UNICEF/ASSOCIATION OF PAEDIATRICIANS IN THE FEDERATION OF BOSNIA
AND HERZEGOVINA

INTERVENTION PROGRAMME FOR PREVENTION OF NUTRITIVE
ANAEMIA AMONG CHILDREN AGED 0-6 IN THE FEDERATION OF BOSNIA
AND HERZEGOVINA


Sarajevo, August, 2000
1. INTRODUCTION

Nutritive anaemia pose a big health problem of young and elderly, pregnant women and especially children younger than 5. This also includes developing countries and since the 90s the countries in transition.

Nutritive anaemia with malnutrition is the leading cause of disorders and in some countries the leading cause of death. They are compounded with frequent infections, disorders in psychomotor development, stunted growth and development of child in general.

One of the goals of the 1990 World Children Summit was the reduction of nutritive anaemia, particularly those caused due to iron deficiency among risk population groups by the year 2000. The results toward achieving this goal and eliminate this condition showed small progress. Particular problem is high prevalence, prevention and control of nutritive anaemia in the countries of eastern and central Europe, among which there is Bosnia and Herzegovina (1).

UNICEF and WHO in 1999 consulted representatives of 27 countries from this region, including the countries of the former Russian Federation to start activities on prevention and control of nutritive anaemia, including changes in nutrition of infants and small children (1).

2. FACTORS IMPORTANT FOR DEVELOPMENT OF NUTRITIVE ANAEMIA IN TRANSITIONAL COUNTRIES

According to the WHO global database, the prevalence of nutritive anaemia, i.e. anaemia caused due to iron deficiency is separately registered for pregnant women and schoolchildren ( Micronutrient Deficiency Information System - MDIS).

In the countries of Western Europe, the anaemia prevalence among pre-school children is 5 percent and in countries of northern Europe up to 10 percent.

In transitional countries, the anaemia prevalence exceeds 16 percent, while among pregnant women and school children it is 53 percent, pre-school children 42 percent and elderly up to 51 percent.

High prevalence of nutritive anaemia in these countries is caused by many factors. Most significant are the life habits, inadequate nutrition of infants, toddlers and entire population in general.

Over the past 15 years, the prevalence rate surged due to changes affecting social and economic systems in these countries. Economic slump prompted reduced meat consumption and food rich in iron, while the use of foods containing less iron increased (white types of flour and its products).

A particular problem of these countries is inadequate nutrition of infants. The breastfeeding period is less then 6 months and additional food is given very early in life. The reasons behind this situation are health workers who need more training and insufficient education of mothers and pregnant women about the importance of breastfeeding.
3. Health and economic effects of nutritive anaemia in transitional countries

Reduced occupational/vocational capacitates and an increased morbidity rates are negative effects of iron deficiency in the total population. In severe cases, consequences of nutritive anaemia include death, especially among children.

Nutritive anaemia, especially due to iron deficiency, affects the growth and intelligence in early age. Many studies have shown that infants and children with Fe deficiency are depressed, have reduced spontaneous and recognition activities. The link between iron deficiency anaemia in developmental behaviour of infants was described in several studies (1,2), made in different environments. The studies show lower Bailey index of mental development among infants with iron deficiency anaemia. Other studies indicated significant differences in mental and motor development among children with Hb<10.4 g/dl. Treatment of Fe deficiency and anaemia did not improve test scores. This points to the fact that iron deficiency anaemia in critical growth period and brain development can cause irreversible alterations. Also observed was the stunted growth and skeletal development among these children. On skull of these children changes such as expansion of the diploe, inborn haemolytic anaemia and demineralisation were found.

Timely detection of anaemia reduces the duration of treatment and wards off unwanted consequences of anaemic condition.

Prevention of nutritive anaemia is the most important link toward reduction of incidence and serious disorders that develop due to this condition. Prevention needs to be especially implemented among risk groups, which includes twins, prematurely born babies, children with low birth weight and children who haemorrhaged in the perinatal period. Medicament therapy and exclusive breastfeeding to 4 or 6 months, is the best way for nutrition and the best means of prevention. Breastmilk provides sufficient Fe needs until the period when the child starts taking other food. The Fe resorption from breastmilk is far more efficient, even from Fe resorption of enriched milk substitutes. Nutrition with exclusively cow milk can precipitate anaemic condition among infants (3). These children need to be given additional Fe until they turn 1 year old. Until recently, there was a belief that anaemia does not have economic consequences in society. The WHO and World Bank research showed that anaemia costs more than other diseases. Preventive activities on iron deficiency anaemia show high benefit compared to the cost of these activities. Because of this, preventive strategies are highly beneficial for any country aimed at achieving better health of population.

4. PREVALENCE OF NUTRITIVE ANAEMIA IN BIH

Until 70s, nutritive anaemia was a significant social and medical problem in Bosnia and Herzegovina. Social and economic condition of population affected higher rate of malnutrition and frequent anaemia prevalence at that time.

With the improvement of social and economic situation in the country, with the improvement in living standard and implementation of the child health protection programmes, the rate of nutritive anaemia was considerably reduced and moved around 40 to 1,000 children of pre-school age (2.7 percent in the total morbidity of children aged 0-6 in 1991.)

The war in Bosnia and Herzegovina led to a deteriorated social and economic situation and this particularly impacted the health of the youngest. Malnutrition and nutritive anaemia are more frequent among children in the post-war period.
The statistical reports, although incomplete, together with results of other studies indicate increased morbidity rate from this disease. In the Federation of Bosnia and Herzegovina, in 1997 the disease rate was 58 and in 1998 - 80 among 1,000 pre-school children and it is twice greater when compared to the situation before the war (4).

In 1998, in the total morbidity rates of pre-school children, anaemia occurs in 4.3 percent and takes fourth place by incidence, right after acute bronchitis (10.6 percent) and diarrhoea (4.5 percent). For 1998, nutritive anaemia is no longer on the list of 10 most frequent diseases among schoolchildren.

The pilot project, "Improvement of health among pre-school children, concerning malnutrition, anaemia and rickets," implemented in some cantons in the Federation BiH, showed that some 45 percent of children are affected with nutritive anaemia. The prevalence of this condition depends on social, economic and education status of parents, mother especially. Study findings showed different positions of doctors in terms of criteria for diagnosis using laboratory testing and their different takes on therapy (5).

The October 1998 Congress of Bosnian and Herzegovinian Paediatricians, highlighted high prevalence of this condition among children. The Congress passed a conclusion that urgent action is needed for prevention, early detection, and treatment of nutritive anaemia and taking of unified standardised criteria for diagnosis of nutritive anaemia.

High prevalence rates and different points of view with regard to diagnosis and treatment of nutritive anaemia among doctors pointed to the need to pass and implement intervention programme to prevent, timely detect and treat nutritive anaemia among children in the Federation of Bosnia and Herzegovina.

5. PROGRAMME OBJECTIVES

The objectives of intervention programme among children aged 0-6 include the following:

1. Establishment of joint criteria to assess anaemic condition among children aged 0-6.

2. Drafting of diagnostic and therapeutic protocol for prevention and treatment of nutritive anaemia and its acceptance by health workers.

3. Early detection of risk groups of children and implementation of timely and adequate treatment of people with this condition.


6. WORKING METHODOLOGY

6.1. General principle for implementation of intervention programme

The primary principle for programme implementation is establishment of a single health protection of children aged 0-6. This principle assumes the following:

- United and simultaneous action in promotion and primary prevention of disease and risk factors significant in the development of nutritive anaemia;
- Early diagnosis, timely and adequate treatment of nutritive anaemia within the system of health care.

The bulk of these activities unfolded through the system of primary health care in health institutes and only in severe cases of this condition at the secondary and tertiary level in hospital health care.

6.2. Strategies for implementation of intervention programme

The following strategies were used for nutritive anaemia intervention programme implementation:

- Training of health workers (doctors and medical technicians), treating children at the level of primary health care in the field of prevention, early diagnosis and adequate treatment based on the Protocol for prevention, diagnosis and therapy of nutritive anaemia among children up to 6 years old, adopted by the FBiH Association of Paediatricians.
- Detection of children with laboratory confirmation (concentration of haemoglobin <11 gr/dl) with anamnestic and clinical signs of nutritive anaemia. These examinations exclude children with chronic diseases that can precipitate nutritive anaemia.
- Children with conformed nutritive anaemia are monitored for a 4-6 month period, they are under a therapy and they receive advice on proper nutrition. This is how the effects of therapy are evaluated.
- Training of parents whose children are confirmed to have nutritive anaemia, making of education materials on diet regimen for parents.

6.3. Regions of implementation and programme participants

The implementation of intervention programme was conducted in the region of Central Bosnia, Zenica-Doboj, Una-Sana, Sarajevo and Herzegovina-Neretva cantons. In health institutes in Travnik, Zenica, Bihac, Sarajevo, Konjic and Jablanica, teams of doctors have been set up to implement the programme. These teams were trained according to the diagnostic and therapeutic protocol for nutritive anaemia among children up to 6 years old.

6.4. Selection of examinees

The intervention programme included all children who went to see a doctor and who were diagnosed as anaemic, based on the criteria for Hb plasma concentration, one month since the start of the project.
6.5. Instruments to monitor implementation

A survey questionnaire was designed for the needs of the programme. It consisted of questionnaire for the first examination and 5 control (check-up) questionnaires. At first examination, the questionnaire was filled out for all children. For children with anaemia, questionnaires were filled at every next check-up, 6 months after the first examination at the most.

Questionnaire for first examination consisted of general data for the child and parents: age, marital status, education, employment, migratory status, accommodation.

Other group of questions concerned the risk groups of mothers and children.

Risk groups of children are defined with the Protocol and included: prematurely born babies, twins, children with low birth weight and children who had haemorrhage in the perinatal period. Combinations of risk groups were taken into consideration during data processing.

Risk factors of mothers were defined with the Protocol and included the number of deliveries, time between deliveries and the number of abortions.

A separate part of questionnaire concerned nutrition of children in their first year. This included: natural nutrition (breastfeeding), duration of breastfeeding, breastfeeding with food supplements, time when food supplements were introduced, milk supplements and the time when they were first introduced.

Clinical signs were observed according to the determined Protocol. If the child had just one clinical sign of anaemia, we believed that the clinical signs are there.

Nutritive anaemia was diagnosed on the basis of haemoglobin concentrations in plasma according to the Protocol criteria: Hg <11gr/dl for children up to 5 years of age and Hg<12gr/dl for children aged 6-12 (1, 6, 7).

Other diseases found during examination were registered in the questionnaire including respiratory, gastrointestinal and urinary infections.

The ordained therapy was observed according to the Protocol criteria: 6 mg/kg per day divided into three doses with Vitamin C. The selection of supplements was also determined by the Protocol and for infants Orferon drops were used, Ferum LEK syrup for smaller children and Retafer tablets 30 x 40 mg for elderly children. They were distributed free of charge according to therapeutic needs.

For children of risk groups, a two-month prophylactic therapy with 2 mg/kg of Fe per day until they turn 1 year old. For infants fed with cow milk the Protocol defined prophylactic dose of 1 mg/kg per day until a child turns one 1 year.

If the therapy was adequate under the above standards, it was considered satisfactory and if it was only partly adequate, i.e. either in smaller doses or Vitamin C deficiency, the therapy was considered inadequate.

In addition to therapy, dietary habits for children older than 6 were also observed. Mothers provided information about the type of food and number of meals the child had. If the nutrition was made of iron-rich foods (Defined by the Protocol 7 on the type of foods) and if the child had at least two such foods per day, the nutrition was considered satisfactory, if the daily nutrition included one iron-rich food, it was considered partly satisfactory and in the daily nutrition did not have iron-rich foods, the diet was considered unsatisfactory.

The check-up questionnaire contained questions based on which the therapy success was monitored, the knowledge of mothers about proper nutrition and health condition of a child.
The clinical signs were observed, the concentrations of Hb, diagnosis were made at every check-up and the current dietary regimen under the previously determined methodology.

## 7. RESULTS

### 7.1. Examinees

During a one-month period, as envisaged by the protocol, there was 826 anamnestic examinations of children up to 6 years of age with Hb < 11 gr/dl.

**Table 1. Children with anaemic condition aged 0-6 in health institutes**

<table>
<thead>
<tr>
<th>Health Institute</th>
<th>No. of examined children</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarajevo</td>
<td>171</td>
<td>20.7</td>
</tr>
<tr>
<td>Bihac</td>
<td>188</td>
<td>22.8</td>
</tr>
<tr>
<td>Zenica</td>
<td>190</td>
<td>23.0</td>
</tr>
<tr>
<td>Travnik</td>
<td>135</td>
<td>16.3</td>
</tr>
<tr>
<td>Konjic</td>
<td>101</td>
<td>12.2</td>
</tr>
<tr>
<td>Jablanica</td>
<td>41</td>
<td>5.0</td>
</tr>
<tr>
<td>Total</td>
<td>826</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The age structure of children with anaemia shows that there was 11.7 percent of children up to six months of age, 22.0 percent up to one year and 66.3 percent from two to six years of age. The sex ratio points to a higher number of boys than girls with anaemic condition: 57.8 percent were boys and 42.2 were girls.

### 7.2. The social and economic status of parents

Almost all children have both parents, only 0.4 percent of children have only father and 2.2 percent of children only have mother. All parents are married and there are no divorced parents; except that 2.6 percent of children live with a single parent.

According to the completed education, fathers have higher levels of education compared to mothers, although mothers are to a considerable extent very well educated. The secondary school education is the most frequent -- 47.6 percent of mothers and 66.3 percent of fathers have completed secondary education. Incomplete primary education and no education have 9.4 percent of mothers and 4.9 percent of fathers. (Table 2) The worse situation in terms of education is the Travnik region where there is 10.8 percent of mothers without school or incomplete primary school.

**Table 2. Education of parents**

<table>
<thead>
<tr>
<th>Total</th>
<th>No education</th>
<th>Incomplete primary education</th>
<th>Primary school</th>
<th>Secondary School</th>
<th>Higher School</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>mother</td>
<td>father</td>
<td>mother</td>
<td>father</td>
<td>mother</td>
<td>Father</td>
</tr>
<tr>
<td>100.0</td>
<td>1.0</td>
<td>0.2</td>
<td>8.4</td>
<td>2.7</td>
<td>38.7</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>47.6</td>
<td>66.3</td>
<td>2.5</td>
<td>2.6</td>
<td>1.7</td>
<td>4.9</td>
</tr>
</tbody>
</table>
The employment rate of parents at the time when the study was conducted (second half of 1999 and the first half of 2000) was very low. At that time, 35.9 percent of children lived in conditions in which both parents were out of work, while in 56.3 percent of families only the father was employed and in 2.1 percent of families, the mother was employed.

Observing the financial situation in the family, one can gather that 29.4 percent of families do not have any income and that 31.3 percent of families live with an income of up to 99 KM per month. The situation is worse in Jablanica and Konjic, where 37.3 percent of families do not have any income and in Zenica where 28.1 percent of families have no income. (Graph 2)

The status of a displaced family had 15.8 percent of respondents, of which there were only 4.2 percent returnees. Most displaced people are in Sarajevo - 37.2 percent and Travnik 27.6 percent. Domicile families are mostly living in their own apartment or house -- 63.2 percent, while there are 16.7 percent of sub-tenants. The best housing conditions are in Jablanica. (Table 3)

**Table 3. The accommodation of families**

<table>
<thead>
<tr>
<th></th>
<th>Domicile population</th>
<th>Displaced population</th>
<th>Returnees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Own house</td>
<td>Subtenant</td>
<td>Collective accomod.</td>
</tr>
<tr>
<td>%</td>
<td>63.2</td>
<td>16.7</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.3. Susceptible (risk) groups of children

Among the examined children, 8.8 percent belong to a high-risk (susceptible) group of children. The risk factors for development of iron deficiency anaemia are prematurely delivered babies, low weight new-borns, twins and children who had a haemorrhage in the perinatal period. The most at risk were the prematurely delivered babies (1.4 percent) and twins (1.8 percent). The combinations of high-risk children are found in 4.7 percent of cases. The most frequent combination is prematurely delivered babies with low weight (2.1 percent). Within the high risk group, most frequent were prematurely delivered babies -- 16.4 percent and twins -- 20.5 percent, while there was 53.5 percent of the combined cases of with lower birth weight. (Graph 3)
7.4. *Risk factors among mothers*

The most important risk factors in mothers that affect the development of iron deficiency anaemia were the number of births and their frequency. In addition to these factors, also observed was the number of live births and the number of abortions. There were 37.6 percent of mothers with one delivery, and 41.0 percent with two deliveries. Four and more deliveries had only 6.8 percent of women. There are regional differences, though. Mothers with four and more deliveries are more frequent in Jablanica (9.7 percent) and Travnik (5.9 percent).

A total of 39.7 percent of the examined children were the first-borns, 38.5 percent were the second-borns and 15.2 percent the third-borns.

In the group of second and later borns, 35.1 percent were born within two years after the first delivery and 33.1 percent were born within two to four years after the previous delivery. There are regional differences. In Konjic, 46.5 percent of children and in Bihac 40.2 percent were born within two years after the previous child was born. (Table 4.)

### Table 4. *Time period between deliveries*

<table>
<thead>
<tr>
<th>Years between deliveries</th>
<th>Up to 2 years</th>
<th>2-4 years</th>
<th>5 and more years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average %</td>
<td>35.1</td>
<td>33.1</td>
<td>31.8</td>
</tr>
</tbody>
</table>

There were a fewer number of pregnancy termination cases, either spontaneous or artificial. There were 10 percent of mothers with one pregnancy termination and 2.1 percent with 4 or more pregnancy terminations.

7.5. *Child nutrition during their first year*

Nutrition of children during the first year is surely listed among the factors that affect the development of nutritive anaemia. The latest insights indicate that natural nutrition is the most ideal and that exclusive breastfeeeding up to six months is the best prevention of nutritive anaemia.
Children who had undergone exclusive breastfeeding for four to six months and longer than one year were less likely to have iron deficiency in their blood.

7.5.1. Natural nutrition of children

Of the children examined, 131 or 15.8 percent were never breastfed. Other 695, or 83.2 percent were breastfed for a different duration and period during the first year of their life. (graph 4.)

In the first year, 15.8 percent of children were not breastfed and received milk substitutes or cow milk, while 84.1 percent were breastfed for a different period. Of the total number of children, 61.7 percent were breastfeeding during the first four months of age, 19.4 during 6 months, 13.9 up to one year of age, and 4.7 percent continued to be breastfed after they turned 1 year (graph 5.)

Table 5. Types of additional food administered to children up to six months old

<table>
<thead>
<tr>
<th>Type of milk</th>
<th>Up to 4 months</th>
<th>Up to 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diluted cow milk</td>
<td>35.8</td>
<td>42.4</td>
</tr>
<tr>
<td>Pure cow milk</td>
<td>12.7</td>
<td>42.0</td>
</tr>
<tr>
<td>Industrial milk substitutes</td>
<td>36.3</td>
<td>12.5</td>
</tr>
<tr>
<td>No additional food</td>
<td>15.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Supplemental food to children with anaemia consisted of cow milk and milk substitutes. With 4 months, 35.8 percent of children were given diluted cow milk, 12.7 percent pure cow milk and 36.3 percent milk substitutes. Only 15.2 percent of children were without supplemental food. In the sixth month almost all children had supplemented diet; 42.4 percent were given pure and 42.0 percent diluted cow milk. Only a small number of children had industrial milk supplements. Only 3.2 percent were not given supplemental food. (Table 5)

Supplemental food to children started very early, as early as the second month of life. (graph 6.)

![Graph 6. Time chart of additional food administered to children who were breastfeeding](image)

There are regional differences. Milk substitutes is most prevalent in Bihac - 56 percent of children were on this diet in the first two months. In Travnik, children were mostly given cow milk - 44/4 percent of children in were given diluted cow milk in the second month of life. Similar situation is in Konjic. The most proper dietary regime for children is in Jablanica, where supplemental foods with milk substitutes or diluted cow milk are rarely used.

In addition to cow milk and milk substitutes, children were also given other types of food. The earliest supplemental food started in the second month of life among 4.0 percent of children with a fruit meal. In the fourth month, 51.8 percent of children had a fruit meal and 40.1 percent vegetables. Meat is introduced as a meal among 66.9 percent of children at the age of six months.

Milk with biscuit or flour is a frequent meal among anaemic children. In the fourth month as many as 68.0 percent of children have it and in sixth month, even 75 percent of children.

7.5.2. Artificial nutrition during the first year

A total of 15.8 percent of the examined children were not breastfeeding. Artificial nutrition in the first 6 months mostly included diluted or pure cow milk with biscuit and/or flour, or industrial milk substitutes (formula) (graph 7.)
Among the regions, artificial nutrition is most prevalent in Bihac, and least prevalent in Jablanica (table 6.)

Table 6. Artificial nutrition by region

<table>
<thead>
<tr>
<th>Region</th>
<th>Children on artificial diet (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarajevo</td>
<td>22.4</td>
</tr>
<tr>
<td>Bihac</td>
<td>35.4</td>
</tr>
<tr>
<td>Zenica</td>
<td>20.9</td>
</tr>
<tr>
<td>Travnik</td>
<td>20.1</td>
</tr>
<tr>
<td>Konjic</td>
<td>20.7</td>
</tr>
<tr>
<td>Jablanica</td>
<td>7.3</td>
</tr>
</tbody>
</table>

Industrial milk substitutes are most widely used in Sarajevo and Bihac, while the cow milk is used most in Zenica, Travnik and Konjic. The nutrition starts with milk substitutes and from the age of 4 months onwards, continues with cow milk and biscuits or with flour.

By the time they reach 6 months, all children will have started eating fruits, vegetables and meat. The time when fruits and vegetables are introduced is the fourth month, meat is introduced at a somewhat later stage. In the sixth month, 80.3 percent of children have a fruit meal, 61.8 percent meat meal and 77.1 percent have vegetables as a meal.

The concentration of haemoglobin in children who eat artificial food and who drink cow milk and biscuits or flour averaged 9.5 gr/dl, in children up to 1 year old and in elderly children up to 60 months old it was 9.4 9.5 gr/dl. The average haemoglobin value in these children is the lowest compared to all children examined, after the children with high risk.

7.6. Clinical symptoms

The primary clinical signs of anaemia were observed: pale skin, dry and desquamating skin, bright and brittle hear, brittle and breakable nails, slow growth and development. At the first examination, one or more clinical signs were detected among 54.4 percent of children. A total of 377 children did not have clinical symptoms of nutritive anaemia. These symptoms were equally distributed among regions, except in Zenica where clinical symptoms were detected only among 19.6 percent, while in Jablanica 90.3 percent of children manifested symptoms.
7.7. Laboratory research

The concentration of haemoglobin in plasma is used as diagnostic criteria for nutritive anaemia. At first examination, the children were determined the level of haemoglobin. According to the adopted Protocol for diagnosing nutritive anaemia, the haemoglobin concentration of below 11 gr/dl is considered as anaemic condition for children under 5 (standard or borderline value).

The average value of haemoglobin at first examination was 10.1 gr/dl. Regionally, the lowest values were detected among children from Bihac, Zenica and Konjic (Graph 8.).

The average values of haemoglobin children's in blood are lower, especially for the age of between 7 and 12 months of age. (graph 9.)
Seven-month-old children and elderly had reduced haemoglobin concentration by an average of 8.9 percent, compared to borderline value.

Regionally, highest average haemoglobin values were among 7-12 month-old children from Sarajevo (10.4 gr/dl) while the lowest were among children from Bihac (9.4 gr/dl), Zenica (9.6 gr/dl) and Konjic (9.4 gr/dl). Lower haemoglobin values were discovered among children older than 1 year, while the highest average haemoglobin values had children up to 6 months. (graph 10.) The average values of haemoglobin in risk groups were lower compared to other anaemic children and varied between 8.7 to 8.8 gr/dl.

Average values of haemoglobin among children who were on substitution diet and who were given cow milk and flour or biscuits, show lower values then the average. Between the age 0-12 months, the haemoglobin concentrations among these children was 9.45 gr/dl, and in the age of 13-60 months it was 9.4 gr/dl.

7.8. Other anaemia-related diseases

Nutritive anaemia can appear in lighter cases of respiratory, gastrointestinal and urinary infections and these health conditions do not bear a significant affect on haemoglobin concentrations.
Upon the first examination, 19.0 percent were diagnosed with respiratory infections, 1.5 percent with urinary and 1.2 percent with gastrointestinal infections.

With improved anaemic condition, subsequent examinations show reduced number of other infections. At the first check-up, 2.1 percent had respiratory infections and the number dropped down to 1.3 percent at the second examination.

7.9. Therapeutic treatment

A therapy was administered on children who were diagnosed as anaemic based on their haemoglobin levels. The protocol defined the supplements, dosage and the period of medicine administering. At first examination, 57.6 percent of anaemic children received adequate therapy. At first check-up, 79.8 percent of anaemic children received adequate therapy and at subsequent check-ups the percentage of adequate therapy increased to 95 percent.

During the programme implementation, intensive education of doctors, nurses and medical technicians was carried out, focusing on prevention, criteria for diagnosis and therapy for nutritive anaemia. During programme, iron supplements were distributed; they met the protocol criteria and were distributed to children with this health condition free of charge.

7.10. Current nutrition

In addition to medicament therapy, the proper nutrition of affected children was recommended. Mothers received information about the proper nutrition, particularly the nutrition involving infants and elderly children.

At first examination, the nutrition was not satisfactory among 27.2 percent of children; it was partly satisfactory in 24.6 percent and adequate in 42.2 percent (for 6 percent there is no data). The check-ups showed that the situation in nutrition was improving from 18.0 percent who did not have adequate nutrition at first, to 13.4 at the second, 8.7 at the third to 0 percent at the fourth check-up, showing that there were no children who had inadequate foods. (graph 12.)

Region-wise, there are no wider differences concerning the nutrition of children, except that children older than 1 year frequently had iron-rich beans in Travnik, Zenica, Konjic and Jablanica and rarely foods of animal origin.
7.11. **Therapeutic and dietary effects**

After the first examination, the children with diagnosed anaemia were ordered therapy and advice about proper nutrition was given to mother. After one month all children came for a check-up. In total, there were four check-ups. The average haemoglobin values increased at every check-up, reaching normal values after three months of treatment (Graph 13)

![Graph 13. The values of haemoglobin after check-ups](image)

At first examination the average Hb concentration was 10.1 gr/dl, and it increased to 11.2 gr/dl at the third check-up and to 11.5 gr/dl at the fourth check-up.

Regionally, the normal average values of haemoglobin were reached after the second check-up in Sarajevo and after fourth check-up in Konjic, Travnik and Zenica.

8. **DISCUSSION AND CONCLUSIONS**

The results of the implemented programme show that preventive, therapeutic and dietary effect in nutritive anaemia of pre-school children are effective and that the recovery from anaemic condition is pretty rapid.

During the programme implementation, a large number of children were diagnosed to have anaemic condition, i.e. lower-than-standard levels of haemoglobin in plasma. Based on laboratory findings, anaemic conditions were confirmed among 826 children.

It is interesting that the anaemic condition among 45.6 percent of children was not accompanied with any clinical manifestation. This indicates that the anaemic condition is present in latent form, characterised by other diseases or disorders.

While diagnosing anaemic condition, other diagnostic conditions were established, such as infections, but they did not have a deep impact on the course of anaemic condition. At every new check-up, the number of other infections was reduced, prompting us to conclude that prevention and treatment of anaemic condition improves the general health condition of a child (1, 3).
Anaemic condition is most prevalent in children aged 7-13 months. The average haemoglobin levels in plasma stood at 10.1 gr/dl. The data confirms that the most vulnerable age for anaemia to develop is between 7 and 12 months. In this period all iron reserves which the child had until the age of six months are used and adequate nutrition was not in place.

Children with anaemic condition were mostly nourished with artificial foods or were exposed to breastfeeding for a shorter period of time, while the administering of additional food started almost immediately with cow milk mixed with biscuits or flour. Exclusive breastfeeding in the first six months is the best prevention for iron deficiency (8), but here we still have the traditional nutrition, which in addition to breastfeeding presupposes giving of water or juices or tea. Findings on breastfeeding prevalence study in FBiH agree with this data (9). They indicate that exclusive breastfeeding is only 8.1 percent prevalent among children to the age of four months and 5.5 percent among children up to six months. According to this study, supplemental nutrition started within the first six months and 81.3 percent of children had supplemental nutrition in this period, while 50 percent stopped breastfeeding at the age of four months. Early introduction of cow milk and biscuits, as well as fruits and vegetables is a commonplace in these regions. Such diet is conducive to development of disorders, especially because supplementation starts very early, before fourth month of age. This is substantiated by the fact that the average haemoglobin values are the lowest among children who were given cow milk and biscuits (except the risk-groups of children).

Among children with anaemic condition, 8.8 percent came from risk groups. Premature deliveries and twins are the leading risk groups among anaemic children. The haemoglobin levels among these children are the lowest of all the average. Because of this, special care needs to be taken of these children by highlighting these risk groups to doctors and nurses and mothers while they are still at the maternity wards.

The social and economic status of parents also correlates with the prevalence of anaemic condition (1).

Low education levels of mothers and their unemployment is directly linked to small time spans between deliveries. More than 35 percent of these children were born two years after the previous pregnancy. It is probable that the mothers are anaemic and that this contributes to development of anaemia among new-borns (1).

Low education levels of mothers, high unemployment and poor economic standard are conducive to development of anaemic conditions among children. A third of parents at the time when this study was conducted were out of job, and the chances of finding one are ever so slim. As a disease that shows no alarming symptoms in regions with lower cultural levels and poor economic power, it seems that this is a long-lasting disease, leaving serious and often irreversible changes to health condition of a child.

What makes us feel optimistic is that haemoglobin concentrations improve relatively quickly with the therapy and dietary regimen. Mothers are highly motivated to contribute to an improved health condition. The nutrition of most children is adequate after the second check-up, in terms of food quality and quantity. However, the meat and liver, as good sources of iron are rarely used in daily diets of most families, due to their unaffordability. Instead of these foods, beans are used as a good source of iron.
The intervening programme was implemented only on one target group, according to the WHO and UNICEF recommendations. Namely, the Programme for Control and Prevention of Iron Deficiency Anaemia (1, 10) recommends implementation of this programme not just for children, but pregnant and lactating women and women in adolescent age. The primary strategic directions in prevention and control of anaemia among these groups include the following:

- Education of medical personnel to make correct diagnosis, based on recommended criteria and proper therapy for this condition,
- Detection of risk groups and their monitoring,
- Education of mothers, pregnant women and adolescents about the proper nutrition, aimed at preventing anaemic condition,
- Exclusive breastfeeding in the first 4-6 months and continuing breastfeeding up to one year of age,
- Essential perinatal protection of new-borns,
- Essential protection of reproductive health and the health of pregnant women,
- Education of the overall population on healthy nutrition.

Based on the findings and results of the programme implementation among children up to six years of age, we can conclude the following:

- Natural nutrition of children is not carried out in line with the recommendations of UNICEF and WHO;
- Early ablactation and nutrition with other types of milk and foods;
- Additional nutrition of children consists of giving cow milk with biscuits or flour as early as the second month;
- High percentage of children at risk which must be kept under constant supervision of doctors and nurses;
- There is a high percentage of children born within two years since mother's previous pregnancy, which indicates anaemic conditions in pregnant women as well;
- Socio-economic conditions have deteriorated, this especially applies to soaring unemployment and low purchasing power of families. This directly affects the nutrition within the family.
- Education level of parents is good on the average, but mothers have lower education and they play the crucial role in treatment of these children. What's particularly encouraging is a high level of motivation of mother's to upgrade the health condition of their children. Advice about proper nutrition of children were embraced and put into practice. The same applies to a direct administering of prescribed medicines.
- The turnout to subsequent check-ups was low in some health clinic. A check-up depended on the position of month for further treatment and availability of health workers for check-up.
- In examined children the therapy produced rapid positive results, which proved that significant results are achievable with relatively low effort. During programme implementation, iron supplements were distributed free of charge, including orferon drops, retafer tablets and syrup.
- Positive results in programme implementation could not have been achieved without adequate training of doctors and nurses in prevention, diagnosis and treatment of nutritive anaemia. The training was conducted according to the Protocol for diagnosis and therapy of nutritive anaemia among children up to 6 years old in these regions, i.e. with selected teams of doctors in health clinics. The reports on education evaluation of these health workers point to an increased level of knowledge and the necessity of continual recapitulation of knowledge (11).
9. **DIFFICULTIES**

There were no greater difficulties during programme implementation. Doctors' teams were educated for programme implementation. However, doctors did not show readiness for a continual monitoring of these children. Namely, the number of children from the first examination dwindled. There were no mechanisms to get the information about these children at home, which included the therapy and dietary regimen. The institution of family doctor and patronage nurse is yet to take hold in our health care system and the child's check-up visits mostly depended on mother's assessment and awareness that the therapy should continue according to the doctor's advice. Decision on regular control of child with this condition was affected by mothers' position that it is not necessary to check the level of haemoglobin at every check-up.

Insufficient knowledge of mothers, as well as their lower education, affected repeated visits of a child to the doctor.

9. **RECOMMENDATIONS AND FUTURE DIRECTIONS**

A relatively successful therapeutic and dietary effect of treatment of anaemic children show that the applied programme was a success that produced positive results. A precise diagnosis of anaemic condition, defining of risk factors for development of this disease and proper therapeutic and dietary regimen indicate that the programme needs to be continued in other regions in FBiH. Although the goal of this programme was not to assess the prevalence of anaemic condition among children, we found that this condition is significantly prevalent among children and that a more robust, corrective action is necessary.

It is to be expected that the situation in this sphere improves with the improvement of living standard of people, and when the employment and housing problems are resolved.

The programme results will be used as a signpost in defining risk population, risk factors and implementation of this programme in our country. The programme for prevention and control of anaemia needs to be expended to other risk groups, especially pregnant and lactating women.

To make the programme sustainable, it is necessary to continue training of health workers, who will be able to convey their knowledge to other health workers involved in the child health care.

Mothers are an important component of this programme. If possible, training should be expended to include mothers; in the first stage anaemic mothers and later other risk groups of children. We should properly benefit from the motivation of mothers to improve health condition of their children. This can be achieved with the establishment of groups consisting of mothers and health workers, well-trained nurses in particular. In addition to nutrition and treatment of children with anaemia, other topics could be covered as well, depending on the interest of mothers. The activities of nurses in health training should be their routine activity, since the legal support is in place.
11. REFERENCES