



RELATIONSHIP BETWEEN SOME BLOOD PARAMETERS AND LIPID PROFILE IN PATIENTS WITH ISCHEMIC

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ABSTRACT

Background: An ischemic stroke occurs when the blood supply to part of the brain is blocked or reduced. This prevents brain tissue from getting oxygen and nutrients. So, this study aimed to determine the role of some hematological parameters (red blood cells, hemoglobin, packed blood volume and white blood cells), cholesterol and triglycerides in patients suffering from ischemic stroke. **Methodology:** The study community consisting of 100 subjects (60 patient equal number for both gender and 40 subject as health equal number for both gender), aged between 44-78 for male, and between 44-82 for female. 5 ml of blood was drawn from the brachial vein, from each subject. To measure some blood parameters and lipid profile. Also, the same analyzes were conducted on the healthy subject. **Results:** The value of RBC, Hb, and PCV did not differ significant ($p>0.05$) between patient and healthy women. WBC decreased significantly ($p<0.05$) in patient women compared to healthy. Higher values in cholesterol and triglycerides, but did not reach to the significant level in women patients when compared to the healthy. Moreover, the results showed significant ($p<0.05$) decrease in RBC, Hb, and PCV in males patients compared to healthy. While, no significant ($p>0.05$) changes in WBC and triglycerides. But, cholesterol increased significantly ($p<0.05$) in men patients compared to healthy. **Conclusion:** we can conclude from this study the blood parameters and lipid profile may be changes in patients with the stroke. Thus, we believe that patients with hypercholesterolemia should have their lipid profile evaluated periodically before the development of cerebrovascular events.

Keywords : Ischemic stroke, cholesterol, triglycerides, blood parameters

العلاقة بين بعض متغيرات الدم وصورة الدهون لدى مرضى نقص التروية
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الخلاصة

تحدث السكتة الدماغية عندما يتم حصر أو انخفاض تدفق الدم إلى جزء من الدماغ وهذا يمنع أنسجة المخ من الحصول على الأكسجين والمواد المغذية. لذا هدفت هذه الدراسة الى بيان دور بعض المؤشرات الدموية (خلايا الدم الحمراء، الهيموجلوبين، حجم الدم المضغوط وخلايا الدم البيضاء) والكوليسترول والدهون الثلاثية لدى مرضى السكتة الدماغية الإقفارية. تكون مجتمع الدراسة من 100 شخص (60 مريض عدد متساو من كلا الجنسين و 40 شخص سليم ايضا بعدد متساو لكلا الجنسين)، تتراوح أعمارهم بين 44-78 للذكور، وما بين 44-82 للإناث. تم سحب 5 مل من الدم من الوريد العضدي لكل من المرضى والاصحاء وذلك لقياس بعض مؤشرات الدم ومستوى الدهون. النتائج: لم يختلف عدد كريات الدم الحمراء، الهيموجلوبين و حجم الخلايا المضغوط معنويا بين الاناث المريضات والسليمات . انخفاض عدد خلايا الدم البيضاء معنويا في الاناث المريضات مقارنة بالسليمات ، لوحظ ارتفاع في قيم الكوليسترول والدهون الثلاثية إلا انها لم تصل إلى مستوى معنوي عند الاناث المريضات مقارنة بالسليمات . اما بالنسبة الى الذكور أظهرت النتائج انخفاضاً معنوياً في كريات الدم الحمراء، الهيموجلوبين، و حجم الخلايا المضغوط في المرضى الذكور مقارنة بالاصحاء. في حين لم تلاحظ تغييرات معنوية في كريات الدم البيضاء والدهون الثلاثية. ولكن ارتفع مستوى الكوليسترول بشكل معنوي لدى المرضى الذكور مقارنة بالاصحاء. يمكننا أن نستنتج من هذه الدراسة أن صورة الدم ومستوى الدهون قد تكون متغيرة لدى مرضى السكتة الدماغية وبالتالي، فإننا نعتقد أن المرضى الذين يعانون من فرط كوليسترول الدم يجب أن يتم تقييم مستوى الدهون لديهم بشكل دوري قبل تطور الأحداث الوعائية الدماغية لديهم .

الكلمات المفتاحية : نقص التروية ، الكوليسترول ، الدهون الثلاثية ، معايير الدم

1.INTRODUCTION

A stroke is a sudden neurological injury resulting in the loss of neurological function, owing to changes in the blood arteries of the brain. Blood vessel changes might originate within the vessel (weakness or obstruction, atherosclerosis, inflammation, arterial dissection, vascular dilatation) or be related to external factors such as when an embolism travels from the heart to the brain (Sommers, 2019). It is a complex disorder with diverse presentations and may be ischemic, contributing to ~80% of cases or hemorrhagic, about 20% of cases (GBD, 2016). Cerebrovascular conditions, such as hypertension, hyperlipidemia, atrial fibrillation, diabetes, smoking and physical inactivity, are significant stroke risk factors. The major cause of stroke however, is embolism, either cardiac related or caused by atherosclerotic plaques either in the epiaortic vessels or aortic arch. In particular, there has been an increase in strokes caused by atrial fibrillation which have been observed to be more severe and disabling than other kinds



of strokes (O'donnell *et al.*,2013). Intracranial atherosclerosis with in situ thrombosis and small vessel disease are also important mechanisms of stroke, whereas cervical artery dissection is one of the most prevalent causes of stroke in younger patients (Campbell and Khatri,2020). The traditional risk factors are unable to explain all cases of stroke, the pathogenesis of stroke remains largely unknown. In fact, not all individuals with common risk factors for cerebrovascular disease will develop a stroke. It can occur in people who do not have cerebrovascular risk factors (Rubattu *et al.*, 2004). Rapid and unplanned urbanization, the global spread of unhealthy lifestyles, and an aging population are contributing factors to the rise in these diseases. Elevated blood pressure, increased blood sugar, high cholesterol, and obesity are often linked to tobacco use, excessive alcohol consumption, poor diets, and physical inactivity. These metabolic imbalances, often termed metabolic risk factors, can increase the risk of cardiovascular disease. The observed trend can be attributed to both the aging of the global population and the increase in modifiable risk factors for cardiovascular disease (WHO, 2018). Red blood cell (RBC) aggregation plays an important role in many physiological phenomena, especially atherosclerosis and clotting processes, which contribute to the development of this disease (Liu *et al.*,2004). Platelets are also crucial in the formation of blood clots, known as thrombi. When platelets are activated, they release substances like Thromboxane A2 and cyclooxygenase, which promote clot formation (O'Malley et al., 1995). It is well-established that dyslipidemia, an imbalance in blood lipid levels, is a risk factor for stroke, much like its link to coronary artery disease. Cholesterol levels are directly correlated with ischemic stroke, particularly atherosclerotic disease, with the strongest associations observed for total cholesterol and low-density lipoprotein (LDL). Conversely, low cholesterol levels have been associated with an elevated risk of intracerebral hemorrhage (ICH), and evidence suggests that low lipid levels may also heighten the risk of small vessel disease (Rajakumar et al., 2024). Timely identification and management of dyslipidemia can lessen the severity of strokes (Murad, 2022). .So that , the current study highlight on the relationship between blood parameters and lipid profiles in patients with stroke.

2.MATERIAL AND METHOD

2.1 study subjects

Blood samples of this study were taken from healthy people participating and people suffering from a stroke. The duration of illness ranged from one



week to five years for women and from one week to three years for men, who frequented the blood bank and laboratories of Al-Sadr Teaching Hospital in Maysan governorate from the period 22/12/2021 to 2/4/2022. The total number of people on whom the study was conducted included (100) people (60 patient and 40 healthy) for both gender. Ages ranged between (44-76) years for male, and between (44-82) for women.

2.2 Blood Samples

Blood is drawn from the brachial vein and an amount of 5 mm from each subject (patient or healthy), by means of a single-use medical syringe where it is placed. A quantity of blood is estimated at about (3) mm in clean tubes free of anticoagulant material. To obtain the serum in order to perform the biochemical analyzes (cholesterol and triglyceride) (Weatherby *et al.*, 2002), a quantity is placed (2) mm in a test tube containing an anticoagulant substance for the purpose of conducting blood analyzes (red blood cell count, hemoglobin, packed cell volume and white blood cell count).

Measurements were performed on blood and serum samples

Complete blood count (CBC) examinations were done on whole blood by using an automated hematology analyzer (model LH750, Beckman Coulter, Brea, CA), analyses included (RBC, Hb, PCV and WBC) (Greiling *et al.*, 1995). Cholesterol and triglycerides analyses by using an auto analyzer (Roche/Hitachi cobas systems) (Gidez *et al.*, 1982).

Statistical analysis

A statistic analysis was carried out to assess significant differences using the T-test with a probability ($P < 0.05$) (Al-Rawi and Khalaf Allah, 2000).

RESULTS

Table (1) represent the distribution of disease according to the gender, the number and percentage of men suffering from stroke, was 30, and their percentage was 50%. While, the number of women suffering from stroke was 30, and their percentage was 50%. Thus, the total number of patients was 60 subjects. The number of healthy people was 40, including 20 males and 20 female, their percentage 50% for both gender. Table (2) shows the distribution of disease according to the duration which ranges from one week to five years in males, and from one week to three years in women.



Table (3) presents the hematological parameter values for both patient and healthy groups. Among women, there were no statistically significant differences ($p > 0.05$) in RBC, Hb, and PCV values between the patient and healthy groups. However, the WBC count was significantly lower ($p < 0.05$) in female patients compared to healthy controls. In contrast, male patients exhibited significantly lower RBC, Hb, and PCV values ($p < 0.05$) compared to healthy men. No significant difference ($p > 0.05$) in WBC counts was observed between the male patient and healthy groups (Table 3).

Higher values in cholesterol and triglycerides are also observed, but did not reach a statistically significant level in female patients when compared to the healthy (figure, 1). In men, no significant ($p > 0.05$) changes in values of triglycerides. But, cholesterol increased significantly ($p < 0.05$) in patients compared to healthy (figure, 2).

Table (1): the number Patients and healthy people and their percentage according to the gender

Patients		Healthy		
Percentage %	Number	Percentage %	Number	Sex
50	30	50	20	Male
50	30	50	20	Female
100	60	100	40	Total

Table (2): The distribution of disease according to the duration.

Patients	The smallest Period	The longest Period
Men	One Week	5 years
Women	One Week	3 years



Table (3) : The blood values in patients and healthy people for both gender.

Groups	WBC ($10^3/\text{mm}^3$)	PCV (%)	Hb (g/dL)	RBC ($10^6/\text{mm}^3$)
Afflicted Women	10.86 ^a ±1.23	41.23 ^a ±2.25	13.43 ^a ±1.12	4.92 ^a ±0.55
Healthy Women	13.20 ^b ±1.89	41.00 ^a ±3.66	13.00 ^a ±1.77	4.00 ^a ±0.87
Afflicted Men	14.3 ^a ±1.50	39.73 ^a ±3.34	13.30 ^a ±1.12	4.31 ^a ±0.85
Healthy Men	14.20 ^a ±1.5	43.5 ^b ±4.50	14.40 ^b ±1.98	5.10 ^b ±0.95

Data are presented as Mean ±Standard Error (SE).

*Superscript letters that differ indicate statistically significant differences between groups ($p < 0.05$).

*Identical superscript letters indicate a lack of statistically significant differences between groups ($p < 0.05$).

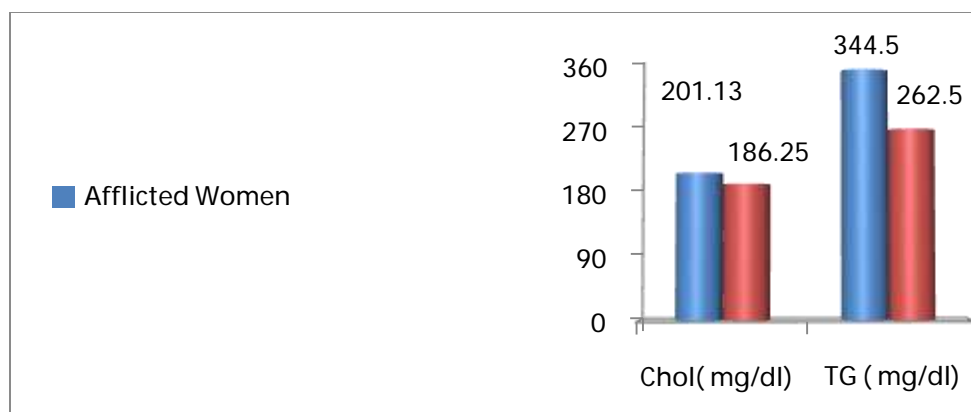




Figure (1) : The values of TG and cholesterol in woman with stroke and healthy

*Identical superscript letters indicate a lack of statistically significant differences between groups ($p < 0.05$).

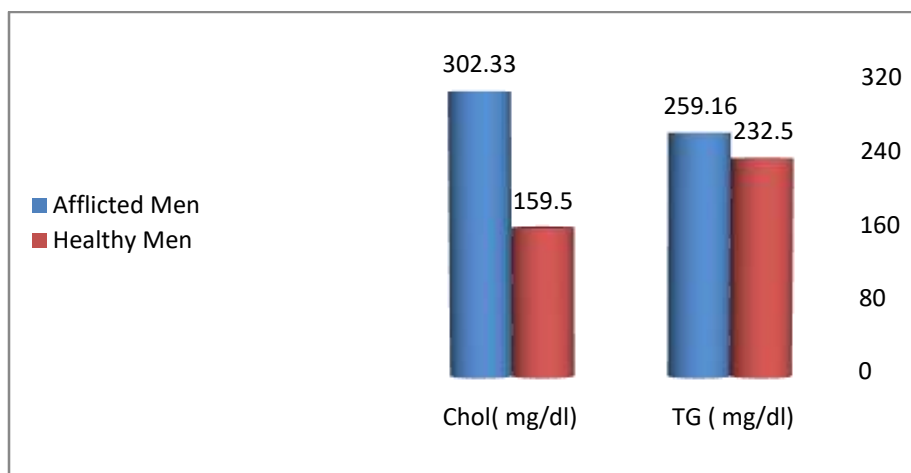


Figure (2) : The values of TG and cholesterol in man with stroke and healthy

*Superscript letters that differ indicate statistically significant differences between groups ($p < 0.05$).

*Identical superscript letters indicate a lack of statistically significant differences between groups ($p < 0.05$).

DISCUSSION

Our study investigates the relationship between blood parameters and lipids in stroke patients. The results of this study showed that there is no significant difference in the value of RBC, HB, and PCV between sick women and healthy women, and the findings similarity was noted with the study of Icme and his team (2014) where they observed that there were no statistically significant differences in the parameters of the complete blood count in stroke group. Moreover, the results showed significant ($p < 0.05$) decrease in RBC, HB, and PCV in males patients compared to healthy. This study agrees with researchers by Akinlua and Asaolu (2019), Observation, where the PCV of stroke patients were found to be significantly lower ($p < 0.05$) compared to control subjects.



Packed cell volume (PCV) is a key factor influencing whole blood viscosity. Elevated blood viscosity has been shown to significantly contribute to increased blood pressure, a major risk factor for many cardiovascular diseases (Strand et al., 2007). Also observed in the findings no significant ($p > 0.05$) changes in WBC in men patients compared to healthy, and this consistent with the study of Akinlua and Asaolu (2019). In some studies of adult patients with acute ischemic stroke, the relationship between leukocyte and neutrophil count and the risk of ischemic development has been specifically studied, and it has been found to be generally correlated to a high leukocyte count and neutrophil count, however the studies do not agree with our study results (Buck *et al.*, 2008; Celikbilek *et al.*, 2014).

The results of this study indicate an increase in lipid standards in women and men, as the value of cholesterol increased in patients compared to healthy people, where it was in men (302.33 mg/dl) and in women (201.13 mg/dl), respectively. This increase may lead to the deposition of fats in the blood vessels, which contributes to In lack of blood flow to parts of the brain, especially in elderly patients.

This difference in lipid parameters in women and men may serve as a warning sign and may provide information to predict future stroke. These results are similar to results of other researches, such as the studies of Huang and his team (2021) and Murad (2022), which found that patients with stroke had higher lipid fluctuations.

A study by Au (2018) reported that lipid levels, blood pressure and aging may contribute to the risk of ischemic stroke . Whereas, Amarenco and his team (2009) stated that there is a close relationship between dyslipidemia and stroke. It may be associated with high white blood cell counts and number of neutrophils.

Furthermore, the causal link between serum cholesterol and stroke remains uncertain. While the Copenhagen stroke study associated high total serum cholesterol levels with less severe strokes and reduced post-stroke mortality (Olsen et al., 2008), another investigation found a connection between high total cholesterol and improved functional outcomes (Pan et al., 2010).

Conclusion: We found a statistically significant relationship between cholesterol and blood parameters with stroke. Therefore, these criteria are considered warning signs that must be examined periodically to prevent or reduce the severity of a stroke.



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Conflict of interests

Authors declare no conflicts of interest.

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