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

Household Blood Surveillance Report
Bethlehem Governorate

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Blood survey in Bethlehem Governorate

The present survey aimed at determining main malnutrition relevant deficiencies in Bethlehem governorate and analyzing the level of deficiency in relation to age and sex variables, in addition to comparing their prevalence rates between localities. The total number of blood samples was 955, collected from the most vulnerable thirteen localities that were selected during the project period. Of these 903 were collected from persons of either sex, and 52 samples were from pregnant women. The age of the study participants ranged from 10 days to 98 years (Photos 1,2,3).

The results of blood test analysis helped in assessing the nutritional status of the patients and determining the main malnutrition relevant deficiencies. Out of the tested 955 selected persons participated in the study, 16.8% had hemoglobin deficiency and 30.2% had ferritin deficiency, reflecting a high prevalence of iron deficiency anemia. Also, 5.2% of this same population suffered of total protein deficiency whereas just 1.6% had been recorded to have the level of albumin low in the blood (Figure 1).

Other types of blood tests were also performed but for two different groups. Vitamin B12 test was performed only for children (age less than 14 years old), which comprised 39% of the total selected study participants. Of these 7% suffered vitamin B12 deficiency. The other one is the folic acid test which was performed only for pregnant women and the results of the test analysis indicated that there were no problems of folic acid deficiency among pregnant women in the targeted thirteen localities (Figure 1).

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1 The Blood Survey Methodology can be found in details in the Integrated Blood Surveillance Report.
The study participants, excluding pregnant women, were divided in function of age to analyze the level of deficiencies in children and adults. The 903 participants were divided into four main groups to carry out the analysis in relation to age (Table 1).

Table 1: Percentage of malnutrition relevant deficiencies from collected blood samples in 13 localities of Bethlehem Governorate, 2010

<table>
<thead>
<tr>
<th>Indicators*</th>
<th>Prevalence of deficiencies within age groups (years)</th>
<th>Pregnant women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 1 year</td>
<td>1-14</td>
</tr>
<tr>
<td>Hemoglobin deficiency</td>
<td>7.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Ferritin deficiency</td>
<td>19</td>
<td>34.4</td>
</tr>
<tr>
<td>Total protein deficiency</td>
<td>28.6</td>
<td>3</td>
</tr>
<tr>
<td>Albumin deficiency</td>
<td>0</td>
<td>0.9</td>
</tr>
<tr>
<td>Vitamin B12 deficiency</td>
<td>19</td>
<td>5.4</td>
</tr>
<tr>
<td>Folic acid deficiency</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total number of Samples</td>
<td>42</td>
<td>331</td>
</tr>
</tbody>
</table>

*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.*
It was obvious from the results obtained that anemia is the most common blood disorder in children and adults. This is reflected by the low levels of hemoglobin and ferritin in blood samples. The main age group suffered from hemoglobin deficiency was of those participants older than 49 years old, where the prevalence rate of the deficiency was 22.7%. As for the prevalence of ferritin deficiency, 34.4% of children between 1-14 and 37% of adults between 15 and 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, mainly due to monotonous diet with little or no meat and low calorie intake in relation to iron requirement of the body.

Total protein deficiency was mainly observed among children under 1 year with a prevalence of 28.6% (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 amount 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 her nutritional status to breastfeed play an important role in the appearance and prevalence of malnutrition relevant deficiencies 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 meet 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 adults older than 49 years which is 4.5% (Table 1). Albumin level decreases slowly as undernourishment progresses; this may explain the higher prevalence rate among the old. People with harsh economic situation undergo malnutrition and undernourishment with changing in food consumptions and habits that with time would affect the level of elements and proteins in the blood. In addition albumin level is related to other chronic kidneys’ and liver’s diseases, that people, mainly the old, may suffer from and thus reducing its level.

As mentioned earlier, vitamin B12 test was performed for children and the results of the blood analysis indicated that there was a deficiency in children between 10 days to 14 years. The prevalence of the deficiency in children under 1 year was 19% which was higher by 13.6% than those children between 1 and 14 years (Table 1). This can be translated to the fact that the body stores 3 – 5 years worth of vitamin B12 and thus it takes years to manifest the results of the
vitamin deficiency in adults\textsuperscript{2}, for infants, the signs of deficiency are detected rapidly as they have not yet established considerable reserves of the vitamin.

The survey has further encompassed the level of deficiency among males and females. The data of the survey revealed that in general malnutrition relevant deficiency affects females more than males, mainly hemoglobin and ferritin deficiencies which indicate anemia (Figure 2). Ferritin deficiency occurred with the highest prevalence in all participants and mainly in females, where the rate was recorded to be 36\% in comparison to 24.2\% in males. Followed by the prevalence of hemoglobin deficiency where in females the rate was 24.4\% and in males was 5.7\%. The levels of total protein and albumin in blood were little higher in females than in males with prevalence rates in females of 5.3\% and 1.8\% respectively. As for the prevalence of vitamin B12 among children, the rate was very close between males and females as well.

In general, females were more anemic due to the fact that there are differences in male-female mean caloric intake, in addition that females are normally exhausted by the heavy work load and reproductive demands\textsuperscript{3}. 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, 9% 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 were affected by iron deficiency anemia, mainly caused by hemoglobin deficiency which occurred with a prevalence of 71.2% (Table 1). Also, 25% of those women suffered from ferritin deficiency and another 25% from total protein deficiency. According to the test of folic acid, there haven’t been recorded any cases of folic acid deficiency.

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. Anemic women undergo a twofold risk for preterm delivery and a threefold risk for low birth weight, that’s in addition to maternal mortality. 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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Blood survey results by locality

The blood test survey was also analyzed on locality level where the prevalence of MRD in the 13 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\(^5\) in SPSS\(^6\), using the percentages of MRD in each locality (Table 2).

<table>
<thead>
<tr>
<th>Locality</th>
<th>Hemoglobin</th>
<th>Ferritin</th>
<th>Total protein</th>
<th>Albumin</th>
<th>Vitamin B12</th>
<th>Folic Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dar Salah</td>
<td>14.7</td>
<td>19.0</td>
<td>4.3</td>
<td>0.0</td>
<td>8.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Marah Rabah</td>
<td>16.1</td>
<td>51.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Marah Ma’alla</td>
<td>25.0</td>
<td>30.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Nahhalin</td>
<td>20.9</td>
<td>25.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Battir</td>
<td>5.3</td>
<td>26.3</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Husan</td>
<td>11.5</td>
<td>42.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Wadi Rahhal</td>
<td>8.2</td>
<td>22.4</td>
<td>4.1</td>
<td>0.0</td>
<td>18.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Al ‘Ubeidiya</td>
<td>16.9</td>
<td>29.0</td>
<td>8.5</td>
<td>2.8</td>
<td>7.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Beit Sakariya</td>
<td>12.8</td>
<td>44.7</td>
<td>6.4</td>
<td>2.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Jubbet adh Dhib</td>
<td>8.6</td>
<td>37.1</td>
<td>8.6</td>
<td>0.0</td>
<td>5.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Al Jab’a</td>
<td>28.6</td>
<td>34.8</td>
<td>7.1</td>
<td>1.8</td>
<td>8.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Kisan</td>
<td>11.7</td>
<td>23.3</td>
<td>1.7</td>
<td>0.0</td>
<td>4.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Wadi Fukin</td>
<td>16.1</td>
<td>31.5</td>
<td>4.7</td>
<td>3.4</td>
<td>7.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Localities were grouped into 3 clusters. Each cluster contained the localities that share common and similar prevalence rates of MRD. This method helped in understanding the MRD status in targeted 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 5 main groups. The first cluster consisted of are Dar Salah, Nahhalin, and Kisan. The second cluster included Marah Rabah, Husan and Beit Sakariya. The third was of Marah Ma’alla and Al Jab’a, the forth was of Battir and Wadi Rahhal, and finally, the fifth which consisted of Al ‘Ubeidiya, Wadi Fukin and Jubbet adh Dhib.

From the clusters obtained, and from the analysis of blood tests, it can be concluded that the fifth cluster (Al ‘Ubeidiya, Wadi Fukin and Jubbet adh Dhib) had suffered from all MRD tested

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\(^5\) 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.

\(^6\) Statistical Package for the Social Sciences
with different prevalence rates, which indicated that those localities were the main affected by malnutrition.

Considering the percentage of occurrence of MRD, the highest prevalence of hemoglobin deficiency was observed in Al Jab’a (28.6%) where the highest prevalence of ferritin deficiency was in Marah Rabah (51.6%). Total protein deficiency was the highest in Jubbet adh Dhib (8.6%) whereas the prevalence of albumin deficiency was observed to be the highest in Wadi Fukin (3.4%).

The study in 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 Bethlehem Governorate. The highest prevalence in females was observed among those of Marah Ma’alla and Al Jab’a Localities (40%), also the highest
prevalence in males was observed in Marah Ma’alla (30%). It should be noted, that in the locality of Al Jab’a the gap of difference in hemoglobin deficiency between males and females was the highest where the prevalence among women was higher by 27.2% than in men.

The prevalence of ferritin deficiency was observed to be also higher in females than in men in the selected localities, except for Husan and Nahhalin, where the prevalence rates of ferritin deficiency were higher in males with difference of 21.2% and 3.8%, respectively. The highest percentage of the deficiency was observed in Marah Rabah, where affected females constituted 60.9% of the studied participants, whereas as men constituted only 25%. The highest difference between the prevalence of ferritin deficiency in females and males was in Marah Ma’alla, where 60% of all patients of hemoglobin deficiency were females.

For total protein deficiency, the results of blood tests varied among localities, where in some males were the main affected population, and in other localities were females. However, the prevalence of the deficiency in males was the highest. In Jubbet adh Dhib, the only study participants that were found to suffer total protein deficiency were the males, constituting 20% of all participants, and this percentage is considered the highest among the other localities. As for the occurrence of the deficiency among females, the highest prevalence was recorded in Al ‘Ubeidiya (10.6%).

Albumin deficiency was found only in four localities of which Wadi Fukin constituted the highest prevalence of the deficiency and it was among females (4.9%), on the other hand, in Al Jab’a, the males were more affected by the deficiency (2.1%). In Beit Sakariya, the prevalence of albumin deficiency was detected only in males who constituted 4.2% of the locality’s participants.

As for the prevalence of vitamin B12 deficiency, it varied among female and male children in the selected localities. The most affected participants were females of Wadi Rahhal, where the prevalence rate among girls was 22.2%. The highest percentage among boys was observed in Dar Salah (16.7%), and it was higher than that of the girls by 13%. In Battir and Kisan, the occurrence of the deficiency was only recorded in girls with rates of 14.3% and 10%, respectively, whereas in Jubbet adh Dhib, boys were the only affected sex by the deficiency with a prevalence of 10%.

For more details about the prevalence of MRD in males and females by locality see annex 1.
Annex 1
Prevalence of ferritin deficiency among females and males by locality in Bethlehem Governorate, 2010

Deficiency (%)
Prevalence of total protein among females and males by locality in Bethlehem Governorate, 2010
Prevalence of vitamin B12 deficiency in female and male children by locality in Bethlehem Governorate, 2010

- Dar Salah
- Marah Rabah
- Marah Ma'alla
- Nahhalin
- Battir
- Husan
- Wadi Rahal
- Al 'Ubeidiya
- Khamlet Sakariya
- Jubbet Ad Dhib
- Al Jab'a
- Kisan
- Wadi Fukin

- Female
- Male