BioBacta

Journal of Medical and Life Science
https://jmals.journals.ekb.eg/

SPBH

Study of some hematological and biochemical parameters in patients with polycythemia vera

Zainab Abdul Jabbar Ridha AL-ALI [1], Hawrra Jabbar Mohammed[1*], Muslim Jassim Owais[2], Ahmed Hakim Abdel Reda[2] and Mahdi Laiby Globe[2]

[1] Dept. of Biology, College of Science, Univ. of Misan, Maysan Iraq,

[2] Health Department Maysan Iraq.

* Corresponding author: hawraa.histology@uomisan.edu.iq

DOI: 10.21608/jmals.2024.363972

ABSTRACT:

Background: The present study aimed to know the effects of age and measure the values of parameters such as cholesterol, triglyceride, Hb, and PCV in patients with polycythemia vera. **Methodology**: a community sample of 56 males aged 30-59 years was studied, they were divided into 3 groups based on age, the first group from (30-39) years, the second group (40-49) years, and the third group (50-59) years. Blood was drawn from the venipuncture, as much as 5 mm from each patient. For hematological and biochemical parameters (Hb, PCV, Cho, and TG). Furthermore, the same previous analyses were conducted on 20 healthy people as a control group. **Results**: the hemoglobin value was non-significant ($p>0.050$) differences between the healthy subjects and the patients, while the PCV, Chol, and TG were significant ($p<0.050$) in patients' comparison to the healthy. Moreover, the results showed that age had no effect on the studied parameters among the groups, but there was a significant difference only between the age of patients and the healthy subjects between the groups. This study concluded that there was an increase in PCV, Chol, and TG significantly in patients with polycythemia vera, as the age did not affect the studied parameters.

Keywords: Polycythemia vera, cholesterol, triglycerides, hemoglobin, age.

Introduction

Polycythaemia PV can be defined as a myeloproliferative disorder that is marked by clonal proliferation of bone marrow primogenitors, as well as an increase in the number of (Red Blood Cells) as well as the leukocytes and platelets. The condition has a pre-existing prothrombotic stage and is linked to an elevated risk of venous and arterial thrombotic events (1). PV disease was first described by Louis Henri Vaquez (2). It is not a new disease and while uncommon, with an incidence of at least 2 per 100 000 (3). There is no known exactly what is the cause of PV. Previous research suggested that the proteins known as the Janus kinases, or JAKs, are involved, they send out signals that affect how blood is made in the bone marrow. When JAKs send out multiple signals, the bone marrow produces an excessive number of blood cells. Hyperactive signaling is the term for this. JAK signaling that is overactive is a crucial factor in the development of PV. In persons with PV, hyperactive JAK signaling may lead to excess production of certain proteins that are termed cytokines (SIGH-toe-kines), in addition to the development of too many blood cells. Maintaining

Received: April 1, 2024. Accepted: June 17, 2024. Published: June 23, 2024

proper hematocrit levels is a crucial goal in PV management (4). In this study, the purpose was to measure some of the parameters such as hemoglobin, hematocrit, cholesterol, and triglyceride, as well as the effect of age on those variables with PV.

Material and method

Sample collection

Blood samples have been collected by venipuncture from persons who frequent the blood bank and laboratories of Al-Sadr General Hospital in Maysan. The people who conducted the study (56) were male (36 patients and 20 health), and they ranged in age between (30-59) years old. They were split into three groups, the first group was 14, their ages ranged from 30-39, the second group numbered 14 and ages 40-49, and the third group numbered 8 with ages 50-59, blood was drawn from the brachial vein and an amount of 5 mm from each patient. Using a single-use medical syringe where it is placed. The quantity of blood is estimated at 3 mm in clean tubes free of anticoagulant material. To obtain the serum to perform the biochemical analyses (Cho, TG) (5), a quantity is placed 2 mm in a test tube that contains an anticoagulant substance to conduct blood analyses (Hb, PCV).

chemistry measurements were performed on serum samples

An automated hematology analyzer (model LH750, Beckman Coulter, Brea, CA) was used to perform CBC tests on whole blood, with analyses including Hb and concentration PCV (6). By using an autoanalyzer (Roche/Hitachi cobas c systems) and included triglycerides, and cholesterol (7).

Statistical analysis

The values have been telling mean ± SD (standard deviation). The data was statistically analyzed to determine significant differences using the T-test and one-way ANOVA with a P0.05 probability (8).

Results

The results showed that the hemoglobin (Hb) value was non-significant ($p>0.05$) differences between healthy individuals and the patients. while the PCV was significantly ($p<0.05$) increased in patients (49.79±3.54) compared to the healthy was (43.30±3.48). On the other hand, the cholesterol value of the patients (201.61±33.73) was significantly ($p<0.05$) increased Compared to the healthy (175.55 ±22.57), the triglycerides value was significantly ($p<0.05$) increased of the patients (249.83 ±57.87) compared to the healthy (161.25±36.94) as shown in table (1).

Also, the results in this study showed that age did not affect the studied parameters between the three groups of patients with PV as shown in Table (2).

Table (1). the values of Hb, PCV, Chol, and TG of the patients and the Control.

people	Hb g/L	PCV L/L	Chol mmol/L	TG mmol/L
patients	16.33 [a] ± 1.20	49.79 [a] ± 3.54	201.61 [a] ± 33.73	249.83 [a] ± 57.87
Control	14.15 [a] ± 1.29	43.30 [b] ± 3.48	175.55 [b] ± 22.57	161.25 [b] ± 36.94

*value represent (mean± SD).*different letters indicate ($p<0.05$) significant difference between the values.
*the similar letters indicate a non-significant ($p>0.05$) difference between the values.

Table (2). the values of Hb, PCV, Chol, and TG of the patients according to age.

parameters	Groups according to age		
	(30-39) years	(40-49) years	(50-59) years
Hb g/L	16.40 ±1.28 [a]	16.24±1.09 [a]	16.40±1.39 [a]
PCV L/L	50.20±3.69 [a]	49.50±4.02 [a]	49.60±2.62 [a]
Chol mmol/L	190.42±32.98 [a]	210.35±39.70 [a]	205.87±17.86 [a]
TG mmol/L	261.61 ±38.87 [a]	246.35±62.39 [a]	517.12±807.03 [a]

*value represent (mean± SD).*the similar letters indicate non-significant (p>0.05) difference between the values.

Discussion

This is the first study that dealt with PV disease in Maysan. In the present study, the values of cholesterol, triglycerides, and hematocrit increased in patients than in healthy. As we noted in this study, there are no statistically significant differences in the level of hemoglobin between patients and healthy. On the other hand, Pillai and his team, PV denotes an increase in the body's absolute RBCs bloc, which is represented in an increase in hemoglobin levels, or hematocrit, above what is deemed normal for that gender and age (9).

The reference domain for normal hemoglobin levels and hematocrits varies with altitude, ethnicity, and nation. Wouters study indicated that low Hb thresholds in the 2016 revised WHO classification may be very important for the diagnosis of masked PV, however, Due to the lack of relationships with cardiovascular morbidity and death, they may be too low as a screening tool for secondary polycythemia vera (10).

According to Keklik, polycythemia is already a pathogenic factor for cardiovascular events because it could seriously impair endothelial function and result in significant increases in (Hb), hematocrit, and serum lipid parameters, except for HDL cholesterol (11). The lowest cholesterol levels were seen in the most advanced stages of proliferative illnesses, and some have suggested utilizing this parameter as a predictor of disease activity because PV is associated with endothelial dysfunction that might appear as a vascular disease (12;13).

Indicating a generalized disturbance of the metabolism of cholesterol (14). According to Torkhovskaia et al. (15), high hematocrit caused specific abnormalities in the distribution of blood cholesterol across cell and plasma species. Erythrocytes from patients had significantly higher levels of total blood cholesterol than normal (23.7+/-0.8% and 27-31%, respectively). In several short investigations, patients with PV had reduced cholesterol levels (14;16). Homocysteine levels, however, were noticeably greater in PV patients (17). Numerous endothelial functions were found to be disrupted by high blood homocysteine levels (18). For example, NO-mediated vasodilation could be impacted by a slight increase in hematocrit levels (19). Each individual is affected by PV differently, and some PV patients have enlarged spleens (4). At the same time, this work demonstrated that the analyzed parameters were unaffected by age. Studies that provided clinical information on the life expectancy of people who have polycythemia vera or essential thrombocythemia also revealed that it was comparable to that of the general population (20).

Conclusion: This study shows that there is an increase in PCV, Chol, and TG significantly in patients with polycythemia vera, as explained that the age did not affect the studied parameters.

Acknowledgments

This study has been supported by the University of Maysan and the Corporation of Al-Sadr General Hospital in Maysan.

Conflicts of Interest:

The authors declare no conflict of interest.

References

1- POLICITEMIA, Gruppo Italiano Studio. Polycythemia vera: the natural history of 1213 patients followed for 20 years. Annals of Internal Medicine, 1995, 123.9: 656-664.

2- VAQUEZ, Henri, et al. Sur une forme spéciale de cyanose s' accompagnant d'hyperglobulie excessive et persistante. CR Soc Biol (Paris), 1892, 44: 384-388.

3- MCNALLY, R. J. Q., et al. Age and sex distributions of hematological malignancies in the UK. Hematological oncology, 1997, 15.4: 173-189.

4- RAEDLER, Lisa A. Jakafi (Ruxolitinib): first FDA-approved medication for the treatment of patients with polycythemia vera. American health & drug benefits, 2015, 8. Spec Feature: 75.

5- GIDEZ, Lewis I., et al. Separation and quantitation of subclasses of human plasma high density lipoproteins by a simple precipitation procedure. Journal of lipid Research, 1982, 23.8: 1206-1223.

6- WEATHERBY, Dicken; FERGUSON, Scott. Blood chemistry and CBC analysis. Weatherby & Associates, LLC, 2002.

7- GREILING, H, Gressner A.M. Lehrbuch der Klinischen Chemie und Pathobiochemie, 3rded. Stuttgart/New York: Schattauer, 1995.

8- AL-RAWI, K. M., and Khalaf Allah, A. M. Design and Analysis of Agricultural Experiments. University of Mosul. Ministry of Higher Education and Scientific Research. Dar Al Kuttab for printing and publishing. Mosul. Iraq, 2000.

9- PILLAI, Ashwin A.; FAZAL, Salman; BABIKER, Hani M. Polycythemia. 2018.

10- WOUTERS, Hanneke JCM, et al. Erythrocytosis in the general population: clinical characteristics and association with clonal hematopoiesis. Blood advances, 2020, 4.24: 6353-6363.

11- KEKLIK, Muzaffer, et al. Evaluation of systemic endothelial functions by flow mediated vasodilatation method in polycythemic individuals Polisitemik bireylerde sistemik endotelyal fonksiyonların akış aracılı genişletme yöntemi ile değerlendirilmesi. Journal of Anatolian Medical Research, 2016, 1: 1-8.

12- PANDOLFINO, John, et al. Hypocholesterolemia in hairy cell leukemia: a marker for proliferative activity. American journal of hematology, 1997, 55.3: 129-133.

13- FINAZZI, Guido, et al. Second malignancies in patients with essential thrombocythaemia treated with busulphan and hydroxyurea: long-term follow-up of a randomized clinical trial. British journal of haematology, 2000, 110.3: 577-583.

14- GILBERT, Harriet S., et al. Characterization of hypocholesterolemia in myeloproliferative disease: Relation to disease manifestations and activity. The American journal of medicine, 1981, 71.4: 595-602.

15- TORKHOVSKAIA, T. I., et al. Erythrocyte cholesterol content in polycythemia vera: relation to ischemic heart disease. Kardiologiia, 2003, 43.9: 49-51.

16- AIXALA, M.; SARANDRIA, C. N.; SPERONI, J. G. Hypocholesterolemia in hematologic neoplasms. Sangre, 1997, 42.1: 7-10.

17- GISSLINGER, Heinz, et al. Homocysteine levels in polycythaemia vera and essential thrombocythaemia. British journal of haematology, 1999, 105.2: 551-555.

18- NEUNTEUFL, T., et al. Endothelial dysfunction in patients with polycythaemia vera. British journal of haematology, 2001, 115.2: 354-359.

19- DEFOUILLOY, Christian, et al. Polycythemia impairs vasodilator response to acetylcholine in patients with chronic hypoxemic lung disease. American journal of respiratory and critical care medicine, 1998, 157.5: 1452-1460.

20- PASSAMONTI, Francesco, et al. Life expectancy and prognostic factors for survival in patients with polycythemia vera and essential thrombocythemia. The American journal of medicine, 2004, 117.10: 755-761.