

Investigation of Iron Deficiency, Iron Deficiency Anemia and Hemoglobinopathy Frequency in Kahramanmaraş City

Kahramanmaraş İlinde Demir Eksikliği, Demir Eksikliği Anemisi ve Hemoglobinopati Sıklığının İncelenmesi

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ABSTRACT

The present study examined the levels of hemoglobin, MCV, ferritin, and hemoglobin electrophoresis of patients admitted to the hospital for different reasons, thus based on the results of these values, the number of patients diagnosed with iron deficiency, iron deficiency anemia, and hemoglobinopathy were aimed to be compared with their numbers, age, gender, and percentage rates. The cases recruited into the study consist of a retrospective examination of the results of blood samples sent to the biochemistry laboratory for the study of hematological parameters by outpatient clinics and wards in various branches of Kahramanmaraş Sütçü İmam University Research and Practice Hospital between 2007 and 2015. For this purpose, hemogram results, ferritin, Hb electrophoresis of 1,350,750 patients in total were studied. HbA2 (beta thalassemia), HbS (sickle cell anemia), HbF (fetal anemia) values were also compared based on age groups and gender differences. According to the gender difference, 604,924 (44.8%) were female, and 745,826 (55.2%) were male. Age ranges were grouped as 2-5, 6-12, 13-18, 19-49, and 50-year-olds and older. As a result, when the groups of girls and boys in the 2-5 years, 6-12 years, 13-18 age groups are compared, contrary to what is expected, boys seem to be more anemic in both microcytic anemia and iron deficiency anemias. In groups 19-49 and 50 and older, women were more anemic than men. Hemoglobinopathy is one of the most common genetic transitional diseases in Turkey, and the incidence of it regionally varies at significant rates.

Keywords: Iron deficiency, iron deficiency anemia, hemoglobinopathy.

ÖZET

Çalışmamıza farklı sebeplerle hastaneye başvuran hastalar arasında hemogloblin, MCV, ferritin ve hemogloblin elektroforezine bakılan hastalar ve bu değerlerin sonuçlarına göre demir eksikliği, demir eksikliği anemisi ve hemoglobinopati teşhisi konulan hastaların sayıları, yaşa ve cinsiyete göre sayısal değerleri, yüzde oranları ile karşılaştırılıp değerlendirilmesi amaçlanmıştır. Çalışmaya alınan olgular 2007-2015 tarihleri arasında Kahramanmaraş Sütçü İmam Üniversitesi Araştırma ve Uygulama Hastanesine çeşitli branşlardaki poliklinik ve servislere herhangi bir nedenle başvurarak biyokimya laboratuvarına hematolojik parametrelerin çalışılması için gönderilen örneklerin sonuçlarının retrospektif olarak incelenmesinden oluşmaktadır. Bu amaçla toplam 1.350.750 hastaya ait hemogram, ferritin, Hb elektroforezi sonuçları incelenmiştir. Hemogloblin elektroforezi ile bakılan HbA2 (beta talasemi), HbS (orak hücre anemisi), HbF (fötal dönem anemisi) değerleride aynı yaş grupları ve cinsiyet farklarına göre görünme oranlarına bakılmıştır İncelenen örneklerin cinsiyet ayırımına göre 604.924'ü kadın (%44,8), 745.826'sinin (%55,2) erkek olduğu görülmektedir. İncelemede yaş aralıkları 2-5, 6-12, 13-18, 19-49, 50 yaş ve üzeri olarak alınmıştır.

Sonuç olarak 2-5 yaş, 6-12 yaş, 13-18 yaş gruplarındaki kız ve erkek grupları kıyaslandığında beklenenin aksine erkekler hem mikrositer anemide hem de demir eksikliği anemilerinde erkekler daha anemik görünmektedir. 19-49, 50 yaş ve üzeri gruplarda ise kadınlar erkeklerden daha anemik bulunmuşlardır. Hemoglobinopatilerde Türkiye’de yaygın görülen genetik geçişli hastalıklardan biri olup bölgesel olarak da görülme sıklığı anlamlı oranlarda farklılık göstermektedir

Anahtar Kelimeler: Demir eksikliği, demir eksikliği anemisi, hemoglobinopati.

INTRODUCTION

Iron deficiency (ID) and iron deficiency anemia (IDA) are two of the major public health challenges in undeveloped and developing world countries. The incidence of IDA in a country, region, or province is directly related to its socio-economic cultural structure, and development level (Çıkım & Baylan, 2021; Savaş & Köken, 2019). Iron deficiency is one of the most important nutritional problems in the world. The prevalence of anemia due to iron deficiency appears to be at high rates in underdeveloped and developing countries (d’Arqom, 2021; Yücel et al.).

Türkiye is also among the developing countries and the prevalence of anemia is still high. In developed countries, however, the prevalence appears to be quite low. Iron deficiency is frequently seen in infancy in the period when growth is rapid, in the fertility period of women, and in chronic diseases. In societies with a low socio-economic structure, besides nutritional deficiency, infections are among the reasons that increase the risk of anemia (Kılıçbay et al., 2022; Nikniaz et al., 2019)

Hemoglobinopathy is a genetic disorder that leads to an abnormality in the structure of one of the globin chains in the hemoglobin molecule (Altan; Özbolat & Tuli; Türközen & Zeynep, 2020). It harbors many diseases, including sickle cell anemia and thalassemia. Human hemoglobin (Hb) consists of heme and globin chains in the polypeptide structure. At birth, a newborn has 80% fetal Hb (Hb F=2 α 2 γ) and 20% adult type Hb (Hb A=2 α 2 β). HbA2 (2 α 2 δ) is not present in this period. After birth, Hb components change as the day goes on, and in the sixth month, major Hb is HbA, and there are very few amounts of HbF and a minor HbA2 (Balci et al.; Çıkım & Baylan, 2021; d’Arqom, 2021; Güler et al., 2008; Özbolat & Tuli; Yılmaz, 2021).

Hemoglobin, MCV, ferritin, and hemoglobin electrophoresis values of patients admitted to Kahramanmaraş Sütçü Imam University (KSU), Faculty of Medicine, for different reasons in the last eight years were examined, and according to the results of these values, it was aimed to compare and evaluate the numbers, numerical values and percentage ratios of patients diagnosed with iron deficiency, iron deficiency anemia and hemoglobinopathy based on age and gender (Duyuran et al., 2019).

The population of Kahramanmaraş in the Mediterranean region earns their living in the industry, agriculture, and animal husbandry, and the national income of the city is below the average of Turkey. The fact that it is behind the average in Turkey socioeconomically suggests that there may be some problems with nutrition from an economic point of view (Çipil & Demircioğlu, 2016; Naiboğlu et al., 2019).

When determining the etiology of iron deficiency and iron deficiency anemia, it is necessary to receive accurate anamnesis. The person's social condition and the area where he/she lives are important for nutrient deficiency and hemoglobin diseases (Yılmaz & Yasemin, 2019). Whether the patient's family members have a history of anemia and consanguineous marriage should be sought and careful anamnesis should be taken with such questions. Attention should be given to the person's dietary conditions (a diet low in meat causes iron deficiency, while a diet low in green vegetables causes folate deficiency), bleeding from the genital system, and gastrointestinal (GI) bleeding. Blood loss in some cases causes anemia and the underlying cause may be hemostasis disorder (congenital or acquired). The patient's profession, his struggles in life, and the drugs he uses should be questioned (Yurdakök & Ot, 2009).

Frequent delivery or miscarriage by women can cause iron deficiency. In the research conducted on women of childbearing age, it has been revealed that there are problems caused by lack of information as well as nutritional deficiencies due to the current economic problems experienced by developing countries. To raise healthy generations, it should be a priority to raise awareness of women about nutrition and to give importance to nutrition education, especially for pregnant and lactating women. This topic needs to be controlled with effective public health protection. Healthy and quality life models should be created with simple measures in society.

MATERIAL AND METHOD

The cases included in the study consist of the compilation of the results of the samples sent to the Biochemistry Laboratory for the study of hematological parameters of the patients applying to the polyclinics and services in different branches of Kahramanmaraş Sütçü Imam University Research and Application Hospital between 2007-2015 for any reason. For this purpose, a total of 1.350.750 hemograms, ferritin, Hb electrophoresis results were examined. The classification of the examined samples according to gender shows that 604.924 of them were female (44.8%) and 745.826 (55.2%) were male. In the study, age ranges were grouped as 2-5, 6-12, 13-18, 19-49, 50 years, and older. Hemograms were studied in Sysmex brand fully automatic blood counting device, ferritin levels were studied in a fully automatic hormone analyzer, and hemoglobin chain analyzes were studied in Bio-Rad brand automatic HPLC device, thus the data obtained by transferring the approved results to the automation system were used.

RESULTS

The distribution of patients admitted to the hospital according to gender is shown in figure 1 and the distribution according to age is shown in figure 2. Figure 3 demonstrates a % (percentage) distribution graph of male and female patients with iron deficiency anemia based on the age groups. In Table 1, the number and percentage of iron deficiency and iron deficiency anemia cases were calculated based on age groups, and the numerical results were indicated. In addition, in Table 3, the results of patients who were examined through hemoglobin electrophoresis (HbA₂, HbS, HbF) are shown with the proportions. In Table 4, the proportion of patients with iron deficiency anemia to hemoglobinopathy patients was again shown with percentage distribution based on age and gender.

As a result, as shown in Tables 1 and 2, when the groups of girls and boys in the 2-5 years, 6-12 years, 13-18 age groups are compared, contrary to what is expected, boys appear to be more anemic than girls in both microcytic anemia and iron deficiency anemias. In the 19-49 age group, on the contrary, women seem to be more anemic (Duyuran, 2018).

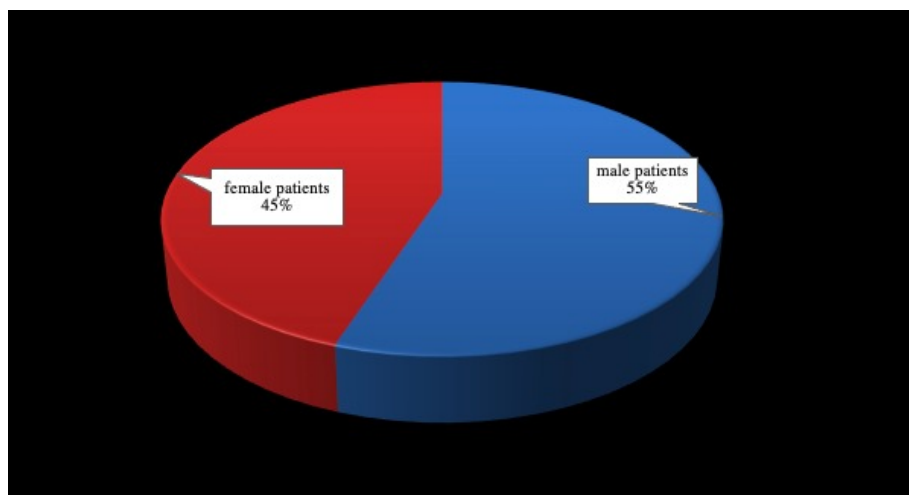


Figure 1. Percentages of patients included in our study by gender.

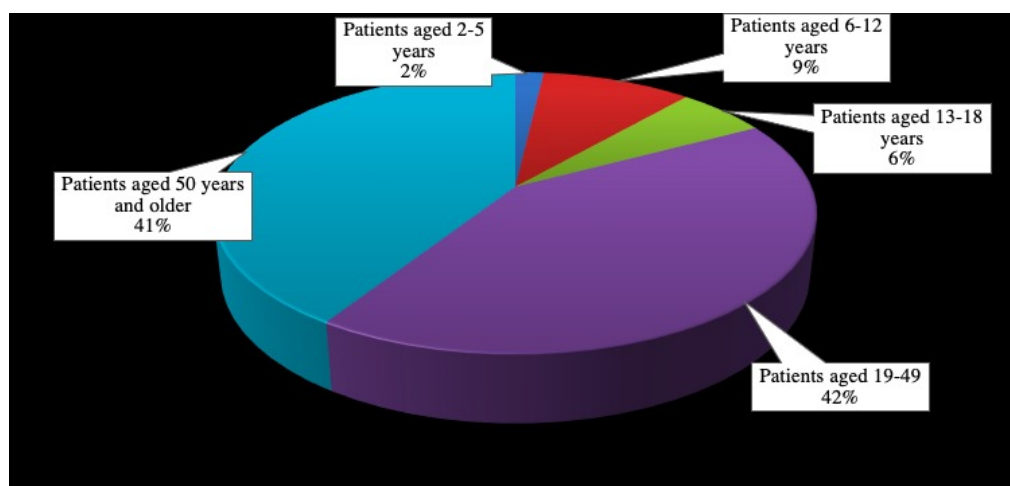


Figure 2. Percentages of patients included in our study by their age groups

According to the results, the Iron Deficiency Anemia (IDA) and Anemia percentage tables were presented as follows.

Table 1. Number and percentage rate of patients with iron deficiency anemia according to all hospital records

Table 1. Number and percentage rate of patients with iron deficiency anemia according to all hospital records

| Gender and age range | Iron Deficiency Anemias (ida) | Number of cases whose hemogram value was examined | Percentage (%) |
|-----------------------------|-------------------------------|---|----------------|
| 2-5 years old girls | 2772 | 22368 | % 12,39 |
| 2-5 years old boys | 4776 | 30337 | % 15,74 |
| 6-12 years old girls | 14180 | 53376 | % 26,56 |
| 6-12 years old boys | 22551 | 71635 | % 31,48 |
| 13-18 years old girls | 9673 | 34522 | % 28,02 |
| 13-18 years old boys | 13653 | 39689 | % 34,40 |
| 19-49 years old women | 144372 | 400616 | % 36,04 |
| 19-49 years old men | 25930 | 116636 | % 22,22 |
| 50+ years old men and women | 149463 | 534151 | % 27,98 |

Table 2. Number and Percentage of Anemic Patients

| Gender and age range | ANEMIA | Number of cases whose hemogram value was examined | Percentage (%) |
|-----------------------------|------------------------|---|----------------|
| 2-5 years old girls | 2634 | 22230 | % 10.59 |
| 2-5 years old boys | 4525 | 30086 | % 13.07 |
| 6-12 years old girls | 14630 | 54204 | % 21.25 |
| 6-12 years old boys | 23360 | 72425 | % 24.39 |
| 13-18 years old girls | 9328 | 34177 | % 21.44 |
| 13-18 years old boys | 13514 | 39550 | % 25.47 |
| 19-49 years old women | 139682 | 395926 | % 26.08 |
| 19-49 years old men | 25653 | 116359 | % 18.06 |
| 50+ years old men and women | 98387+63278 =161665 | 585793 | % 21.63 |

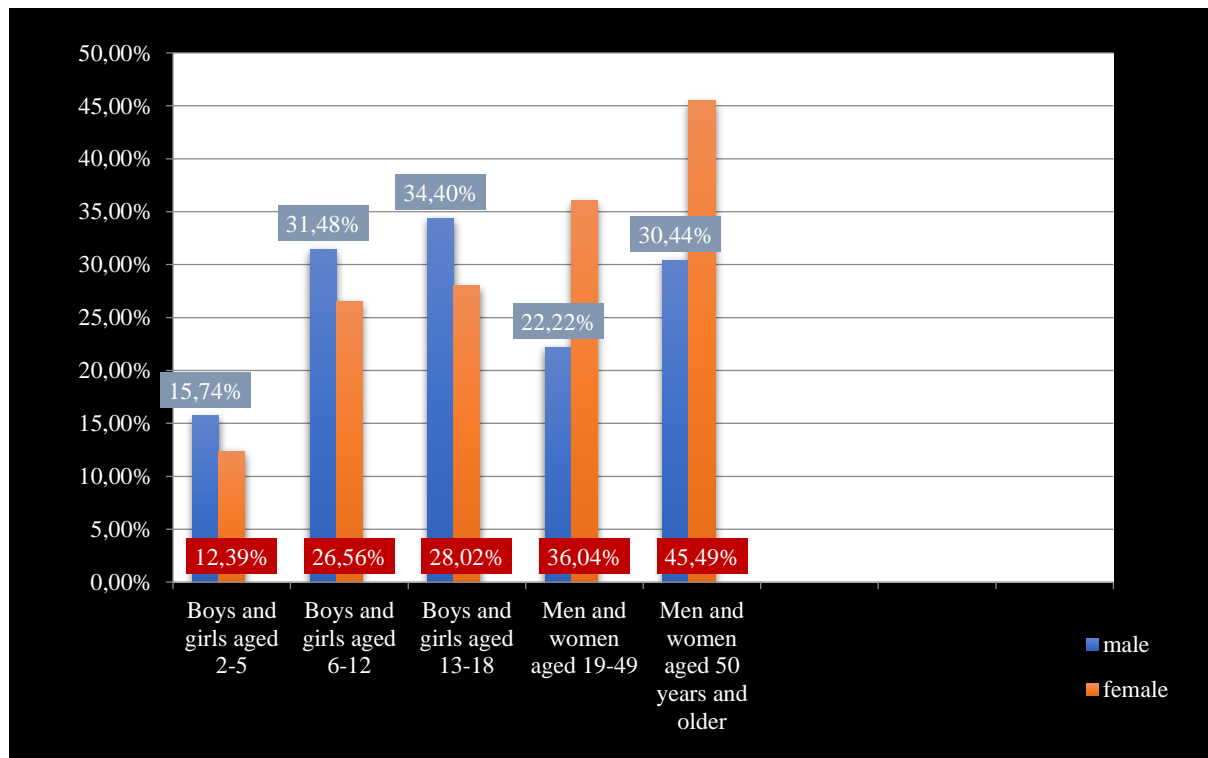


Figure 3. Percentage of male and female patients with Iron Deficiency Anemias

HbA2 (beta thalassemia), HbS (sickle cell anemia), HbF (fetal period anemia) values examined by hemoglobin electrophoresis are shown in Table 3 as follows.

Table 3. Cases examined through hemoglobin electrophoresis (HbA2, HbS, HbF)

| Gender and age range | Patients | Number of cases | Percentage (%) |
|-----------------------------|----------|-----------------|----------------|
| 2-5 years old girls | 11 | 59 | %18.64 |
| 2-5 years old boys | 28 | 110 | %25.45 |
| 6-12 years old girls | 66 | 315 | %25.95 |
| 6-12 years old boys | 93 | 525 | %17.71 |
| 13-18 years old girls | 18 | 112 | %16.07 |
| 13-18 years old boys | 30 | 138 | %21.73 |
| 19-49 years old women | 112 | 886 | %12.64 |
| 19-49 years old men | 64 | 313 | %20.44 |
| 50+ years old men and women | 26+18 | 182 | %24.17 |

Hemoglobinopathy is one of the most common genetically transmitted diseases in Turkey and the incidence varies significantly on a regional basis.

Table 4. Ratio of patients with iron deficiency anemia to those with hemoglobinopathy

| Gender and age range | Iron Deficiency Anemias | Hemoglobinopathy frequency | Percentage (%) |
|-----------------------------|-------------------------|----------------------------|----------------|
| 2-5 years old girls | 2772 | 11 | 0.3968 |
| 2-5 years old boys | 4776 | 28 | 0.5862 |
| 6-12 years old girls | 14180 | 66 | 0.4654 |
| 6-12 years old boys | 22551 | 93 | 0.4123 |
| 13-18 years old girls | 9673 | 18 | 0.1860 |
| 13-18 years old boys | 13653 | 30 | 0.2197 |
| 19-49 years old women | 144372 | 112 | 0.0775 |
| 19-49 years old men | 25930 | 64 | 0.2468 |
| 50+ years old men and women | 149463 | 26+18=44 | 0.0294 |

DISCUSSION

The hemogram tables of a total of 1.350.750 cases were examined in our study. Of these, 55.2% were male and 44.8% were female patients. Some of these are likely to have duplicate outcomes belonging to the same patient. Due to a large number of data, there is no possibility of separation. The population of Kahramanmaraş earns their livelihood with industry, agriculture, and livestock in the Mediterranean region and ranks 52 in the national income. The fact that it is behind the average in Turkey socioeconomically suggests that there may be some problems with nutrition from an economic point of view.

Anemia and iron deficiency anemia (IDA) are two of the most important public health challenges in undeveloped and developing countries. The incidence of iron deficiency anemia in a country, region, or province is associated with the cultural, socio-economic structure, and development level of that region.

We have determined in our literature review that the high frequency of iron deficiency and the decrease in iron reserves are more common health problems in women than in men due to the menstrual period and pregnancy period, but in our study, the opposite result is seen in some age periods.

Male patients aged 2-5 years, 6-12 years, 13-18 years seem to be more anemic than females, as opposed to expected, according to the results of the cases with hemogram values. Iron deficiency also appears to be greater in men of the same age group.

In a study conducted in the United States, the male-to-female ratio for iron deficiency anemia was found to be 1.3-2.1. In our study, the male-to-female ratio for iron deficiency anemia was found to be 1.29, which is consistent with the ratios in the United States (Duyuran, 2018).

Dilek et al. reported that iron deficiency anemia caused by intestinal parasites was found 6.6% in men and 8.6% in women. Compared to another study result (11.4%) previously conducted in the Eastern Anatolia region, the values appear to have improved positively (Akkeçeci et al.; Dilek et al., 2000; Togay et al.). This can be explained by the development of the economic level in our region in recent years.

In a study conducted in Van city of Turkey, gynecological bleeding of women (38%) and blood losses due to the gastrointestinal system (32%) were shown as the cause of iron deficiency anemia. According to the results, insufficient iron intake was detected in 11% of patients (Akarsu et al.; Dilek et al., 2000).

Another study in Ankara found that 36% of women had a gynecological-based iron loss and 21% had a gastrointestinal tract-based loss. The same study found no etiological cause in 12% of patients (Aslan et al., 1997; Çaylak, 2022)

IDA is known to adversely affect mental, and motor development in children, and cause a persistent decline in development and intelligence scores if treated inadequately or late, for this reason, preventing the formation of the IDA or treating cases of iron deficiency before causing anemia as soon as possible is critical.

The studies of Grindulus et al. and Walter et al. showed lower IQ scores for children with IDA than for the control group, and although there was an improvement in blood values after 2-3 months of iron treatment, no increase in IQ scores was observed (Firat & Bildiren; Grindulis et al., 1986; Sağlık et al.; Walter et al., 1989).

Several studies showed that when 9-24 month-old babies with iron deficiency were compared with the same age control groups without anemia, low cognitive and motor scores and increased behavioral disorders were found in the group with IDA. Longer-lasting studies have suggested that developmental problems are more persistent (Moffatt et al., 1994; Sağlık et al.; Uyaroğlu, 2022).

In the measures to be taken to prevent IDA in childhood, bleeding and infections that may occur in antenatal care and perinatal follow-ups should be prevented and iron support should be given to all mothers starting from the second half of pregnancy during breastfeeding. It should be encouraged to feed babies only with breast milk in the first six months of life. Iron-enriched milk should be used in the diet of babies who cannot receive breast milk or who are weaned from the milk before one year of age. Cow's milk feeding should be avoided in the infant group of one age (Büyükcavcı et al., 2020; Erdem & Yazıcıoğlu).

The diagnosis of IDA is usually made when patients are admitted to a health care facility for another reason. Our study was based on the results of patients who were admitted to the hospital for any reason and whose hemograms were examined.

As can be understood from these results, this disease, which can be prevented with simple measures or is easy to treat, becomes a public health problem that causes high rates of death when not treated.

CONCLUSION

As a result of the research conducted according to the data of the university hospital in Kahramanmaraş, iron deficiency, iron deficiency anemia and hemoglobinopathy is a national public health problem as seen in our literature review. As seen in our results, our values are proportionally high. These ratios show eight years of data from a university hospital, which is a serious data potential. Looking at our averages, our rates seem high. These results clearly show that there is a society-wide problem that threatens human health and reduces the comfort of life. With the screening and follow-up of health problems that can be easily taken care of, the costs that will arise both in protecting public health and in coping with the problems that will arise can be avoided

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Statement of Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author's Contributions

The contribution of the authors is equal.

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