

SOCIAL AND ECONOMIC CIRCUMSTANCES AS FACTORS OF INFLUENCE ON THE VALUES OF HEMATOLOGICAL PARAMETERS

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Summary: There are many different factors which influence the values of hematological parameters of healthy persons and they can be recognized as biological, methodological and the factors of analytical method in the elaboration of samples. For these previously mentioned factors, it is necessary to establish the bases of referential values which will take into consideration all the influences in such a way that each result can be interpreted when compared to a specific base. In this research we investigated a population of women in childbed during three different periods of time characterized by diverse social and economic circumstances (the year 1986, the period between 1994 and 1996 and the beginning of 2004) and we settled the referential values for the basic hematological parameters. The results from the second period observed show a decrease of the average values compared with the first observed period. In the third examined period, there is the increase of the same values, related to the second one. The interactive relations among the results in various periods are statistically very important. The changes in average values for each of the seven hematological parameters caused the changes in referential limits and they represent the clear reflection of the social and economic situation during those periods of time.

Key words: referential values, hematological parameters, social and economic factors

Introduction

To settle the referential values in hematology is a very complex process and the reasons for that are the whole range of factors which influence the values of hematological parameters, as well as the technique used for their elaboration. The data from the clinical and laboratory researches are interpreted in relation to referential values. In order to make such a comparison, it is necessary to settle the referential values for all the analyses made in the laboratory, and not only for healthy people, but also for persons with certain illnesses (1). These persons are called referential persons, meaning that they are chosen according to criteria used for establishing referential values. In perfect circumstances, specific referential values should exist for each population – values which refer to healthy people,

hospitalized patients, persons with typical illnesses, ambulatory patients, and it is also necessary to have the previous values for the same persons. There are some circumstances which must be identified before the comparison of the results to the referential values is made. These circumstances are:

- a) all the groups of referential persons must be clearly defined,
- b) the examined patients and the referential persons must be alike,
- c) the state in which the results are worked out must be precisely defined as well as the analytical procedure, and
- d) all the laboratory results must be obtained through standardized methodology and with the appropriate quality control (1).

In the process of establishing the referential values, the first step is to establish the referential population. The population must be defined well because the right referential persons are to be chosen from it. One of the criteria for the right definition is the criterion of good health. There are a few problems in defining the concept of good health and the criterion

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cannot be completely fulfilled even with various definitions, including the definition by the World Health Organization which says that health is »the state of complete physical, mental and social well-being, not only the absence of illness and weakness« (2). This was the attempt to define absolute state of health. However, absolute health does not exist. There is a very thin line between sickness and health and it is difficult to recognize it, especially if various criteria are taken into consideration. That is why the state of health is not an absolute, but a relative one. But the truth is, the state of health cannot be defined only on the basis of exclusion of sickness. The values which are the results of a certain research can be compared to the earlier values for the same persons or to the referential values. The referential values are altered, by agreement, into a referential interval with two referential limits. The validity of any interval depends on the proper selection of persons, then, and the samples should be collected in accordance with a certain state, the quality control and the assessment of the analytical variation in the process of establishing the referential values (3). It is agreed that the referential interval should be defined as the central one, 95% (0.95), and it is limited with 2.5 (0.025) and 97.5 (0.975) percentiles, meaning that 2.5 % of the values are eliminated from each distribution end of the referential values (1–5).

The aim of this work was to establish the referential values of the basic hematological parameters for a certain population of women in childbed, to figure out the referential limits, to study the influence of the social and economic circumstances on the values of hematological parameters and to establish the base of referential values which includes all the previously mentioned factors of influence.

Material and Methods

The examination was made in three different periods of time – in 1986, when 132 women were examined; during the period from 1994 to 1996, when 400 women were examined; and at the beginning of 2004, when 375 women were examined. The women were chosen by the method of random choice at the Clinic for Gynecology, the Clinical Center of Montenegro, Podgorica.

The hematology parameters: the number of red blood cells, hemoglobin, haematocrit, mean cell volume (MCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC) and the number of white blood cells are determined on the electronic counter AL 816. The basic statistical parameters are determined for each group (the average values, the standard deviation, the quotient of variation), as well as the referential limits, and they are 2.5 and 97.5 percentiles. The Student's test and the analyses of variance are used to survey the importance of diversities among average values.

Results

The results of the obtained values for each parameter and for each observed period of time are represented in *Table I*.

Statistically significant difference in the values of hemoglobin is found in the first and the second period of time ($t=3.24$, $p=0.001$). That is, also, the case between the second and the third period of time ($t=7.44$, $p<0.001$).

The values of red blood cells found in 1986 are higher when related to the values from the second period of time ($t=8.75$, $p<0.001$). The same is with values found in 2004 related to the second period ($t=5.44$, $p<0.001$).

The values of haematocrit found in 1986 are significantly higher ($t=6.74$, $p<0.001$), as well as the values from the year 2004 ($t=6.90$, $p<0.001$) when related to the values found in the second observed period, from 1994 to 1996.

The values of MCV found in 1986 do not differ significantly from those found in the period from 1994 to 1996 ($t=1.075$, $p=0.088$). The values found in 2004 also do not differ significantly from those found during the second period of this research ($t=3.058$, $p=0.001$).

The difference between the average values of MCH in the first two periods is statistically significant, meaning that the values found from 1994 to 1996 are higher ($t=5.24$, $p<0.001$). The values found in 2004 are higher than those found in the second period of this research ($t=3.56$, $p<0.001$).

There is a significant difference between the average values of MCHC found in the first two periods ($t=7.24$, $p<0.001$). There is, also, a difference between the results found in the second and the third period of time ($t=13.02$, $p<0.001$).

The values of white blood cells found in 1986 are higher than the ones found during the second period of this research ($t=3.173$, $p<0.001$), and the values found in the third period are higher than those found in the second one ($t=7.257$, $p<0.001$).

Discussion

Many factors are mentioned as having a great influence on the values of hematological parameters (7–10).

We discovered that the values of hemoglobin in the first observed period are significantly higher, related to the values from the second period of time, from 1994 to 1996. In this period, the socio-economic circumstances were getting worse and the fall of the standard of living was recorded. It is obvious that there is a decrease of the values in the second period related to the first one. In the third period, there is an increase of the values when related only to the second one, but it is not the case when related to the first one. These rela-

Table I Statistical parameters calculated from the values obtained for each parameter and for each observed period

Parameters period	N	\bar{x}	Sd	CV (%)	2.5-th percentile	97.5-th percentile
Hb, g/L						
1986	132	102.1	15.97	15.6	70.8	133.4
1994–1996	400	97.1	15.43	15.9	66.8	127.2
2004	375	105.2	13.41	12.75	78.9	131.5
Rbc $\times 10^{12}/L$						
1986	132	3.90	0.58	14.9	2.78	5.03
1994–1996	400	3.47	0.47	13.5	2.55	4.39
2004	375	3.68	0.55	14.9	2.60	4.76
Hct, L/L						
1986	132	0.32	0.052	16.2	0.22	0.43
1994–1996	400	0.29	0.043	13.8	0.21	0.38
2004	375	0.31	0.038	12.42	0.23	0.38
MCV, fl						
1986	132	83.4	8.65	10.4	66.4	100.3
1994–1996	400	84.8	8.57	10.1	68.0	101.6
2004	375	82.8	9.61	11.6	64.0	101.6
MCH, pg						
1986	132	23.6	3.34	12.7	19.8	32.9
1994–1996	400	28.1	3.40	12.1	21.4	34.8
2004	375	29.2	5.08	17.4	19.2	39.2
MCHC, g/L						
1986	132	316	25.9	8.2	265	367
1994–1996	400	330	17.3	5.2	296	364
2004	375	344	11.9	3.5	321	367
Wbc $\times 10^9/L$						
1986	132	12.47	4.29	34.4	4.06	20.88
1994–1996	400	11.32	3.34	29.5	4.78	17.86
2004	375	13.18	3.78	28.4	5.78	20.58

tions are completely compatible with the social and economic changes in the country (11, 12).

A group of scientists from Turkey (13) analyzed the influence of the social and economical status on the values of hematological parameters in a group of children who were between 7 and 14 years of age. They paid a special attention to the way the educational level of the parents, per capita income in a infections they had before, influence the hematological values. They discovered that a lower educational level of the parents causes a significant decrease of the values of haematocrit and hemoglobin ($p < 0.01$), while the decrease of the values of MCV is not so significant ($p < 0.05$). Per capita income did not have an influence so significant as it was believed to have. Making a comparison between theirs and someone else's results, Turkish scientists came to a conclusion that the referential values of one population

could not be used to elaborate the results of some other population because there would be more anemic children in that population.

How the social status influences the presence of anemia during pregnancy was the subject of a research carried out among the population of pregnant women and women in childbed in western Jerusalem (14). The presence of anemia was recorded in 19% of the cases and it was significantly increasing along with the age of the woman, the number of deliveries she had had, and it was directly connected with her social and class status.

A research carried out in North Carolina (15) showed that pregnant women and women in childbed, regardless of their race, were exposed to the same risk of getting nutritional anemia. The cause was the same for both races, and it was the inade-

quate choice of food, especially food which contains iron and folic acid.

We concluded that the values of hemoglobin, haematocrit and the number of red and white blood cells are statistically much higher in periods of favorable social and economic circumstances. The values

of MHC and MCHC are much higher in unfavorable circumstances. The values of MCV do not show a statistically significant difference related to the specific period of research. The referential values depend on socio-economic circumstances and they must be established for a certain population, in a certain period of time and in certain circumstances.

SOCIO-EKONOMSKI USLOVI KAO FAKTOR UTICAJA NA VRIJEDNOSTI HEMATOLOŠKIH PARAMETARA

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Kratak sadržaj: Na vrijednosti hematoloških parametara kod zdravih osoba utiču različiti i brojni faktori kao što su: biološki, metodološki i analitičke metode u obradi uzoraka. Zbog navedenih faktora neophodno je formirati baze referentnih vrijednosti koje uzimaju u obzir sve pomenute uticaje, tako da svaki pojedinačni rezultat možemo interpretirati u odnosu na nju. U ovom radu obradili smo populaciju porodilja u tri vremenska perioda koja karakterišu različiti socio-ekonomski uslovi (1986., 1994–1996. i početak 2004. godine), i odredili referentne vrijednosti osnovnih hematoloških parametara. Rezultati u drugom ispitivanom periodu pokazuju pad srednjih vrijednosti u odnosu na prvi. U trećem ispitivanom periodu bilježimo porast istih vrijednosti u odnosu na drugi period. Međusobni odnosi rezultata u ovim periodima su statistički značajni. Promjene srednjih vrijednosti za svaki od sedam hematoloških parametara, dovele su do pomjeranja referentnih granica, i predstavljaju direktan odraz socioekonomskih dešavanja.

Ključne riječi: referentne vrijednosti, hematološki parametri, socio-ekonomski faktori

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