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Pathobiological significance and evaluation of membrane potential and Selenium in Stroke patients

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A B S T R A C T
Objectives: This study was carried out to determine the level of membrane potential and seleniumin stroke patients. Methods: Thirty confirmed stroke patients age 50–70 years were selected. Thirty apparently normal subjects age 50–70 years were used as control. The membrane potential and selenium levels were determined using standard methods. Results: The levels of membrane potential and selenium were significantly decreased in stroke patients ($p<0.05$) when compared with the control. Conclusion: The result suggests that supplementation of stroke patients with food and drug-containing selenium might be helpful.

Keywords*: Membrane potential, selenium, stroke.*

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Introduction:

Stroke may be known as Cerebrovascular accident (CVA). This CVA in adults individuals is firmly linked with cardiovascular risk factors such as hypertension, hypercholesterolemia, diabetes, nicotine-abuse and obesity. This usually occurs when there is a stop in the blood flow to a part of the brain [1]

A stroke is a brain disorder. Similarly, it has resemblance with a heart attack, although it occurs to the brain. It is something that causes derangement of blood flow to the brain. Due to poor distribution of blood flow in the brain they do not receive the blood that they need, they do not receive the oxygen they need and it causes hypoxia that may eventually lead to death of the cell. .In a stroke patients, there is deficient oxygen circulation to the brain[2]. Strokes occur due to problems with the blood supply to the brain as a result of the ruptures of blood vessel in the brain which may cause blockage, leading brain tissue to die [3].This may tends to affect the antioxidants specifically selenium.

Seleniumplaysan essential role in the health of the immunological affairs. This antioxidant suppresses oxidative stress in the body, which reduces inflammation and improves immune system. It could be beneficial for boosting the immune system in patients with some disorders like inflammation particularly at an increased rate[4].

Membrane potential could be as a result of unbalance in concentration and permeability of important ions across a membrane It simply indicate the difference in charges between the internal and external of a neuron, which is created due to the unequal distribution of ions on both sides of the cell [5]. It is the difference between the electric potential in the intracellular and extracellular matrices of the cell when it is not excited. Each cell of the body has its own membrane potential, but only excitable cells - nerves and muscles - are capable to change it and generate an action potential [6]. It is quite necessary to note that there are many ions in the cell and extracellular space, but not all of them can sieve through the cell membrane because of the disparity concentrations of ions across a membrane, the membrane has an electrical charge. Membrane potential could also be referred as the voltage difference between the internal and external of a cell. It is necessary to note that Sodium-potassium pumps move two potassium ions into the cell as three sodium ions are pumped out to maintain the negatively-charged membrane inside the cell. Consequently, helps to maintain the membrane potential[7].

In this study, the levels of membrane potential and selenium in stroke patients were determined to provide information on their status in Owerri, Imo State, Nigeria.

MATERIALS AND METHOD:

Subjects:

Thirty stroke patients (15 males and 15 females) aged 50–60 years were selected for the study. These patients were attending General Hospital, Owerri. Thirty apparently normal subjects (15 males and 15 females) were used as control. Patients with past history of a hypertension, diabetes, renal disease were excluded from the study.

Blood sample: In all subjects, 4 ml of venous blood was collected into plain bottle. The samples were spun in a Wisterfuge centrifuge (model 684) at 1000 g for 10 min and the serum collected into bijou bottle. Informed consent of the participants was obtained and was conducted in line with the ethical approval of the hospital.

Biochemical assay: The serum selenium were determined by atomic absorption spectrophotometric method while the membrane potential was determined using Nerst equation [8].

Statistical analysis: The results were expressed as mean±standard deviation. Statistical significance was calculated using Student's t-test. The level of significance was calculated at $p<0.05$.

RESULTS:

Table 1; The results of the levels of membrane potential and selenium in stroke patients

Parameters	Stroke patients	Control
Membanepotential(J)	128.42 ± 12.10	270.38 ± 15.11*
Selenium (μ/dl)		49.52±8.168.27±7.9*

*Significantly different from control at $p<0.05$.

The result from Table 1 shows that the levels of membrane potential and selenium were significantly decreased in stroke patients when compared with the control at $p<0.05$

DISCUSSION:

The level of membrane potential was significantly decreased in stroke patients when compared with control. This could probably be linked to a disruption of electron transport chains in stroke [9]. Impairment in the function of sodium potassium pump could be implicated in the decrease of membrane potential in stroke patients [10]. This sodium-potassium pump make use of energy to expel 3 molecules of sodium in exchange for 2 molecules of potassium [11]. This is useful due to the fact that this pump creates concentration gradients for sodium and potassium, promoting more. The change in charge typically occurs due to an influx of sodium ions into a cell, although it can be mediated by an influx of any kind of cation or efflux of any kind of anion. This is in line with the work of [12, 13]. This means that there is reduction in cell activity in stroke patients. This could be associated with high blood pressure.

In the same vein, selenium level was significantly decreased when compared with the control. Selenium plays a crucial role as a cofactor for the reduction of an antioxidant enzyme such as glutathione peroxidase, an enzyme which helps react with potentially harmful oxidizing agents in substances [14]. In the light of this, the reduction of selenium in stroke may probably generate an oxidative stress [16, 17]. This, in other words, may seemingly suggests that low selenium levels observed in this study may also suggest that antioxidant systems areweakened in stroke patients.

CONCLUSION:

The decreased selenium level may probably serve as a diagnostic marker in stroke patients. Also, the result may indicate that supplementation of stroke patients with food and drug-containing selenium might be helpful.

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