ISSN NO: 2770-0003
Date of Publication: 30-08-2023

Human Hemoglobin's as Diagnostic Markers in the Conditions of the Republic of Karakalpakstan

Serimbetova Rufiya Saribayevna,
assistant of the Department of
Karakalpak State University
Mambetullayeva Svetlana Mirzamuratovna,
DSc in Biology, professor, Director of the Karakalpak
Scientific Research Institute Natural Sciences,
Republic of Uzbekistan,
E-mail- svetmamb@mail.ru

Abstract: The article presents the results of the analysis of hemoglobin indicators in the blood of women living in the Republic of Karakalpakstan. It has been established that in all areas there is some "rejuvenation" of the process of hypo-hemoglobinosis, manifested at a fairly young age (30 years). The change in the ratio of blood hemoglobin types in clinical practice is used to diagnose various pathological conditions.

Keywords: Republic of Karakalpakstan, indicators, women, population health.

Currently, it can be considered proven that anthropogenic environmental pollution has a pronounced impact on the formation of population health, especially in connection with changes in socio-economic conditions [1]. In this regard, the development of the concept of safety in the field of ecology and hygiene, aimed at eliminating the obvious and potential danger to human health associated with the impact of adverse environmental risk factors, is of particular relevance.

Adaptive reactions provide the body with the ability to adequately respond to changes in its internal and environmental environment. Among them, the so-called compensatory-adaptive reactions are distinguished, the mechanisms of which are activated in cases when a violation of a certain structure or function of the body ensures its maintenance due to the increased work of other structural and functional formations of the body [5].

The blood system, realizing various functions in the body, reacts most quickly to any deviations of homeostasis indicators from the norm and, thereby, triggers the mechanisms of adaptive-compensatory reactions of the body [13]. General clinical blood examination is one of the most important diagnostic methods reflecting the reaction of hematopoietic organs to the effects of various physiological and pathological factors on the body. In most cases, it plays an important role in the diagnosis, and in diseases of the hematopoiesis system, it plays a leading role [2, 9].

Hemoglobin (Hb) (from Greek. haemo – blood and lat. globus – ball), a red iron-containing chromoprotein found in all eukaryotic organisms, from unicellular (yeast, etc.) to invertebrates and higher vertebrates. It is able to reversibly bind molecular oxygen in the amount of 20 mg O_2 per 100 ml of blood [4]. In biological systems, Hb performs two important functions: a) transport of respiratory gases; b) maintenance of acid-base balance (it is worth noting that the hemoglobin buffer is the most powerful in the body (about three-quarters of the total buffer capacity of blood) [5].

Hemoglobin is an intracellular component. It accounts for 90% of all red blood cell protein. It is noteworthy that oxygen is not used in the erythrocyte's own metabolism [7]. All types of hemoglobin are tetramers constructed from a pair of α-subunits, and a different pair specific to each type. Each of the four protomers is constructed of two unequal parts: a non–protein structure – heme (4% of the mass of the Hb molecule, provides coloring and covalent bond with oxygen) and a protein globule - globin (96% of the mass, more often represented by either 141 (α-chain) or 146 (β-, γ-, δ-chains) by amino acid residues) [4, 8].

The most significant and studied types of human hemoglobin include: adult hemoglobin – HbA (from the Latin adultus – adult), which includes more than 300 subtypes, the main of which are HbA1, HbA2, fetal

ISSN NO: 2770-0003
Date of Publication: 30-08-2023

hemoglobin – HbF (from the Latin fetus – fetus) and primitive hemoglobin – HbP (from the Greek embryon – embryo) [3, 8, 12].

The object of the study was female persons aged 20 to 60 years living in the Republic of Karakalpakstan. Surveys were conducted in the Northern, Southern and Central regions of the Republic of Karakalpakstan. The northern districts include Muynak, Kungrad and Takhtakupyr districts. The southern districts include Amudarya, Beruniy and Turtkul districts. The Central districts include the Nukus, Khojeyli and Kegeyli districts. A total of 410 women of fertile age were examined.

In the course of the analysis, it was found that in women living in the Northern regions of the Republic of Karakalpakstan, the hemoglobin (Hb) content in the blood in 1980-1990 at the age of 20-50 years was 11,0-12,0 mg/%, by the age of 60 – 10,5 mg/%. These values are below the control by 9-11%. In older women, it is only 6%, since they have a lower physiological norm of hemoglobin (Hb).

In 2000-2010, there were changes in the hemoglobin content in the blood of the examined women. In relation to the norm, it decreased in all age groups: 20-30 years by 12%, 40 years – 11%, 50 years - 15% and 60 years – 11%. Indicators of 2012-2022 indicate a deterioration in the state of saturation of erythrocytes with hemoglobin. This applies to all age groups and is 18% in 20-year–olds, 17% in 30–year-olds, 20% in 40–year–olds, 23% in 50-year-olds, 13% in 60-year-olds.

The analysis showed that the concentration of hemoglobin in the blood of women from the Southern regions of the Republic of Karakalpakstan is lower than the control values (by 6-10%). An analysis of retrospective data (2000-2010) of a survey of women of various ages in these areas showed that the concentration of Hb in the blood continues to decrease in 20–year-olds, which was 12% below normal, 8% in 30 years, 11% in 40 years, 19% in 50 years and 60 years – 11%. If we compare the data obtained with 1980, there is a noticeable continuation of the decrease in Hb content, which ranges from 2 to 9%. More noticeable changes occur by the age of 50 [10].

A survey of women in the period 2012-2022 showed an increasingly progressive decrease in the concentration of hemoglobin in the blood of women from the Southern regions of the Republic of Karakalpakstan. Its deficit was 15% in 20-year–olds, 14% in 30 years, 19% in 40 years, 15% in 50 years and 10% in 60 years.

Further, a study of the hemoglobin content in the blood of women of various ages living in the Central regions of the Republic of Karakalpakstan was conducted. It was noted that the normal hemoglobin content gradually decreases with age, most noticeably by the age of 60 (by 9% compared to 20-year-olds).

In the period 1980-1990, the hemoglobin content in women, regardless of age, was slightly lower than the control values (6-12%), amounting to 11,0-12,0%. With age, there is a slight decrease in the content of Hb in the blood by 6-18%. By the age of 60, it decreases slightly (5%) and is below the control by 9%. The indicators of Hb content in the period 2012-2022 in relation to the accepted standards are lower than in previous years (by 18% in 20 years and 21% in 40-year-olds). At the age of 60, the Hb content is 12% lower in relation to the norm of the age group, and by the age of 20 by 11%, the changes are less pronounced than in younger women.

Summarizing the survey data of women of different ages living in different regions of the Republic of Karakalpakstan, the following distribution can be obtained by quantitative indicators of hemoglobin content in the blood. In all areas, there is some "rejuvenation" of the process of hypo-hemoglobinosis, manifested at a fairly young age (30 years). If we take into account the known clinical value of the hemoglobin concentration in the blood, it can be assumed that its reduced values in the blood of women are a laboratory manifestation of the symptom of anemia. The change in the ratio of blood hemoglobin types in clinical practice is used to diagnose various pathological conditions [6, 9, 7]. An increase in the amount of fetal hemoglobin is observed in the homozygous form of β-thalassemia, hereditary persistence of fetal hemoglobin, σ-, β-thalassemia, sickle cell anemia.

References:

1. Abdirov Ch.A., Aghajanyan N.A., Severin A.E. Ecology and human health.- Nukus.- Karakalpakstan, 1993.- pp. 43-45.
2. Agapova A.,. Kriventsev Yu. A., Dyakova O. N. Development of a diagnostic immunodiffusion test system for fetal hemoglobin // Proteins – markers of pathological conditions: Materials of the

ISSN NO: 2770-0003
Date of Publication: 30-08-2023

conference of young scientists with international participation. – Astrakhan – Moscow, 2001. – pp. 101-103.
3. Blumenfeld L. A. Hemoglobin // Soros Educational Journal. - 1998. – No. 4. – pp. 33-38.
4. Buglanov A.A., Salpina E.V., Turaev A.T. Biochemical and clinical role of iron // Pediatrics. 1991. No. 6. 9-10 p.
5. Volozhin A.I., Subbotin Yu.K. Disease and health: two sides of adaptation. – M.: Medicine, 1998 – 480 p.Горожанин Л.С. Возрастные особенности гуморальной регуляции эритропоэза // Успехи физиол. наук.- 1979.- № 1. – 124-135 с.
6. Gutoranov V. G. Modification of the method for determining the concentration of hemoglobin in the blood // Laboratory business. – M., Medicine. – 1983. – No. 2. – pp. 9-11.
7. Zakharov V.N., Trushinsky Z.K., Burtsev E.M., etc. The main mechanisms of human adaptation.– M.: Nauka, 1993 – 189 p.
8. Laboratory research methods in the clinic / Edited by prof. V. V. Menshikov. – M.: Medicine, 1987. – pp. 108-111.
9. Mambetkarimov G.A. Medico-ecological problems and the state of health of the child population in the conditions of the Southern Aral Sea region // Autoref. diss.... Doctor of Medical Sciences.- Tashkent, 2005.
10. Google TranslateМеньшиков В.В. Методики клинических лабораторных исследований. Т. 1 – Москва, 2009 – 303 с.
11. Perutts M. The hemoglobin molecule // Molecules and cells. – M., 1966. – pp. 7-29.
12. Tel L.Z. Valeology: The doctrine of health, disease and recovery. In 3 vols.– M.: LLC "AST Publishing House"; "Astrel", 2001 - Vol. 2 – 480 p.
13. Guide to Hematology // Edited by A.I. Vorobyov. M.: Medicine, 1985. - Vol. 2. - 105-121 p.