had ferritin deficiency, reflecting a high prevalence of anemia. Also, 8.7% of this same population suffered of total protein deficiency and 4% had been recorded to have the level of albumin low in the blood.

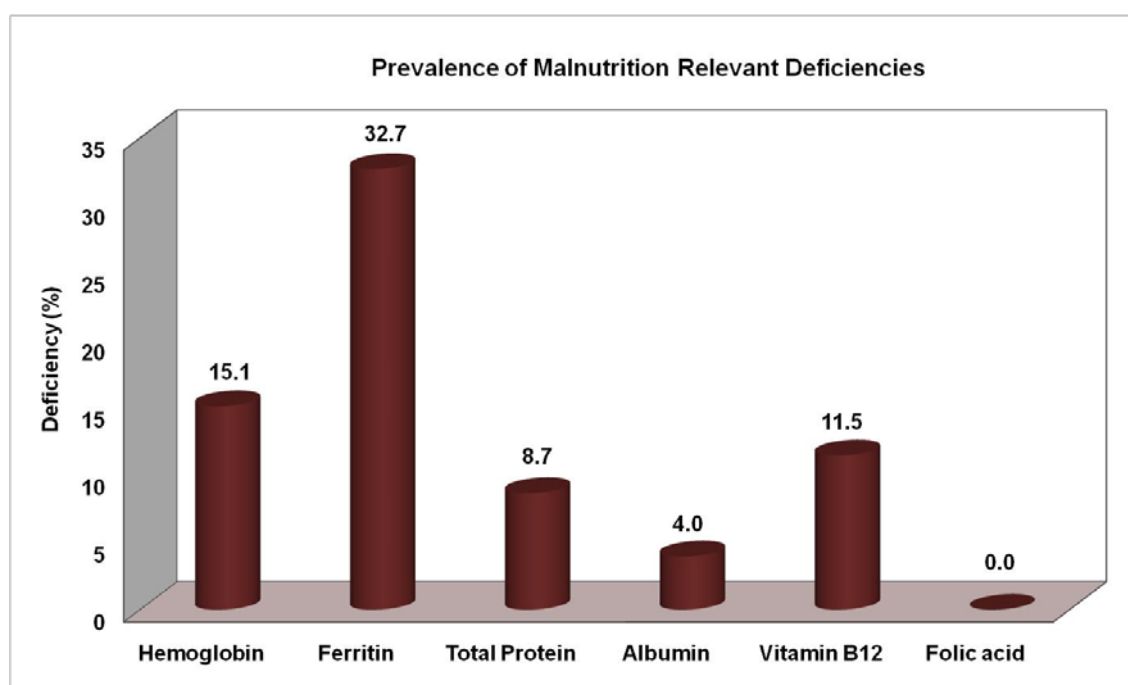
Other types of blood tests were also performed but for two different groups within the study participants. Vitamin B12 test was performed only for children under 14 years old, which comprised 38% of the total study participants. Of those 11.5% suffered vitamin B12 deficiency. The other test was for measuring the level of folic acid in the blood, and it was performed only for pregnant women. The results of folic acid test indicated that there were no problems of folic acid deficiency among pregnant women (Figure 1).



*Photos 1,2,3: Blood Test Survey in Tubas Governorate*

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<sup>1</sup> The Blood Survey Methodology can be found in details in the Integrated Blood Surveillance Report.



**Figure 1: Prevalence of MRD in Tubas Governorate, 2010.**

The study participants, excluding pregnant women, were divided in function of age to analyze the level of deficiencies in children and adults. The 682 participants were divided into four main groups to carry out the analysis in relation to age (Table 1). It was obvious from the results obtained that the prevalence of anemia is high among children and adults due to the low levels of hemoglobin and ferritin in the blood which screens nutritionally significant iron deficiency; 22.5% of people older than 49 years suffered from low hemoglobin level whereas 35.5% and of children between 1-14 and 34.1% of adults between 15-49 suffered from low ferritin level. Hemoglobin deficiency can be related to undernourishment and inadequate intake of iron on a short term whereas ferritin deficiency, which was noted with a higher prevalence, indicates iron depletion in the body. This can be related to long period of iron deficiency in the body, mainly due to monotonous diet with little or no meat and low calorie intake in relation to iron requirement during development and growth period of children.

Total protein deficiency was mainly observed among children under 1 year with a prevalence of 33.3% (Table 1). The deficiency affects those children that have not been given enough calories or protein in their first 12 months. Normally the calories and proteins in infants' diets are provided by adequate amounts of breast milk or infant formula. Therefore the main cause of protein deficiency in children is transition of the infant from breastfeeding to poor nutrition foods that do not provide them with the necessary nutritional requirements. Awareness of the mother about breastfeeding benefits and her health and nutritional status to breastfeed play an important role in the appearance and prevalence of MRD in the child's first year. In addition,

poverty is also an important factor that induces children's undernourishment as access to special costly infants' food and formulas that meets their requirements is not possible.

Another test that was performed and is considered as a good marker of the level of protein in the body is the albumin test. The results obtained indicated that the prevalence of albumin level is higher among elders above 45 years reaching up to 4.5% (Table 1)<sup>2</sup>. Albumin level decreases slowly as undernourishment progresses; this may explain the higher prevalence rate among the old as people with harsh economic situation and changes in food consumptions and habits undergo malnutrition and undernourishment. In addition an albumin level is related to other kidneys' and liver diseases that older adults may suffer.

The prevalence of vitamin B12 deficiency was observed to be higher among children under 1 year, which is 16.7%<sup>3</sup> (Table 1). In general, body stores 3 – 5 years worth of vitamin B12 and thus it takes years to manifest the results of the vitamin deficiency in adults<sup>4</sup>. In infants the signs of deficiencies are detected rapidly as they have not yet established considerable reserves of the vitamin.

**Table 1: Percentage of MRD from collected blood samples in 8 localities of Bethlehem Governorate, 2010**

Indicators*	Prevalence of deficiencies within age groups (years)				Pregnant women
	< 1 year	1-14	15-49	>49 years	
Hemoglobin deficiency	0	5.9	17.9	22.5	71.4
Ferritin deficiency	16.7	35.5	34.1	19.8	100
Total protein deficiency	33.3	11.3	6.0	9.0	14.3
Albumin deficiency	16.7	4.3	2.6	4.5	28.6
Vitamin B12 deficiency	16.7	11.3	-	-	-
Folic acid deficiency	-	-	-	-	0
<b>Total number of Samples</b>	<b>6</b>	<b>256</b>	<b>302</b>	<b>111</b>	<b>7</b>

*\*Malnutrition relevant deficiencies are detected if the amount of the following elements fall under their normal range in the blood: Hb level < 9.5 for children less than 1 years, Hb level < 10.5 for children between 1 and 14 year, Hb level < 12 for adults, Ferritin level <18, Total protein level < 6.2, Albumin level < 3.5, Vitamin B12 < 208, Folic acid < 7.2*

<sup>2</sup> Children less than 1 year had the highest albumin deficiency however the sample size was too small accordingly elders were considered as the group of the highest deficiency.

<sup>3</sup> It is worth noting that the sample size is small.

<sup>4</sup> *Vitamin B12 and Folate Deficiency.* (2010, November 24). Retrieved February 3, 2011, from Lab Tests Online: <http://www.labtestsonline.org/understanding/conditions/vitaminb12.html>

The survey has further encompassed the level of deficiency among males and females. The data of the survey revealed that MRD affects females more than males, mainly for hemoglobin and ferritin deficiencies, which indicate anemia (Figure 2). Females suffering from hemoglobin deficiency exceed males by 17.2%, and from ferritin deficiency exceed males by 24.7%. Females are more anemic due to the fact that in general there are differences in male-female mean caloric intake, in addition that females are normally exhausted by the heavy work load and reproductive demands<sup>5</sup>. Females, on the other hand, who live in poor conditions and where food is not accessible, provide available food in preference to their children instead of themselves.

Among the female study participants, 2% were pregnant. The same types of blood tests, in addition to folic acid test were performed on pregnant women. It was found that the majority of pregnant women suffered iron deficiency anemia, where 71.4% of them suffered hemoglobin deficiency and all of them (100%) suffered ferritin deficiency (Table 1). Anemic women undergo a twofold risk for preterm delivery and a threefold risk for low birth weight, that's in addition to maternal mortality<sup>6</sup>.

In general pregnant women are at high risk for anemia due to the increased needs of iron during pregnancy period. Therefore anemic women are those who enter pregnancy with iron stores already inadequate to meet the increased requirements needed for the development of the fetus and the placenta.

Some of the pregnant women suffered total protein deficiency with a prevalence rate of 14.3% and albumin deficiency with 28.6%. According to the test of folic acid, there haven't been recorded any cases of folic acid deficiency.

The main cause of anemia and protein deficiency in the pregnant study participants is the inadequate diet (mostly inadequate iron supply) such as meat, dairy products, green vegetables, etc.

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<sup>5</sup> Chatterjee, M., & Lambert, J. (1990, October ). *Women and Nutrition: Reflections from India and Pakistan*. Retrieved February 3, 2011, from Women and Nutrition - Nutrition Policy Discussion Paper No. 6: <http://www.unsystem.org/SCN/archives/npp06/ch16.htm#WOMEN%20AND%20NUTRITION%20REFLECTIONS%20FROM%20INDIA%20AND%20PAKISTAN>

<sup>6</sup> Scholl, T., Hediger, M., Fischer, R., & Shearer, J. (1992). Anemia vs iron deficiency: increased risk of preterm delivery in a prospective study. *American Journal of Clinical Nutrition* , 55, 985-988.

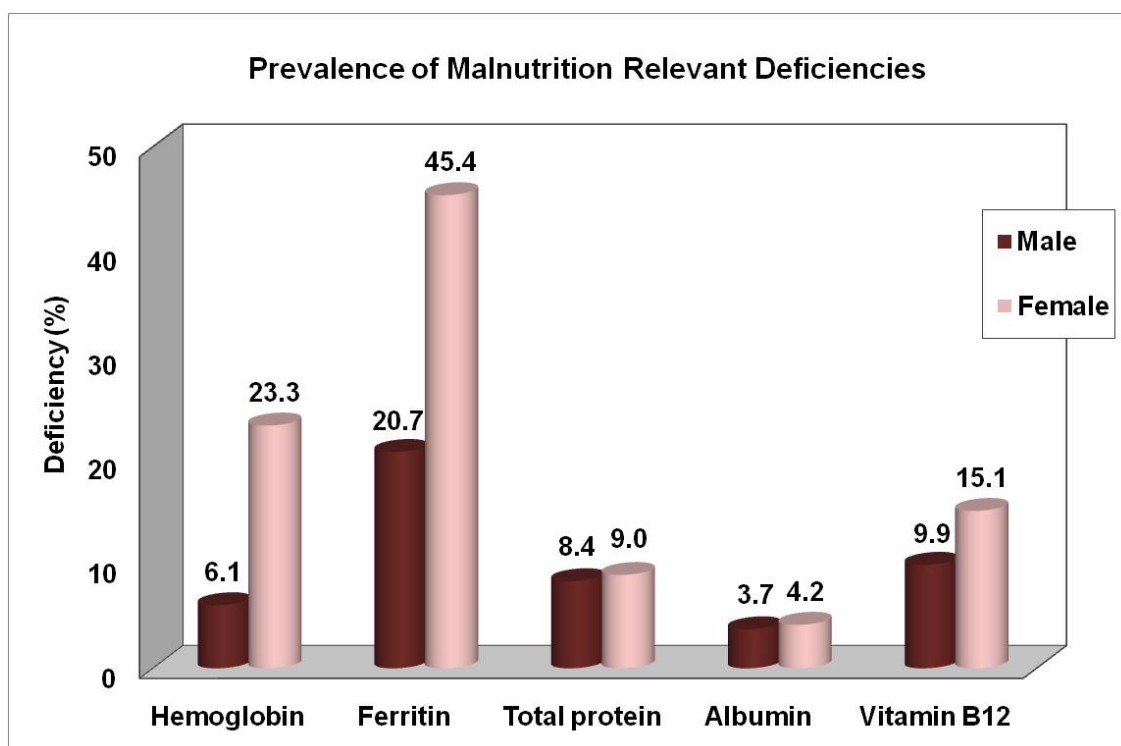


Figure 2: Prevalence of MRD among males and females in Bethlehem Governorate, 2010.

### Blood survey results by locality

The blood test survey was also analyzed on locality level. The prevalence of MRD in the 11 selected localities were investigated and compared with each other in the same period. A multivariate analysis was carried out to examine which localities are mostly affected by MRD. This was done by cluster analysis<sup>7</sup> in SPSS<sup>8</sup>, using the percentages of MRD in each locality (Table 2).

Table 2: Prevalence of MRD in the localities selected in Hebron Governorate for blood survey

Locality	Hemoglobin	Ferritin	Total protein	Albumin	Vitamin B12	Folic Acid
Tayasir	26.2	40.0	0.0	0.0	13.6	0.0
Tammun	14.9	27.6	14.9	5.5	3.5	0.0
Ein el Beida	12.7	41.8	16.4	1.8	5.0	0.0

<sup>7</sup> Cluster analysis is a technique that which aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. In other words it is used in developing taxonomies by grouping objects of similar kind into respective categories.

<sup>8</sup> Statistical Package for the Social Sciences

Al Malih	3.6	23.6	12.7	3.6	0.0	0.0
Salhab	14.3	52.4	0.0	0.0	9.1	0.0
Khirbet Yarza	9.1	0.0	0.0	0.0	0.0	0.0
Bardala	8.4	34.6	9.3	4.7	23.4	0.0
Kardala	25.8	24.7	2.2	6.5	22.5	0.0
Khirbet A'tuf	9.4	50.0	9.4	3.1	0.0	0.0
Aqqaba	11.4	40.9	2.3	4.5	6.3	0.0
Al'Aqaba	5.6	38.9	0.0	0.0	28.6	0.0

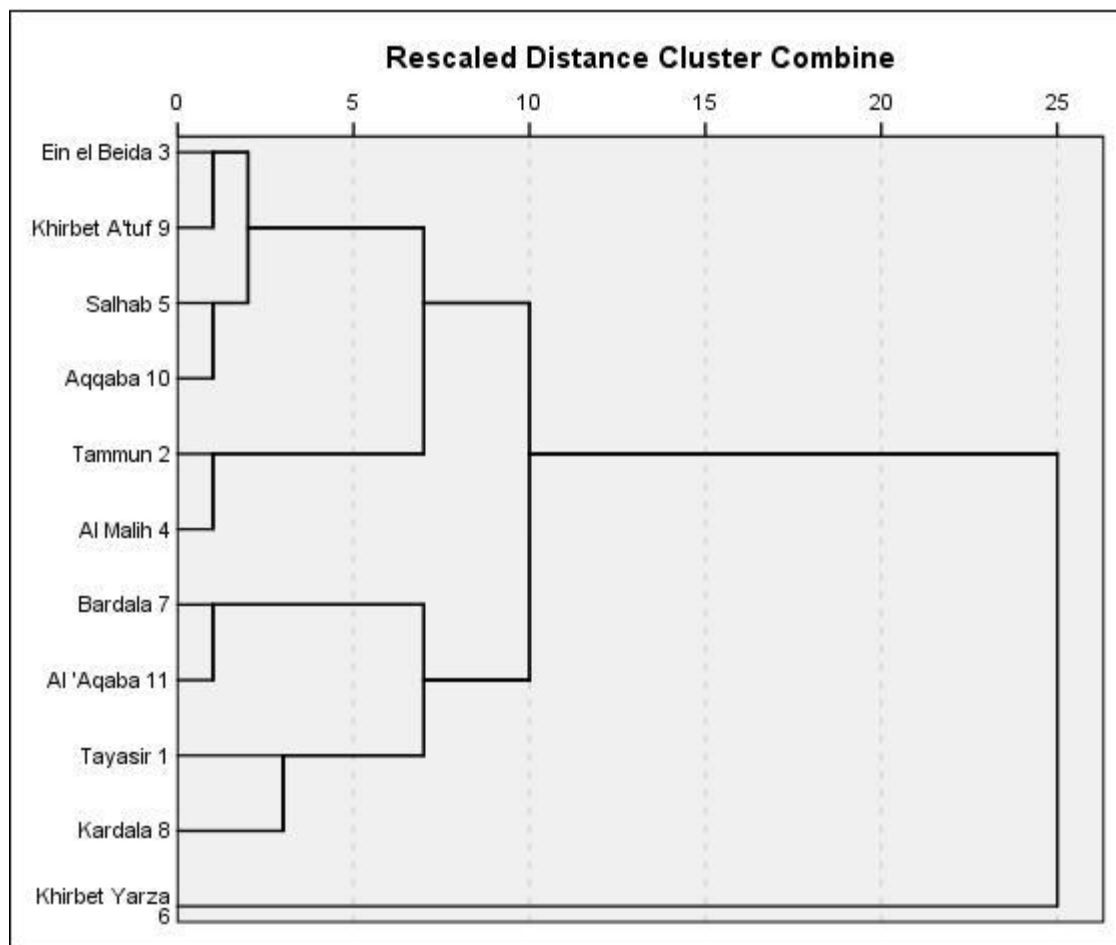
Localities were grouped into 5 clusters. This number of clusters was chosen as the prevalence of MRD types widely varied in the localities and there was a need to group those localities that mostly share common and similar prevalence rates of MRD. This method helped to understand the MRD status in localities based on group membership, all of which shared common prevalence rates of MRD. Figure 3 illustrates the arrangement of clusters of localities produced by building a hierarchy of clusters to reach finally to five main groups. The first cluster consisted of two localities which were Tayasir and Kardala, the second included Tammun and al Malih, the third was composed of Ein el Beida, Khirbet A'tuf, Aqqaba and Salhab, the fourth constituted of only one locality which was Khirbet Yarza, and finally the fifth class included Bardala and Al'Aqaba.

Analyzing each cluster in relation with MRD prevalence, it was observed that each cluster shared common percentages of MRD but it was not possible to select a cluster which could present those localities that had mostly suffered from malnutrition due to the high variation in the prevalence of different types of MRD. Therefore, it was better to consider the highest prevalence of a specific MRD and relate it to a cluster. Considering hemoglobin deficiency, the first cluster which was composed of Tayasir (26.2%) and Kardala (25.8%) presented the highest prevalence. For ferritin deficiency was very high in those localities of the third cluster, where Salhab was the locality of the highest prevalence (52.4%).

In the case of total protein and albumin deficiencies, it was found that Ein el Beida had the highest prevalence of protein deficiency (16.4%), while Kardala had the highest prevalence of albumin deficiency (6.5%). Other localities containing the same makeup of MRD and had high prevalence of total protein deficiency include those of the second cluster which were Tammun (14.9%) and Al Malih (12.7%).

Prevalence of Vitamin B12 deficiency among children was the highest in Al 'Aqaba (28.6%), followed by Bardala (23.4%) where both classified in the fifth cluster.

It is worth mentioning that Khirbet Yarza, were the least affected by MRD among selected localities.



**Figure 3: A dendrogram presentation of cluster analysis of the selected 11 localities of Tubas Governorate, 2010**

The study is further considered the prevalence of MRD on the level of males and females in each locality, where blood tests were compared between males and females, and between localities. The prevalence of hemoglobin deficiency was observed to be higher in females than in males in all the selected localities of Tubas Governorate. The highest prevalence in females was observed among those of Tayasir (46.7%), where the prevalence in women exceeded men by 38.1%.

The prevalence of ferritin deficiency was observed to be also higher in females than in males in the selected localities. The highest percentage of the deficiency was observed in Aqqaba (73.7%) and there was a big difference between the prevalence among females and males by 53.7%.



For total protein deficiency, the results of blood tests showed that males suffered more than females from total protein deficiency, except in Bardala and Al 'Aqaba where females were the main sex affected by the deficiency. Males mostly affected were found in Ein el Beida with a prevalence of 17.9%.

The prevalence of albumin deficiency also varied among localities. However, the highest prevalence was observed in females of 'Aqqaba (10.5%). In Tammun and Bardala, the prevalence of albumin deficiency was higher in males with rates of 6.9% and 6.2% respectively. It should be noted that in some localities the prevalence of albumin deficiency was observed only in females such in Ein el Beida, El Malih, Khirbet A'tuf and Aqqaba.

The prevalence of vitamin B12 deficiency varied among female and male children in the selected localities. In Al 'Aqaba male children had the highest prevalence rate among males and female children, where it was recorded to reach 50%. Also, vitamin B12 deficiency was common only among male children in Salhab and Ein el Beida with prevalence rates of 25% and 7.7%, respectively. As for females, the prevalence of vitamin B12 was only common in females of Tammun and Aqqaba, with prevalence rates of 28.6% and 20%, respectively.

For more details about the prevalence of MRD in males and females by locality see annex 1.

Annex 1

