

HAEMATOLOGICAL PARAMETERS OF STROKE PATIENTS IN A SEMI-URBAN NIGERIAN HOSPITAL

Achugbue F.S¹, Aloamaka C.P², Okokhere P.O³, Otamere H.O⁴, Anyanwu R.A⁵, Obharhua E.J⁶, Iweka F⁷, Adisa W.A⁴

¹Department of Physiotherapy, Irrua Specialist Teaching Hospital, Irrua;

²Department of Physiology, College of Health Sciences, Delta State University,

Abraka; ³Department of Internal Medicine, Irrua Specialist Teaching Hospital, Irrua;

⁴Department of Physiology, College of Medicine, Ambrose Alli University, Ekpoma;

⁵Department of Medical Laboratory Sciences, College of Medicine, Ambrose Alli

University, Ekpoma; ⁶Department of Hematology, Irrua Specialist Teaching

Hospital, Irrua; ⁷Department of Chemical Pathology, Irrua Specialist Teaching

Hospital, Irrua.

CORRESPONDING AUTHOR: ¹Department of Physiotherapy, Irrua Specialist Teaching Hospital, P.M.B. 08, Irrua, Edo State, Nigeria.

Email: mabfyne@yahoo.com

ABSTRACT

Peculiarities of incidence of stroke with respect to different communities or regions could exist due to certain environmental factors. The aim of this study was to assess the haematological parameters of stroke patients in Irrua, Nigeria, and its immediate environments. Two hundred and even (207) subjects participated in the study. Of these, one hundred and seven (107) were stroke patients, who were hospitalized in Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria between September, 2006 and March, 2010. They were 55 males (age: 39-95; mean: 64.84 ± 1.69) years and 52 females (age: 32-93; mean: 66.56 ± 1.97) years. One hundred (100) normal subjects. 50 males (age: 40-65, mean: 48.66 ± 1.20) years and 50 females

(age: 40-80, mean 50.60 ± 1.22) years, served as control group. There were significant increases in all haematological parameters ($P < 0.05$), except for haematocrit level, and a significant decrease in lymphocyte levels. There was a negative correlation between lymphocyte plasma level and diastolic blood pressure [DBP] ($r = -0.418$, $p = 0.019$) and between lymphocyte level and heart rate [HR] ($r = -0.417$ and 0.019). There was inverse relationship between lymphocyte and DBP; and HR, in the female stroke subjects.

KEY WORDS: Stroke, Hematological parameters. Blood pressure, Rural communities

INTRODUCTION

Cardiovascular events have been shown to be associated with some rheological and haemostatic factors.^[1,2] First stroke patients may exhibit evidence of elevated rheological factors in their blood.^[3] Some studies have demonstrated the association between elevated white blood cell (WBC) counts and significant progression of atherosclerosis.^[4] Some mechanisms by which leucocytes cause parenchymal brain injury include release of hydrolytic enzymes, vessel plugging, initiation of thrombosis, and oxygen free radicals.^[1,5]

Pearson and Lipowsky^[6] showed that increase in red blood cells (RBC) results in increase in the firm adhesion of WBCs to the endothelium of post-capillary venules of the rats' mesentery. It was shown that RBCs of patients with stroke have decreased levels of platelet-activating factor, acetylhydrolase activity which may result in the accumulation of oxidized lipids in the cell membrane, and therefore lead to impaired red cell deformability in patients with cerebral thrombosis.^[7] Environmental factors like smoking, including secondary cigarette smoking, physical inactivity, alcohol or drug abuse, air pollutions, and diet have been implicated in the development of stroke.^[8,9,10] Since development of stroke cuts across different populations of the world, it becomes necessary to identify the peculiarities with respect to different communities or regions. Therefore the aim of the study was to

evaluate the haematologic indices of stroke patients in Irrua, Edo State of Nigeria with a view to finding out the possible predictive parameter to the incidence of stroke in the region.

MATERIALS AND METHODS

Ethical consideration: Approval for the study was granted by the research and ethical committee of Irrua Specialist Teaching Hospital (ISTH), Irrua, Nigeria. **Subjects for the study:** The casenotes of 107 stroke patients comprising of 55 males and 52 females aged between 32 and 95 years were studied. These patients were admitted in the hospital (ISTH) between September, 2006 and March, 2010 and their data on first hospitalization were obtained. Old CVA and HIV/AIDS cases, and diabetics and patients with acute infection, heart or renal conditions were excluded from the study. 100 apparently normal age-matched subjects (55 males and 52 females) served as control. Blood (5mls) was obtained by venepuncture from the control subjects using sterilized disposable syringes and needles. The sample was transferred into EDTA bottles for the determination of the following haematological parameters:

- (a.) Hematocrit, by Hawksley microcapillary centrifuge method.^[11]
- (b.) White blood cell (WBC) total and differential count by Manual Methods.^[11,12]
- (c.) Platelet count by manual method.^[13]

(d.) Erythrocyte sedimentation rate (ESR) by Westergreen method.^[11] Systolic (SBP), Diastolic (DBP) blood pressures, Mean arterial pressure (MAP) as well as Pulse rate were recorded for each subject.

STATISTICAL ANALYSIS:

This was by computer software statistical package for social sciences (SPSS). Data were statistically analysed using Independent t-test and Pearson’s moment correlation coefficient. P-value less than 0.05 were considered significant.

RESULTS

Table 1 shows the routine clinical data of subjects. The male stroke subjects, when compared with the female stroke subjects, showed no significant difference in all the blood pressure parameters studied. However, the male and female stroke subjects, when compared with their respective control, showed significant differences (P < 0.05).

The statistical profile of the routine haematological parameters of the subjects is shown in Table 2. It was

observed that there was a significant increase (p<0.05) in the respective indices, except for lymphocytes, platelets, and haematocrit in both the male and female stroke subjects (p<0.05), compared to the control subjects. There was no significant difference in hematocrit values between the stroke and control subjects (p>0.05), but the lymphocyte level was significantly (p<0.05) decreased in the stroke subjects.

The ESR and haematocrit values between the male and female stroke subjects were not compared as shown also in Table 3. This is because the values for males are normally different from those of females. However, results showed that there were no significant differences in other parameters, between the male and female stroke subjects.

Table 4 shows the correlation between hematological values and blood pressure parameters. There was no correlation except for lymphocytes versus DBP and lymphocytes versus HR where negative correlations were obtained i.e. r = -0.417, P = -0.019 and r = 0.417, P = -0.019 respectively.

Table 1: Clinical Data of Stroke and Normal Subjects

Variables	Male (stroke) n = 55	Male (control) n = 50	Female (stroke) n = 52	Female (control) n = 50
Age (years)	64.84 ± 1.69* ^{NS}	48.66 ± 1.20	66.56 ± 1.97**	50.00 ± 1.22
SBP (mmHg)	167.82 ± 4.46* ^{NS}	126.54 ± 1.56	172.48 ± 4.33**	128.44 ±

1.49				
DBP (mmHg)	100.82 ± 3.30 ^{*NS}	78.08 ± 1.37	100.42 ± 2.56 ^{**}	77.72 ± 0.98
MAP (mmHg)	121.54 ± 4.03 ^{*NS}	94.02 ± 1.41	124.33 ± 2.91 ^{**}	94.93 ± 1.08
HR (beats/min)	89.27 ± 2.30 ^{*NS}	77.40 ± 1.04	87.50 ± 2.06 ^{**}	81.76 ± 1.07

Value: Mean ± SEM; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; MAP: Mean Arterial Pressure; HR: Heart Rate; * p< 0.05: male stroke versus male control; ** p< 0.05: female stroke versus female control; NS: No significant difference (male stroke Vs female stroke)

Table 2: Comparison of Haematological Parameters of Stroke and Control Subjects.

Variables	n	Male (Stroke)	Male (Control) n= 50
ESR (mm/hr)	21	41.83 ± 6.48*	15.16 ± 1.10
Hct (%)	49	41.55 ± 1.73 ^{NS}	42.30 ± 0.44
WBC total (cells/μL/mm ³)	27	8066.67 ± 951.62*	5446.00 ± 143.71
Neutrophils (%)	25	54.28 ± 4.26*	42.94 ± 1.10
Lymphocytes (%)	25	43.04 ± 4.05*	54.28 ± 0.79
Platelets coun (permL)	21	Adequate ^R	169000 ± 5.30(10 ³) ^R
	n	Female (Stroke)	Female (Control) n = 50
ESR (mm/hr(26)	26	54.15 ± 8.25*	18.12 ± 1.06
Hct (%)	35	36.90 ± 1.39 ^{NS}	36.50 ± 0.41
WBC total (cells/μL/mm ³)	42	6494.29 ± 467.27*	5282.00 ± 180.87
Neutrophil (%)	31	57.26 ± 2.83*	37.96 ± 1.94
Lymphocytes (%)	31	40.48 ± 2.57 *	57.84 ± 2.07
Platelets count (perml.)	29	Adequate ^R	204600 ± 6.20(10 ³) ^R

Value: Mean \pm SEM; ESR: Erythrocyte sedimentation rate; Hct: Haematocrit; WBC: White blood cell; * $p < 0.05$; NS: No Significant difference; ^R Within normal range.

Table 3: Haematological Parameters of Male and Female Stroke Subjects

Variables	n	Male (stroke)	n	Female (stroke)
ESR (mm/hr)	21	41.83 \pm 6.48	26	54.15 \pm 8.25 (NC)
Hct (%)	49	41.55 \pm 1.73	35	36.90 \pm 1.39 (NC)
WBC total (cells/ μ L/ mm^3)	27	8066.67 \pm 951.62 ^{NS}	42	6494.29 \pm 467.25
Neutrophils (%)	25	4.28 \pm 4.26 ^{NS}	31	57.26 \pm 2.83
Lymphocytes (%)	25	43.04 \pm 4.05 ^{NS}	31	40.48 \pm 2.57
Platelets count (per mL)	21	^R Adequate	29	^R Adequate

Value: Mean \pm SEM; ESR: Erythrocyte sedimentation rate; Hct: Haematocrit; WBC: White blood cell; NC: Not compared; NS: No significant difference; ^R Within normal range.

Table 4: Correlation of Haematological Parameters with Blood Pressure of Stroke Subjects

Stroke Subjects	Male		Female	
Variables	r	p-value	r	p-value
ESR and SBP	-0.0101	-0.664	-0.309	0.972
ESR and DBP	-0.147	0.524	0.213	0.297
ESR and MAP	0.127	0.583	0.269	0.183
ESR and HR	0.308	0.175	0.147	0.473
WBC and SBP	0.292	0.139	0.069	0.692
WBC and DBP	0.329	0.094	0.244	0.157
WBC and MAP	0.104	0.607	0.177	0.308
WBC and HR	0.209	0.401	0.154	0.376
Lyn: and SBP	0.63	0.764	0.227	0.219

Lym and DBP	0.121	0.566	0.418	0.019
Lym and MAP	-0.29	0.890	0.356	0.05
Lym and HR	0.179	0.393	0.417	0.019*
Neu and SBP	0.127	0.545	0.169	0.363
Neu and DBP	0.102	0.626	0.341	0.061
Neu and MAP	0.13	0.952	0.282	0.124
Neu and HR	0.209	0.315	0.359	0.050

ESR: Erythrocyte sedimentation rate; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure;

MAP: Mean Arterial Pressure; WBC: White blood cell; Lym: Lymphocytes; Neu: Neutrophils;

n for Male ESR =21, Female ESR =26, Male WBC =27, Female WBC = 42, Male Lym 25,

Female Lym =31, Male Neu =25, Female Neu 31; *p<0.05

DISCUSSION

The difference in the hematological parameters between stroke and control subjects as shown in table 2 was expected. This is because the increase in the level of rheological factors has been implicated in stroke patients, and such factors include the haematocrit, WBC count, ESR, plasma viscosity etc. ^[13] It was observed that for both male and female stroke subjects, there was increase in mean values of ESR, total WBC count and neutrophils; and decrease in the mean value of lymphocytes when compared with control values. ^[14]

Normally sex variation exists in the values of ESR and haematocrit, with the former being greater in females and the later greater in males. This still remains the observation. either with respect to stroke subjects or control subjects (Table 3). But in case of WBC. both the total count and the relative distribution

of the various types were not significantly different in the male and female stroke subjects despite the hypertension of the condition. This is despite the findings of Ighoroje and Dapper that sex variation of haemorrheological parameters exists in hypertensive Nigerian subjects. ^[14]

When cellular components of blood were correlated with the blood pressure parameters, it was only with respect to lymphocytes in the female stroke subjects that a significant relationship was found. There was a negative correlation between lymphocyte level and DBP. Such relationship is possible only if stroke induces loss of lymphocytes. In fact, stroke has been shown to induce an extensive apoptotic loss of lymphocytes, and this effect has been attributed to activin A, a member of the transforming growth factor β superfamily. ^[15] It is however not clear

why similar relationship between lymphocytes level and DBP was not observed in male stroke subjects. Also, a significant negative correlation existed between lymphocyte level and heart rate in female stroke subjects. This seemed to depend on similar explanation as was given for the relationship between lymphocytes and DBP. This is because the alteration in blood pressure, as is usually observed in stroke, will obviously affect heart rate, i.e. that stroke directly or indirectly, will interfere with heart rate and blood pressure in same direction.

CONCLUSION

Conclusively, strict haematological monitoring may be helpful in assessing stroke and potential stroke patients. Also gender consideration is relevant in designing therapeutic and management protocols for stroke patients.

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