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

The Integrated Blood Surveillance Report

Conducted by
Applied Research Institute-Jerusalem (ARIJ)

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Integrated Blood Surveillance Report

1. Blood Test Survey Methodology

The Blood test survey was one of the main interventions of the FSIS project and considered an initial step in understanding the real health and nutrition status of the targeted vulnerable communities, the nutritional performance of Palestinian poor people, the current nutritional diseases due to the imposed reduction in amount, quality and type of food eaten by poor people and causes behind food insecurity over the different life sectors. The survey also reveals the main future health trends in the targeted localities and helps to set out the main nutritional suggestions towards better health and nutritional status at community and household level.

Coordination and networking were done with the Ministry of Health (MoH) concerning the project activities, mainly the blood survey, the best criteria and main indicators that need to be measured and the most appropriate party to conduct the blood sampling. MoH showed great interest in the project and provided the project team with its main health indicators studied in the targeted villages. The final set off tests to be measured in the field were integrated with those measured by the Ministry to facilitate data exchange at the end of the project implementation. In addition, MoH provided the project team with the registered and most reliable laboratories to deal with while conducting and analyzing the blood tests at each governorate.

ARIJ performed a bid for selection of qualified and accredited laboratories in accordance to MoH consultation, to conduct the blood intervention professionally. Accordingly, ARIJ selected Medicare Labs for its known and long experience in the field, the availability of its labs in the three governorates and its willingness to conduct the sampling taking into consideration ARIJ criteria and project time frame.

The most vulnerable localities and needy households to be surveyed were selected after the consultation of the formulated committees at each targeted governorate and community. The poorest households were selected for the blood survey out of the main 3500 targeted households of the 70 targeted localities. Up to 3000 blood samples were tested, covering 37 localities including 11, 13, and 13 localities in Tubas, Bethlehem and Hebron governorates, respectively. The blood samples were distributed over the three governorates in relevance to their number of targeted households and accordingly, 682 blood samples were taken from Tubas governorate, 955 blood samples were taken from Bethlehem governorate, and 1363 blood samples were taken from Hebron governorate. The distribution of male and female blood samples was also taken into consideration where 1701 blood samples taken from females and 1299 taken from males at the three governorates.

The blood test intervention was designed to withdraw blood directly from the project's selected household members to measure and test the level of malnutrition deficiencies in those households. The blood analysis included measuring CBC - hemoglobin, ferritin, vitamin B12, albumin, T-protein and folic acid. Such tests were agreed on after a process of consultation with MoH and private labs, since each test would give a certain indication for the nutritional and health status of patients and would give verification for results and causes behind them.

For better blood sampling performance, the blood samples were taken from five different age groups as following: Less than one year, between 1 and 14 years, between 15 and 49 years, above 50 years, in addition to pregnant women. The blood sampling numbers were also distributed in accordance to numbers of each age group at community level and availability of the age group during the survey. The total number of blood samples per blood test type is as follows: 125 blood samples for those less than one year old, 1034 blood sample for those from1-14 years old, 1199 blood samples for those from 15 – 49 years old, 487 blood samples for those more than 49 years

old and 155 blood samples for pregnant women (photos 1.1, 1.2, 1.3). The vitamin B12 and folic acid blood tests were mainly sampled for children less than 14 years and pregnant women.

Photo 1.1:Blood test sampling in Hebron Governorate

Photo 1.2: Blood test sampling in Bethlehem Governorate

Photo 1.3: Blood test sampling in Tubas Governorate

A summarized blood questionnaire was prepared to be filled while sampling the blood at each household. The blood questionnaire collected detailed information about the sampled person, obtaining his/her personal info such as name, age, sex, pregnancy and health background such as the disease and type of medicine or fortifications taken (if available).

The project team faced several challenges while conducting the survey especially that the blood test sampling is a sensitive issue in the Palestinian society. Most of the selected households were considered the poorest of the poor within their communities, where levels of un-education is the highest and most had never done a blood testing before. ARIJ and Medicare labs found it necessary to work on raising the awareness level, building trust between the testers and the local community. Hence, the FSIS projects' ideas, aims and causes for such an intervention were explained to those who were selected for blood sampling. In addition, the benefits behind such a survey were also explained. During the field visits women nurses were selected to perform the blood testing. Test results were redistributed and handed to each sampled household.

Another challenge was the availability of all age groups. ARIJ and Medicare labs found it appropriate to cover all age groups in each surveyed household including: < 1 year, 1-14, 15-49, > 50 years and pregnant. Two age groups were not sufficiently represented in the selected households including < 1 year and pregnant groups and therefore this cost the team to perform additional rounds for each locality to cover all age groups.

2. Blood Survey Results

The blood test results were analyzed for the main Malnutrition Relevant Deficiencies (MRD) in Tubas, Bethlehem and Hebron Governorates through analyzing hemoglobin, ferritin, total protein, albumin, vitamin B12, and folic acid levels in the blood. For the analysis 3000 total blood samples were collected from the three governorates, of which 682 were collected from Tubas (335 females), 955 from Bethlehem (566 females) and 1363 from Hebron (800 females) (figure 2.1). Samples were collected from children and adults of either sex, in addition from pregnant women. The age of the study participants in the three governorates ranged from 4 days to 100 years.

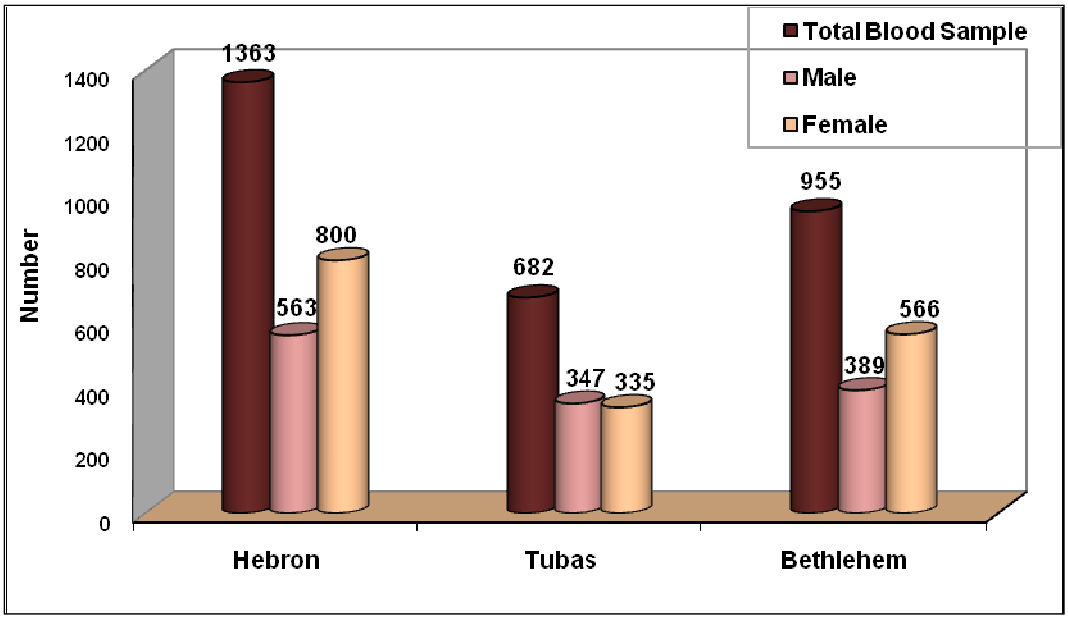

Figure 2.1: Number of total, male and female blood samples by governorate

The results of the blood test analysis helped in assessing the nutritional status of the patients and determining, which governorate suffered more from MRD. It was found from the analysis that ferritin deficiency was the most widespread MRD in the three governorates, followed by hemoglobin deficiency (Figure ***2.***2.2). This indicates that iron deficiency anemia is the most common type of anemia in Tubas, Bethlehem and Hebron. However, the prevalence of the two deficiencies varied among the governorates; the prevalence of hemoglobin deficiency[1] was observed to be the highest in Hebron (17.5% of total sampled blood specimens), whereas the prevalence of ferritin deficiency[2] was the highest in Tubas (32.7% of total sampled blood specimens) (figure 2.2). Inadequate diet (mostly inadequate iron supply) such as meat, dairy products, green vegetables, etc. is of main causes behind iron deficiency, in addition to absorption factor that could reduce malnutrition as a result to better food practices such as the intake of vitamin C in parallel with iron rich food.

[1] Hemoglobin is a protein molecule in red blood cells containing iron and Hb test is considered as a good indicator of the state of red blood cells and thus to a variety of health problems. The normal range of hemoglobin varies depending on age: Less than 1 year: 9.5 – 11.5 g/dl, Children from 1-14: 10.5 – 12.0 g/dl, Adults: 12 – 18 g/dl. The reason behind low Hb is nutritional deficiency, particularly of iron, vitamin B12 and folic acid. Also it can be due to the insufficient dietary intake or absorption of iron, some chronic diseases (sickle cell anemia), and loss of blood by bleeding through many diseases.

[2] Ferritin is a protein that stores iron and an excellent marker to evaluate iron deficiency anemia. The normal reference range for ferritin level is 18 – 323 ng/ml. Low levels of ferritin can be related to malnutrition or mal-absorption in addition it can be related to acute hepatitis, alcohol abuse and some infections.

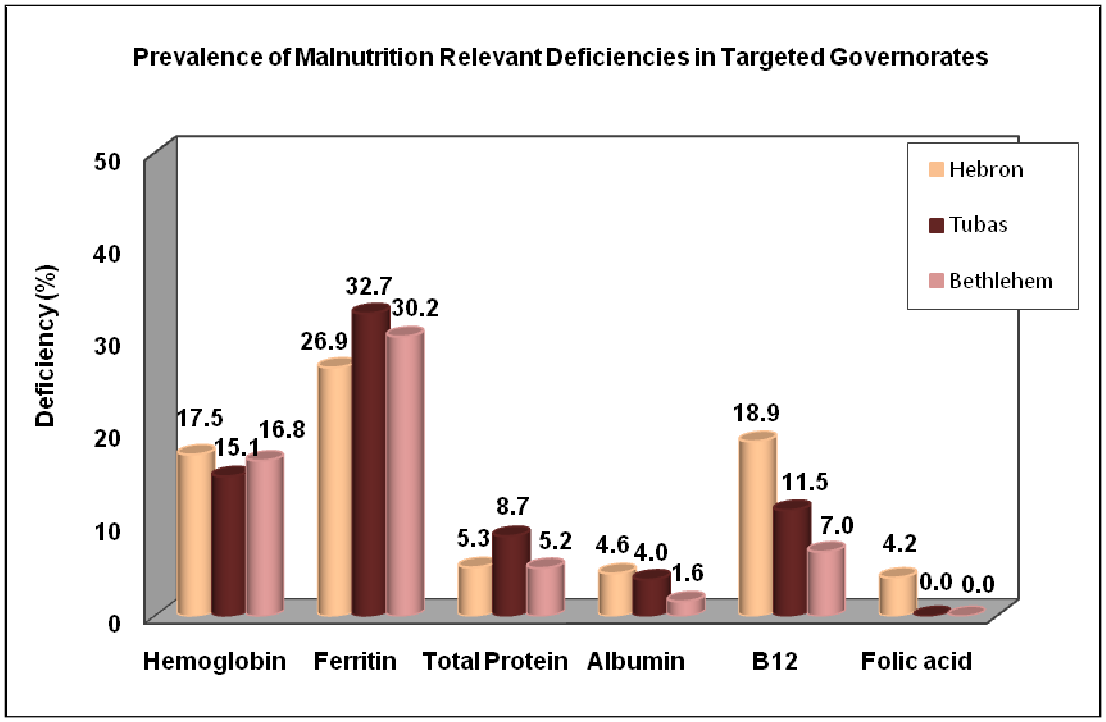

Figure 2.2: Prevalence of malnutrition relevant deficiencies by tested blood type by targeted governorate

The results of the blood test analysis also indicated that the total protein deficiency[3] was more frequent than albumin deficiency[3] in the three governorates. It was observed that protein deficiency was the highest in Tubas Governorate with a prevalence of 8.7% in comparison to 5.2% and 5.3% in Bethlehem and Hebron Governorates, respectively. As for albumin deficiency, it was recorded as the highest in Hebron Governorate with a prevalence of 4.6%, followed by 4% in Tubas, and 1.6% in Bethlehem (figure 2.2). Protein intake is directly related to malnutrition (no intake of meat and its products) and bad food consumption practices.

The tests of vitamin B12[4] and folic acid [5] levels in the blood were performed for two specific groups within the study participants. Vitamin B12 test was performed only for children under 15 years old and the results indicated that the prevalence of vitamin B12 deficiency was the highest among children of Hebron with a rate of 18.9%, followed by Tubas (11.5%), and Bethlehem (7%)

[3] TP is a blood test used to measure the total amount of proteins in the serum to assess general health status with regard to individual's nutrition. The normal range of total serum proteins is 6.2-8.7 g/dl. Low levels of TP and albumin indicate malnutrition and mal-absorption or can be a good marker to liver or kidney disorders

[4] Vitamin B12 is a water soluble vitamin that assists in making red blood cells and maintaining the nervous system. The reference range of the B12 test is 208-964 pg/ml. Vitamin B12 deficiency mainly results from inadequate dietary intake of vitamin B12, impaired absorption of the vitamin due to mal-absorption or mal-digestion syndromes.

[5] Folic acid is vitamin B9 (folate) which is necessary for normal growth, blood cells and platelets generation, making new genetic material (DNA), and for the development of fetus. The reference range varies between 7.2-15.4 ng/ml. Low levels of folic acid results in folic acid deficiency anemia and is mainly a result of malnutrition and inadequate diet. Also, the deficiency can result from liver diseases and vitamin C deficiency.

(figure 5.2). As for the folic acid test, it was performed only for pregnant women and the results of the analysis indicated that there was no folic acid deficiency among pregnant women in Tubas governorate neither in Bethlehem governorate, nonetheless, the deficiency was observed with a small prevalence in Hebron (4.2%) (figure 2.2).

The study participants of the three governorates, excluding pregnant women, were divided in function of age to analyze the level of deficiencies in children and adults. The 2845 participants were divided into four main groups to carry out the analysis in relation to age (figure 2.3).

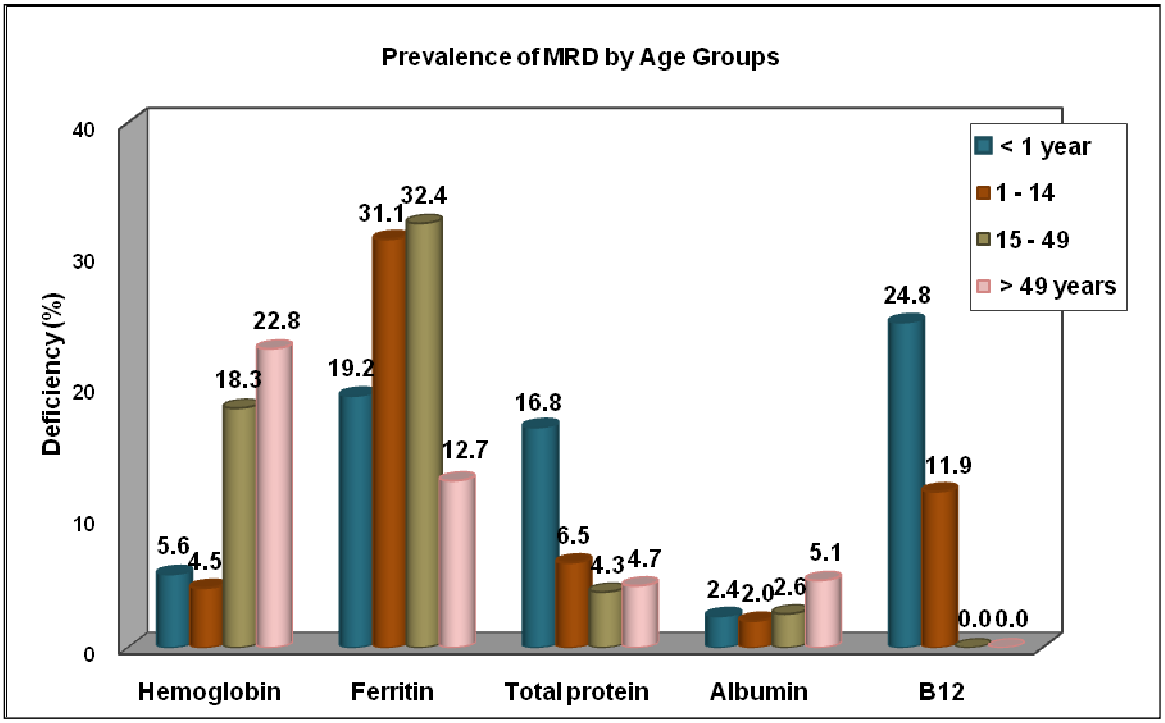

Figure 2.3: Prevalence of malnutrition relevant deficiencies by different age groups in targeted governorates

It was obvious from the results obtained that the prevalence of iron deficiency anemia is the highest MRD due to significant low levels of hemoglobin and ferritin in the blood. Adults older than 49 years recorded the highest hemoglobin deficiency in the three governorates with a prevalence of 22.8%, and it was mainly presented in Hebron governorate with a prevalence of 23%. On the other hand, adults of 15-49 years old recorded the highest ferritin deficiency with a prevalence of 32.4%, followed by children of 1-14 years old with a prevalence of 30.9% (figure 2.3). The prevalence of ferritin deficiency among adults of 15-49 years was mostly observed in Bethlehem Governorate with an average rate of 37%, whereas the prevalence among children of 1-14 was the highest in Tubas Governorate.

Total protein deficiency was mostly common among children under 1 year with a prevalence rate of 16.8%. As for albumin deficiency, it was common among adults older than 49 years with a prevalence of 5.1%. The highest prevalence in total protein deficiency among children was recorded in Tubas Governorate (33.3%), followed by Bethlehem Governorate (28.6%). However, it is worth noting that Tubas children (less than one year old) blood sample comprised only 0.9% of total Tubas blood samples.

As recorded by blood analysis of vitamin B12 for children under 15 years old, the prevalence of vitamin B12 deficiency was mainly observed in Hebron governorate. Children under 1 year old were affected by the deficiency more than children of 1-14 years old. The highest prevalence of vitamin B12 deficiency among children under 1 year was in Hebron governorate of 28.6%, followed by Tubas and Bethlehem Governorates with prevalence rates of 16.7% and 11.8%, respectively (Figure 2.4). For children of 1-14 years old the prevalence rate in Hebron governorate reached up to 17%, followed by Tubas with 11.3% and Bethlehem with 11% (figure 2.4).

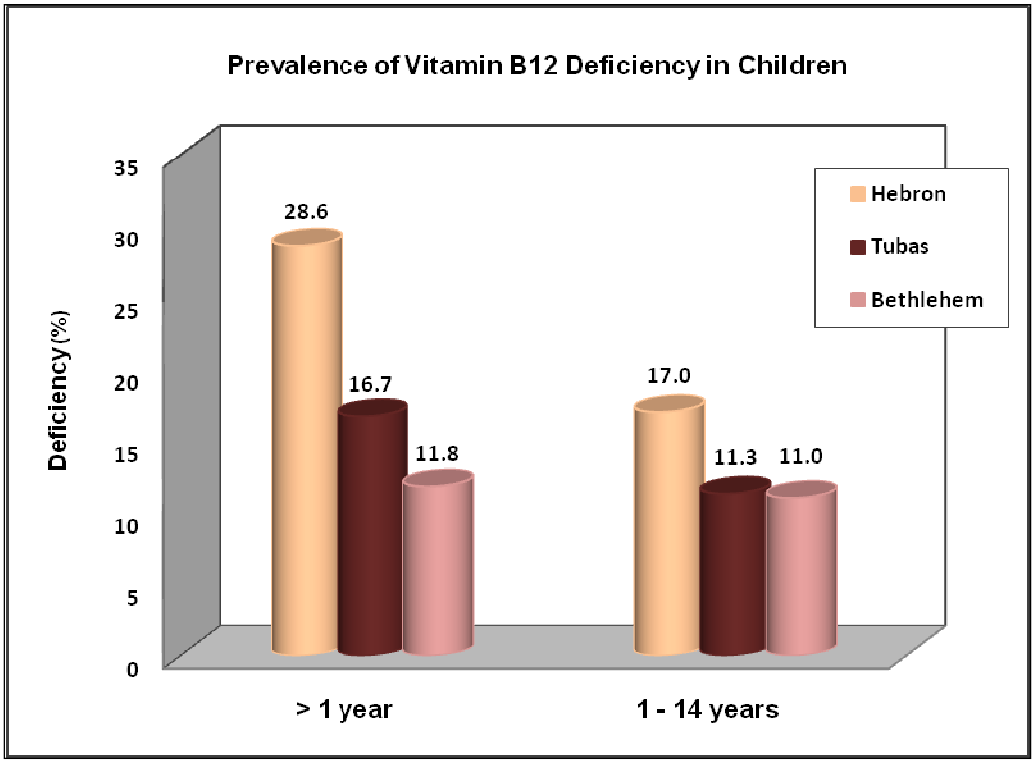

Figure 2.4: Prevalence of Vitamin B12 among children under 15 years old in targeted governorates

Pregnant women were selected during the blood survey as an important group to be measured for malnutrition deficiencies. Pregnant women formed 5.2% of the total governorates' blood sample. The same types of blood tests, in addition to folic acid test were performed to screen the nutritionally significant elements deficiencies in those women. It was found that the majority of pregnant women were affected by iron deficiency anemia, mainly caused by hemoglobin deficiency. The prevalence of hemoglobin deficiency was quite similar among the three governorates, where Hebron was 74%, Tubas 71.4% and Bethlehem 71.2% (Figure 2.5). As for ferritin deficiency, the prevalence was the highest in Tubas, where all tested pregnant women suffered from ferritin deficiency (100%), followed by Hebron governorate (64.6%) and Bethlehem (25%) (figure 2.5).

The prevalence of total protein deficiency was the highest in Bethlehem Governorate (25%), followed by Tubas Governorate (14.3%). On the contrary, albumin deficiency was observed to be the highest in Tubas and Hebron Governorates with prevalence rates of 28.6 % and 24%, whereas there were no recorded cases in Bethlehem Governorate (figure 2.5).

Folic acid test results had shown that Hebron was the only governorate recording folic acid deficiency in pregnant women with a prevalence of 4.2%. Pregnant women of Bethlehem and Tubas Governorates recorded the normal range of the test (figure 2.5).

However, while comparing the results of deficiencies prevalence among pregnant women in targeted governorates, it is worth considering that the sampling size of pregnant women in Tubas Governorate was limited to only 7 pregnant women in comparison to 52 and 100 women in Bethlehem and Hebron governorates, respectively.

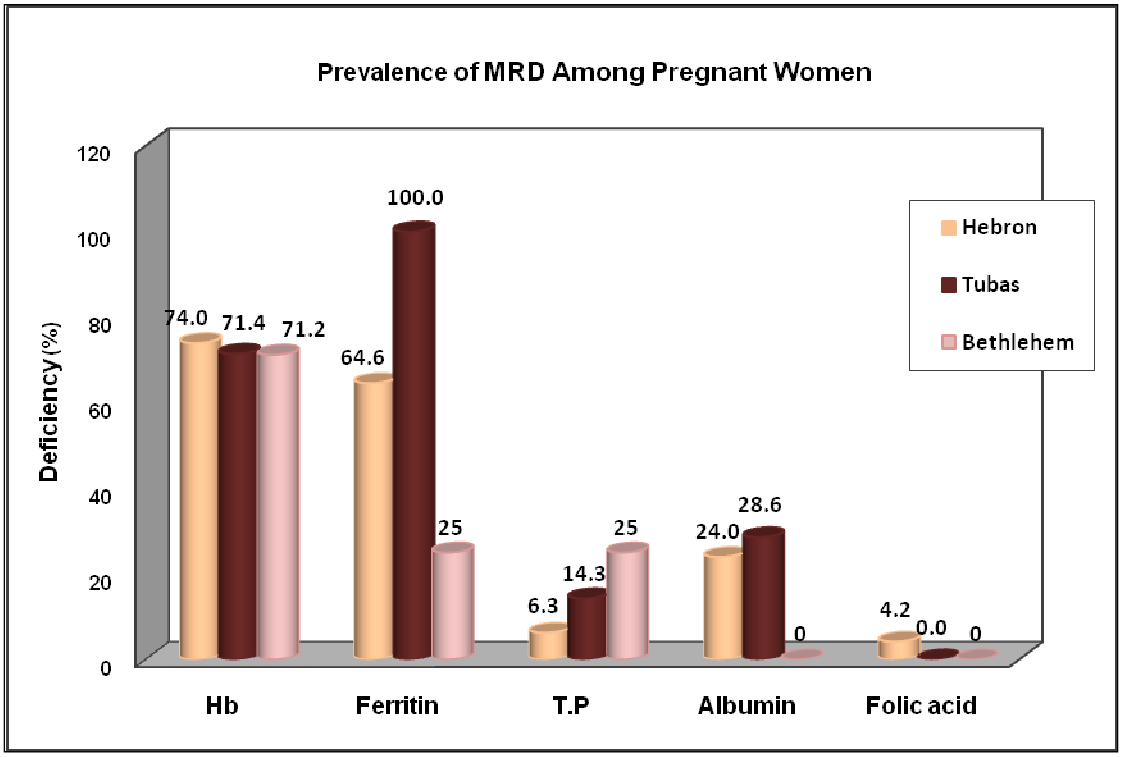

Figure 2.5: Prevalence of malnutrition relevant deficiencies among pregnant women in targeted governorates

As a result to blood sample analysis in the three governorates, it was observed the prevalence of MRDs was higher in females than in males (Figure). The highest MRD was ferritin deficiency and it was observed more in females, mainly in Tubas Governorate with a prevalence of 45.4%, whereas the prevalence of hemoglobin was the second common MRD and again it was observed to be higher in females, being the highest in Hebron Governorate with a rate of 25% (figure 2.6).

The average prevalence of the total protein was slightly higher in males than in females. However, the prevalence varied among governorates, where in Hebron Governorate, the prevalence in males was 6.7%, which was higher than that of the females (4.3%). On the other hand, the prevalence of total protein in Tubas and Bethlehem Governorates was higher in females than in males, where it was 9% and 5.3% in females in comparison to 8.4% and 4.6% in males in Tubas and Bethlehem Governorates, respectively. As for the prevalence of albumin deficiency it was higher in females (5.1%), and it was represented mainly by females of Hebron Governorate (6.4%).

The average prevalence of vitamin B12 deficiency was higher among female children (15%) (figure 2.6). However, this percentage varied among governorates. Female children of Bethlehem Governorate were found to suffer less from vitamin B12 deficiency, where the prevalence was 6.4% in comparison to 7.4% in males. The same in Hebron Governorate; the prevalence among males was 20.5%, where the prevalence in females was 16.9%. As for Tubas Governorate, the situation was conversed where the prevalence of vitamin B12 deficiency was higher in females (15.1%) than in males (9.9%).

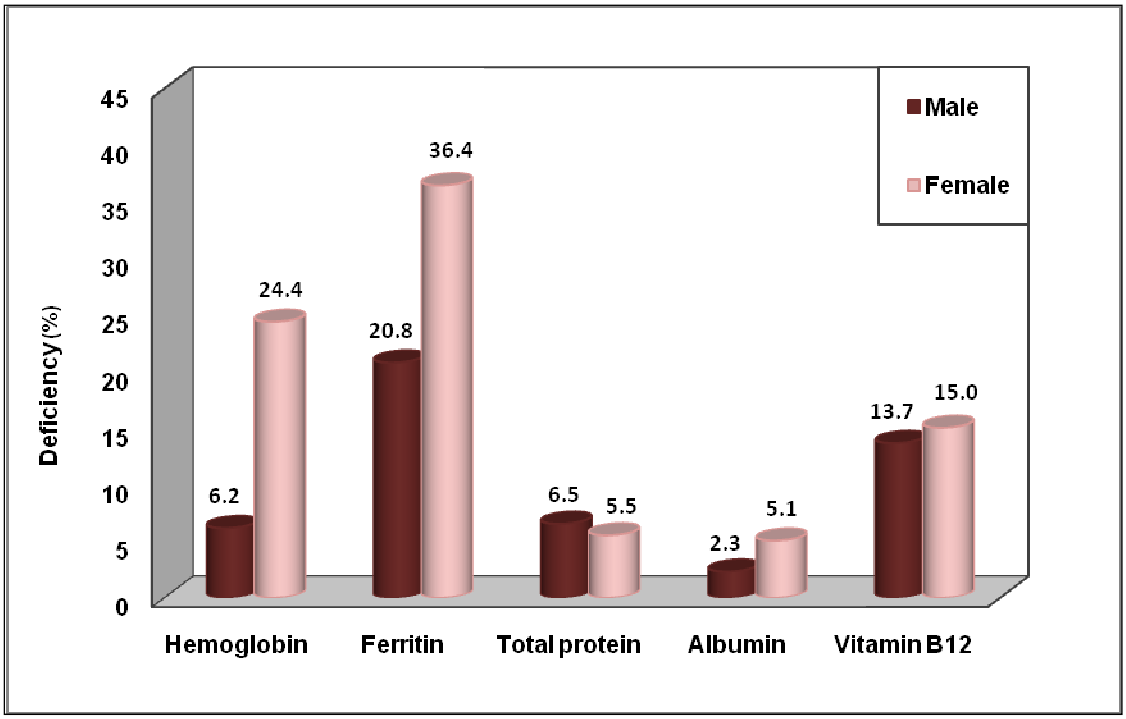

Figure 2.6: Prevalence of malnutrition relevant deficiencies among males and females in targeted governorates

Investigating the results of the blood survey at governorate level by tested blood types, it appears that the three targeted governorates: Tubas, Bethlehem and Hebron Governorates recorded close percentages of prevailed deficiencies over the different blood types (figure 2.2), mainly hemoglobin and ferritin deficiency (Annex 1). Noting that the targeted households were selected from similar livelihood background, where all considered vulnerable and poor. The targeted households recorded close findings in several sectors such as school and university attendees – education, disabilities and diseases – health , and infrastructure and public services. In addition, the selected households at targeted governorates recorded income less than deep poverty line and showed shortage in covering their food and non-food expenditures and low percentages in economical active family members. However, the significant difference among the targeted households was recorded in type of work practiced, where agriculture was dominant among Tubas households with higher owned and planted agricultural lands, which also justifies that Tubas households recorded lower poor consumption and higher borderline consumption.

Tubas Governorates' households showed better food consumption, especially vegetables and dairy products intake, but they also practiced the highest decrease in meat quantity intake during that last six months before the survey, which affected their iron deficiency showing the highest ferritin and total protein deficiency among the targeted governorates. Hebron Governorate's

households, on the other hand, showed highest expenditure on food and highest reduction in expenditures, also highest reduction in expenditure on food quantity among targeted governorates, which are mainly reflected in hemoglobin iron deficiency, vitamin B12, and folic acid deficiency. Households in Bethlehem Governorate showed lower reduction in food quality and the highest poor consumption among the targeted governorates, reflected mainly in hemoglobin and ferritin iron deficiency.

On the other hand, pregnant women and children, which formed almost 42% of surveyed family members among targeted governorates, were mostly affected among household members by the prevalence of malnutrition deficiencies. Comparing age groups by tested blood type, it appears that ferritin, total protein and vitamin B12 deficiencies were the highest among this group. Medically speaking in the normal case pregnant women and children as a family group is mostly sensitive and vulnerable to any changes in health measures and food patterns at household level.

As a conclusion, blood malnutrition deficiencies were prevailing among targeted blood samples justifying the baseline results and reflecting the direct relation between livelihood sectors mainly economy and food security especially concerning food consumption and practices of food intake emphasizing the importance of tackling the poorest communities during the development process.

Annex 1: Percentage of Blood Deficiencies in Targeted Governorates

Indicators	Unit *	Age (Year)				
		< 1	1 - 14	15 - 49	> 49	Pregnant Women
Hb ≤ 9.5 g/dl	%	5.6	4.5	18.3	22.8	72.9
B12 < 208 pg/ml	%	24.8	11.9	0	0	
Ferritin <18 ng/ml	%	19.2	31.1	32.4	12.7	52.9
T.P < 6.2 g/dl	%	16.8	6.5	4.3	4.7	12.9
Albumin < 3.5 g/dl	%	2.4	2	2.6	5.1	16.1
Folate<7.2 ng/ml	%	-	-	-	-	2.5
Number of Samples	Number	125	1034	1199	487	155

Indicators	Unit *	Governorate		
		Tubas	Bethlehem	Hebron
Hb ≤ 9.5 g/dl	%	15.1	16.8	17.8
B12 < 208 pg/ml	%	5.2	5.4	7.2
Ferritin <18 ng/ml	%	33.2	30.2	26.7
T.P < 6.2 g/dl	%	8.6	5.2	4.3
Albumin < 3.5 g/dl	%	6.1	1.6	4.8
Folate<7.2 ng/ml	%	0	0	0.7
Number of Samples	Number	689	955	1363

Notes:

Hb: Hemoglobin

B12: Vitamin B12

T.P: Total Protein

Unit *: Percentage of Blood Test Deficiency Prevalence