Evaluation of some Blood Constituents in Dependence on Complete Blood Count of Patients in Baquba City, Diyala Province, Iraq

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Abstract

The Complete Blood Count (CBC), as part of medical assessment, that can be used to monitor health or diagnose diseases, was depended to know the healthy states of individuals presented to hospital and private laboratories, in Baquba city, center of Diyala province, Iraq, who suffer from different disease conditions. Blood samples from four hundreds (400) individuals were submitted to complete blood count, to know their general health through the blood picture, which can reflect the types and levels of their nutrition, living system, suffering from infectious and non- infectious diseases.

The current study revealed that the parameter that indicate anemia, as Total Red Blood Corpuscular Counts (TRBCs); Hemoglobin concentration (Hb); Hematocrit (HCT%); Mean Corpuscular Volume (MCV); Mean Corpuscular Hemoglobin (MCH); Mean Corpuscular Hemoglobin Concentration (MCHC), showed low levels from reference values, in different ratios in numbers of individuals. Total and Differential Leucocyte Count (TCL and DLC), the platelets count and their related parameters showed increases or decreases in their values. This indicates that the individuals included in this study some of them suffer from anemia of different types, inflammations, bacterial, viral diseases, immune diseases.

Keywords: some blood constituents, Complete Blood Count, Diyala province.

1. Introduction

The Complete Blood Count (CBC), also known as a Full Blood Count (FBC), is one of the most commonly performed medical laboratory tests, which provide information about the cells in a person's blood [1-3]. CBC Help in diagnose, monitor and screen for a wide range of disease, conditions, disorders and infect, often used to screen the diseases incidence as part of a medical assessment. The CBC does many tests to measure and study red blood cells (Erythrocytes), white blood cells (Leucocytes) and Platelets, the concentration of hemoglobin, and the hematocrit (the volume percentage of red blood cells), Red blood cell indices, MCV, MCH and MCHC, which describe the average size and the hemoglobin content of red blood, along with red blood cell distribution width (RDW), which measures the amount of variation in the sizes of red blood cells. And a white blood cell differential, which counts the different types of white blood cells, may be included. Each of these cells plays an important role in how blood performed the works [3, 4].

Blood is composed of a fluid portion (Plasma), and a cellular, Red blood cells, white blood cells and platelet [5, 6].

Some medical conditions, such as anemia or thrombocytopenia are defined by marked increases or decreases in blood cells counts [7].

Differential leucocytes count, doctors needed as part of total blood count, measures numbers of five types of cells: Neutrophils, Basophils, Eosinophil, Monocytes and Lymphocytes [8]. In addition to types of abnormal cells. The variations in leucocytes pictures can help in diagnosis many diseases, Viral, Bacterial, parasitic, blood dysfunction and leukemia. Deviation of percent of these cells can indicate different healthy condition.

So we planned to carry such study in dependence on CBC of patients present to private laboratories and those of governorate hospital in Baquba city, center of Diyala province, during 2019-2021.

Materials and Methods

The persons who presented to hospital and private laboratories in Baquba city, center of Diyala province, were depended in this study. As 400 individuals of different ages and sexes, were depended in this study. Total blood counts were carried automated which count erythrocytes, leucocytes. And hemoglobin percent and concentration were measured by using Automatical Hematology Analyzer (Model KX – 21) made in Japan 2006.

2. Statistical Analysis

All analyses were performed in SPSS statistics version 23. Continuous variables were reported as means (Mean± SE), whereas categorical variables were expressed as the number and the proportions.

Picture-1- Automatical Hematology Analyzer (Model KX – 21) made in Japan 2006.

3. Results

The results of the present study revealed that there were low values of Red Blood Corpuscles counts (RBCCs), Hemoglobin (Hb) concentration, Mean Corpuscular

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Volume (MCV), Hematocrit (HCT). Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC). Increase in Red Distribution Width (RDW) in individuals depended in the study, in the same time some individuals, showed increases in such parameters (Table- 1).

Red Blood Corpuscles (RBC): Mean Total Red Blood Cells Counts (TRBCC) $x10^{12}$/L: 4.67± 0.08., range 3.19 – 5.74 (Normal range 4-5.5), and median 4.68. Number of values less than normal 44/ 400 (11%), while those more than normal 36/ 400 (9%).

Hemoglobin (Hb) g/dl: Mean 12.69 ± 0.32, range 8.7- 18.4 (Normal (11.5-16), median 12.1. Values less than normal 143 /400 (35.5%), and those more 44/400 (11%).

Hematocrit (HCT %), Mean 38. 0±0.65, range 25.9-52.89 (Normal 34-54%), Median 36.10, less than normal 121/400 (30.12%).

Mean Corpuscle Volume (MCV) fl: 81.54±1.20, range 55.4-102.4 (Normal 80-100), median 82.8, less than normal 136/ 400 (33.97%), more than normal 8/400(2.0%).

Mean Corpuscle Hemoglobin (MCH) pg: 27.16 ± 0.49, range 17.4- 37.4 (Normal 27-34), median 27.2, less than normal 192 /400 (48.0.8%), more than normal 8/400 (2%).

Mean Corpuscle Hemoglobin Concentration (MCHC) g/dl: 33.31 ± 0.25, range 30-39.2 (Normal 32-36), median 33.4, less than normal 85/ 400 (21.15%), more than normal 36/ 400(8.97%).

Red Distribution Width c (RDWc) fl: 15.05±0.30, range 12.3- 22.2 (Normal 11-16.7), median 14.4, less than normal -, more 85/ 400(21.15%).

RDWsD: fl: 39.46± 0.90, range 29.4-49.3 (normal 35-56), median 39.0, less 36/400 (8.93%). Table-1.

Table-1- Red Blood Cell and the related parameters

Parameter	Value	Range	Normal	Median	Less	More
RBC x1012/l	**4.67 ± 0.08**	**3.19-5.74**	**4-5.5**	**4.68**	**44 (11%)**	**36 (9%)**
Hb pg./dl	12.69 ±0.32	8.7- 18.4	11.5-16	12.1	143 (35.5%)	44 (11%)
HCT %	38.0 ±0.65	25.9- 52.89	34-54	36.10	121 (30.12%)	-
MCV fl	81.54 ±1.20	55.4- 102.4	80-100	82.8	136 (33.97%)	8 (2%)
MCH pg.	27.16 ± 0.49	17.4 -37.4	27-34	27.2	192 (48.08%)	8 (2%)
MCHC g/dl	33.31 ± 0.25	30- 39.2	32-36	33.4	85 (21.15%)	36 (8.97%)
RDWc fl	15.05 ± 0.30	12.3 -22.2	11-16.7	14.4	-	85 (21.15%)
RDWsD fl	39.46 ± 0.90	29.4-49.3	35-56	39.0	36 (8. L9 %)	-

Total Leucocytes Count (TLC) x 109/l: 9.56± 0.51, range 4.52- 21.89 (Normal 4-10), median 8.8, values more than normal 121/400 (30.13%).

Absolute Lymphocytes Counts (ALC) x109/l: 2.94 ±0.21, range 0.5 – 7.61(Normal 0.8-4), median 2.4, less than normal 28/400 (7.05%), more than 85/400(21.15%).

Lymphocytes percentage (L %):32.57±2.01, range 4.6-64.6(normal 20-40), Median 31.7, less 72/400 (17.95%), more 100 / 400 (29.0%).

Absolute Granulocytes Counts (Gran) (Neutrophils, Eosinophil, and Basophils) x109/l: 5.76± 0.39, range 1.45-16.1(Normal 1.0-8.5), median 5.2, values more than normal 36/400 (8.97%).

Granulocytes (Gran %): 58.96 ±1.61, range 30.2- 87.4(40-70%), median 61.6, values less than normal 44/ 400 (11%). more than normal 85/ 400 (21.15%).

Monocytes Counts (Mid x 109/l): 7.73± 0.89, range 1.2-29.3 (Normal 3-15), median 7.8, less 56/400 (14%), more 44/400 (11%)

Monocytes (Mid %): 0.92± 0.1, range 0.08- 3.62 (Normal 0.l - 0.95), median 0.7, values less 43/400 (10.71%), more 128/400(32.05%). (Table 2).

Table-2- Total and Differential Leucocytes Counts

Parameter	Value	Range	Normal	Median	Less	More
TLC x109/l	**9.56 ±0.51**	**4.52-21.89**	**4-10**	**8.8**	**-**	**121 (30.13%)**
Gran $x10^9$/l	5.76 ± 0.39	1.45 16.1	1.0 -8.5	5.2	-	36 (8.97%)
Gran%	58.96 ±1.61	30.2 87.4	40-70	61.6	44 (11%)	85 (21.15%)
Lymph $x10^9$/l	2.94 ±0.21	0.5-7.61	0.8- 4	2.4	28 (7.05%)	85 (21.15%)
Lymph%	32.57 ±2.01	4.6-64.6	20-40	31.7	72 (17.95%)	100 (29%)
Mid $x10^9$/l	7.73 ± 0.89	1.2 – 29.3	3-15	7.8	56 (14%)	44 (11%)
Mid %	0.92 ± 0.1	0.08-3.62	0.1-0.95	0.7	43 (10.71%)	128 (32.05%)

Platelets Counts (PLT) x109/l: 282.29 ±10.26, range 77-505(Normal 150-450), median 278, less 15/400(3.85%), more 21/400(5.13%).

PCT: 0.22 ± 0.01, range 0.08 0.486(Normal 0.108-0.282), median 0.21, less 8/400 (2%), more 51/400 (12.82%).

Platelets Distributed Width c (PDWc %): 24.67 ±1.83, range 13.9 – 41.2 (Normal 9-17.0), median 15.7, more 164/ 400 (41.02%)

Mean Platelets Volume (MPV) fl: 7.98 ±0.1, range 6.2 -9.9 (Normal 8.0-15), median 7.90, less 208/400 (51.92%)

PLCR%: 24.59 ±1.49, range 10.14-43.81; median 24.28.

PLCC x 109/l: 65.54 ±5.31, range 33-134, median 6.4 (Table-3).

Table -3 – Values of platelets and related parameters

Parameter	Value	Range	Normal	Median	Less	More
PLT x109/l	**282.29 ±10.26**	**77-505**	**150-450**	**278**	**15 (3.85%)**	**21 (5.13%)**
PCT%	0.22 ±0.01	0.08 0.486	0.108 - 0.282	0.21	8 (2.09%)	51 (12.82%)
MPV fl	7.98 ±0.1	6.2 -9.9	8-15	7.9	208 (51.92%)	-
PDWc%	24.67 ±1.83	13.9-41.2	9.0 -17.0	15.7	-	164 (41.02%)
PLCR	24.59 ± 1.49	10.14-43.81	-	24.28	-	-
PLCC x109/l	65.54 ± 5.31	33-134	-	64	-	-

4. Discussion

The results of current study revealed that the values of parameters, that indicate anemia (total red blood cells count, Hemoglobin concentration, Mean Corpuscular Volume MCV, Mean Corpuscular Hemoglobin MCH, Mean Corpuscular Hemoglobin Concentration MCHC, Hematocrit HCT, were below normal (11%, 35.5%, 33.97%, 48.08%,21.15% and 30.12%) respectively. An abnormally low hemoglobin, hematocrit or red blood cell count indicates anemia [3]. General causes of anemia include, blood loss, production of defective red blood cells (ineffective erythropoiesis), decreased production of red blood cells (insufficient erythropoiesis) , and increased destruction of red blood cells(hemolytic anemia) [3].This mean that individuals suffering from one of anemic type. As anemia defined by decreased absolute number of circulating red blood corpuscles, or condition in which red blood corpuscles (which mean ability of carry oxygen) in sufficient to physiological needed [9], in addition to ability of diagnosed it by lower hemoglobin concentration or hematocrit. Anemia can also diagnosed by dependence on count red blood corpuscles, mean corpuscular volume, count reticulocytes in blood. Analyses of blood picture in blood smear, or electrical analysis of hemoglobin [10]. At the group level, and in clinical practice, hemoglobin concentration from assistant ways of most commonly blood test.

The results of our study showed (9% and 11%) increased in number of red blood cells and hemoglobin concentration respectively. An increased number of red blood cells, which usually leads to an increase in the hemoglobin and hematocrit [11], are called polycythemia [12].Dehydration or use of diuretics can cause polycythemia by reducing plasma of blood.

The results of present study revealed that mean corpuscular volume (33.97%) less than normal, while (2%) only suffering from more than normal level. Evaluation of red blood cell indices is helpful in determining the cause of anemia. If the MCV is low, the anemia is termed microcytic, while anemia with a high MCV is macrocytic [13]. Microcytic anemia (lower than 80 fl) is typically associated with iron deficiency, thalassemia, and anemia of chronic disease, while macrocytic anemia associated with alcoholism, folate and B12 deficiency, use of some drugs , and some bone marrow diseases. Anemia of normocytic types occur in hemolytic anemia, bone marrow disorders, and various chronic diseases, early stages of iron deficiencies, sickle cell anemia, cases in which there are deficiency or loosing of blood (acute blood loosing).While macrocytic anemia (more than 100 fl) occur in Vit B 12 or folate deficiency, or in hemolysis [3, 9].

In present study, MCHC showed that (21.15%) less than normal and (8.97%) more than normal. Anemia with a low MCHC is termed hypochromic anemia. If anemia is present but the red blood cell indices are normal, the anemia is considered normochromic anemia and normocytic [12]. The term hyper chromic referring to as high MCHC is generally not used. Elevation of the MCHC above the upper reference value is rare, mainly occurring in conditions such as spherocytosis, sickle cell disease, and hemoglobin C diseases [3].

RDWc showed (21.15%) more in width, an elevated RDW represent increased variation in red blood cell size, a condition known as anisocytosis [14]. Anisocytosis is common in nutritional anemia such as iron deficiency anemia and anemia due to vitamin B 12 or folate deficiency. And this associated with degree and deviation in red corpuscular volume. In anemia of iron deficiency the width is more than (21.5%).

Types of anemia varies, and that of nutritional deficiency is the mostly common [4, 15, 16]. There are many types of anemia, of most important nutritional deficiency anemia, which defined by WHO as, a case in which hemoglobin content is less than normal as a result of deficiencies of one of essential nutritional elements [17].

Anemia is considered as one of more healthy problems of worldwide distribution. The studies pointed that nearly 1.62 milliards individual of different age and sex, were suffered from anemia [18], most of them from infants , childes less than school age and women at birth age , pregnant [19, 20].

The results of our study, can be attributed to many factors intercrossed between each other, important one is bad habit of feeding , as many Iraqi peoples follow imbalance feeding system , concentrated on one or two main times daily with consuming large amount of carbohydrate and starch(Rice and bread). Without consuming sufficient quantities of vegetables and fruits which are rich in essential vitamins and minerals, many peoples have a habit of drinking water while eating , this will dilute digested enzymes and interrupted the digestion process.The results also can be attributed to many factors, that play an important role in nutritional anemia, in addition to chronic diseases as diabetes, and hyperthyroidism, and some diseases of digestive system that inhibited absorption of digested food, increased peristaltic movement, chronic enteritis, parasitic infestation, and intestinal worms that lead to anemia [21].

The results of this study showed that (21.15% and 29%) of individuals showed increased in lymphocyte count and their percentage respectively. An elevated lymphocyte count (lymphocytosis) is associated with viral infection [8], and lymphoproliferative disorders like chronic lymphocytic leukemia [13]. Increase in Lymphocytes count can occur in different viral infections , children have high numbers of lymphocytes in comparison with adult, increase in neutrophils (Neutrophilia) occur in bacterial infection, tissue destruction as in burns, inflammations, smoking , steroids and leukemia.

The results showed that monocytes (Mid) absolute count and percentage showed increases in (11% and 32.05%) respectively. Elevated monocytes counts (Monocytosis) are associated with chronic inflammatory states [14] the eosinophil count is often increased (eosinoiphilia) in parasitic infections and allergic conditions [22]. An increased number of basophils (basophilia) can occur in myeloproliferative disorders like chronic myeloid leukemia and polycythemia Vera.

Leukocytosis mean increase of leucocytes number more than normal in blood [23].frequently it is sign of inflammatory response [24]. Result most commonly from infection, but it can occur in parasitic infestations, bone tumors in leukemia, occur after stressed training, convulsion as in epilepsy, stress of movement, pregnancy and birth, anesthesia and side effects of some medicinal treatment as thallium or administration of epinephrine [23].

The results of our study showed that there are (30.13%, 21.15%, 8.97% and 11%) increase in values of absolute counts of Leucocytes, Lymphocytes Granulocytes, and Monocytes respectively and percentage of Lymphocytes, Granulocytes, and Monocytes (29%, 21.15%, and 32.05%) respectively.

There are five basic types of increases in Leucocyte count [25]: increase in neutrophils (Neutrophilia (the most common type [23] Lymphocytes, Monocytes, Eosinophils and Basophils. Differential results are useful in diagnosis and monitoring many medical conditions. For example elevated neutrophil count (neutrophilia) is associated with bacterial infection , inflammation , and myeloproliferative disorders [8], while a decreased count (neutropenia) may occur in individuals who are undergoing chemotherapy or taking certain drugs, or who have diseases affecting the bone marrow [22, 26]. Neutropenia can also be caused by some congenital disorders and may occur transiently after viral or bacterial infection in children [27].

The results referred to granulocytes percentage decreased in (11%) of individuals depended in study. while lymphocytes percent in (17.95%) and monocytes in (10.71%). Less lymphocytes number observed in infection, as immune deficiencies, influenza, viral hepatitis .Neutropenia (less neutrophils/ Leucopenia (decrease leucocytes), mean neutropenia in sufficient to defense infection, very low neutrophils count is the most common healthy problem case. If the number less than 1000 there is high dangerous from occurrence of infection, and when less than 500 number the infection will be most dangerously.

Platelets: only (3.85%) showed less than normal number and (5.13%) more than normal. A low platelet count (Thrombocytopenia) mean the platelets present in insufficient number in blood, so the blood will not clot normally. It can occur in individuals who are undergoing treatments that suppress the bone marrow, such as chemotherapy or radiation therapy, or taking certain drugs, such as heparin, that can induce the immune system to destroy platelets. Thrombocytopenia is a character of many blood disorders, like acute leukemia and a plastic anemia, as well as some autoimmune diseases [8, 27].

High number of platelets recorded in (5.13%) of cases in this study. (Thrombocytosis) meaning a high platelet count, may occur in states of inflammation or trauma [3].as well as in iron deficiency [27].

The present study showed that mean platelets volume (MPV) decreased in (51.92%). The mean platelet volume (MPV) measures the average size of platelets in femtoliter. It can aid in determining the cause of thrombocytopenia; Decreased production of platelets due to dysfunction of the bone marrow can result in a low MPV. The MPV is also useful for differentiating between congenital diseases that cause thrombocytopenia [28].

5. Conclusion

We can concluded that anemia is one of important problem that affect the population in Baquba. As the percentage of anemic states in present study on the dependence of values of parameters that indicate anemia and caused of it (TRBCc, Hb concentration, MCH, MCHC, MCV, Hematocrit, Red Distribution Width RDW were lower than normal values at (11%, 35.5%, 33.97%, 48.,08%). And the anemia of nutritional type mainly iron deficiency, vit B12, and folate deficiency.

Other people suffer from polycythemia at (9%, and 11%) on dependence of number of RBC and Hb concentration.

The picture of leucocytes and platelets indicate presence of individuals suffering from blood diseases, as there were 30.13%) of individuals have high TLC, (21.15%) high Lymphocytes, and (11%) monocytes and (8.97%) high granulocytes. That indicate they were suffering from infections. Others have low level of Lymphocytes (7.05%), Granulocytes and monocytes (14%). Which indicate that they suffer from diseases and their immunity is lowered.

Recommendation

Carry a screening studies to fix the normal hematological parameters in all Iraqi provinces and know the nutritional state of peoples that has a relation with blood diseases.

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