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STUDIES ON ACTIVATED PARTIAL THROMBOPLASTIN TIME, RED AND WHITE BLOOD CELL COUNTS IN CORONARY ARTERY DISEASE IN OWERRI, NIGERIA.

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ABSTRACT

Background: Coronary artery disease (CAD) is a multifactorial condition influenced by cardiovascular, hematological and haemostatic factors. The knowledge of these parameters in CAD patients, including gender-based differences, is essential for personalized diagnosis and treatment.

Objective: To investigate red cell indices and aspartate aminotransferase in CAD patients Federal Teaching Hospital, Owerri, Nigeria, and assess gender-based variations.

Methods: A cross-sectional study was conducted involving 30 CAD patients (19 males and 11 females) and 30 age-matched healthy controls. A total of 5 mL of venous blood was collected from each participant, with 3 mL placed in EDTA tubes for hematological analysis and 2 mls into sodium citrate containers for APTT determination..Haematological parameters were assessed using an automated hematology analyzer, while APTT was determined using a standard coagulometer and commercial reagents according to the manufacturer's instructions.

. Statistical analysis was conducted using independent t-tests to compare group differences and Pearson correlation for association studies, with $p < 0.05$ considered statistically significant.

Results: CAD patients showed significantly higher mean activated partial thromboplastin time (APTT: 41.23 ± 4.09)secsand white blood cell (WBC) count (15.23 ± 2.1) × 10□/L compared to controls (APTT: 28.30 ± 2.17)secs; WBC: (7.00 ± 1.68) × 10□/L with p-values of 0.002 and <0.001, respectively. Red blood cell (RBC) count was significantly lower in CAD patients (2.07 ± 0.35)× 10^{12}/L) compared to controls (4.01 ± 0.27)× 10^{12}/L. Among CAD patients, males had significantly higher APTT values (65.30 ± 14.48) secs than females (48.60 ± 8.95) secs($p = 0.035$). No significant gender differences were observed in RBC and WBC counts. Correlation

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analysis revealed insignificant negative correlations of APTT with RBC (r = -0.025, p = 0.897), and WBC(r = -0.038, p = 0.843).

Conclusion: CAD patients in Owerri exhibit significant hematological abnormalities, including elevated APTT and WBC levels and reduced RBC counts. Although gender-related variations were observed in APTT, no significant correlations among APTT, RBC, and WBC suggest independent pathological mechanisms. Comprehensive hematological assessments should be incorporated into CAD management protocols. Further studies arewarranted to explore the underlying mechanisms of these hematological changes.

Key words: Activted Partial Thromboplastin Time, Red Blood Cell, White Blood Cell, Coronary Artery Disease.

1. INTRODUCTION

Coronary artery disease (CAD) is one of the foremost causes of morbidity and mortality globally, particularly in low- and middle-income countries where risk factor control is often suboptimal [1]. Although the classical risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, and sedentary lifestyle are well established, growing evidence suggests that hematological and haemostatic parameters significantly influence the pathogenesis and prognosis of CAD [2].

Activated Partial Thromboplastin Time (APTT) assesses the intrinsic and common coagulation pathways and can reflect hypercoagulable or hypocoagulable states depending on the context [3]. In CAD, alterations in coagulation markers may signal endothelial dysfunction or thrombosis risk. Additionally, elevated white blood cell (WBC) count is a known marker of systemic inflammation and has been associated with plaque instability and adverse cardiac events [4]. Conversely, reduced red blood cell (RBC) count may impair oxygen delivery to ischemic myocardial tissue, exacerbating tissue damage [5]

Gender-based differences in hematological and coagulation profiles in CAD patients have also been reported. Females may exhibit elevated coagulation markers and inflammatory indices compared to males, potentially influencing disease progression and therapeutic outcomes [6]. These gender-based disparities warrant investigation in specific populations, including Nigerians, where there is a paucity of localized data. This study

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aims to evaluate the levels of APTT, RBC, and WBC in CAD patients in Owerri, Nigeria, and to assess gender-based differences in these parameters

.2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted at Federal University Teaching Hospital, Owerri, Nigeria.

2.2 Study Design

This study employed a cross-sectional analytical design to investigate selected hematological and haemostatic parameters—namely Activated Partial Thromboplastin Time (APTT), Red Blood Cell (RBC) count, and White Blood Cell (WBC) count—in patients diagnosed with coronary artery disease (CAD) compared to healthy age-matched controls.

2.3Method of Recruitment

A total of 60 participants were recruited for the study. Thirty (30) patients diagnosed with coronary artery disease (19 males and 11 females) were selected from the Cardiology Unit of a tertiary hospital in Owerri, Nigeria. Thirty (30) age- and sex-matched apparently healthy individuals without a history of cardiovascular disease served as the control group. Participants were recruited using purposive sampling based on inclusion and exclusion criteria. Inclusion criteria for CAD patients included clinical diagnosis of CAD confirmed by a cardiologist. Individuals with other comorbid conditions such as diabetes, malignancies, or hematological disorders were excluded.

2.4 Ethical Approval

Ethical approval for the study was obtained from the Ethics and Research Committee of the [Name of Hospital or Institution] (approval number: [insert number]). Informed consent was obtained from all participants prior to sample collection. Confidentiality and anonymity were maintained throughout the study.

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2.5 Laboratory Analysis

Venous blood samples (5 mL) were collected aseptically from each participant. Three milliliters (3 mL) of the blood were dispensed into ethylenediaminetetraacetic acid (EDTA) tubes for hematological analysis. The remaining 2 mL was used for haemostatic analysis. Hematological parameters, including RBC and WBC counts, were measured using a fully automated hematology analyzer. APTT was determined using a standard coagulometer and commercial reagents according to the manufacturer's instructions.

2.6 Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version [insert version, e.g., 25.0]. Results were expressed as mean ± standard deviation (SD). Independent sample t-tests were used to compare the mean values between CAD patients and controls, as well as between male and female subgroups. Pearson correlation was used to determine the relationship between APTT, RBC, and WBC. A p-value < 0.05 was considered statistically significant.

3.RESULTS

Table 1 Mean Values of APTT, Red Blood Cell and White Blood Cell Counts in Patients with Coronary Artery Disease and Healthy Subjects (Mean ± S.D)

Table 1 shows the mean levels of APTT. Red Blood Cell and White Blood Cell Counts in Patients with Coronary Artery Disease and Healthy Subjects

The mean values of APTT (41.23± 4.09)secs and WBC (15.23± 2.1) x 10^9 /L in patients with coronary heart disease were significantly raised when compared to that of the controls (28.30± 2.17)secs and (7.00± 1.68) x 10^9 /L respectively (t= 20.01, p= 0.002 and t=59.58, p= < 0.001)

On the other hand, the mean values of RBC (2.07± 0.35) x 10^{12} /L in patients with coronary heart disease were significantly reduced when compared to that of the controls (4.01± 0.27) x 10^{12} /L(t = 5.66, p =<0.001)

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Parameters	No	Test (n=30)	Control (n=30)	t-value	P value
APTT (Secs)	30	41.23± 4.09	28.3 ± 2.17	20.01	0.002*.
RBC (10^{12} /L)	30	2.07±0.35	4.09 ±0.27	-5.66.	< 0.001*,
WBC (10^{9}/L)	30	15.33± 2.15	7.0 ± 1.68	59.58	0.001*

Key:
S.D- Standard Deviation
*- Significant p value
APTT- Activated Partial Thromboplastin Time
RBC- Red Blood Cell
WBC- White Blood Cell

Table 2: Comparison of Levels of APTT, Red Blood Cell and White Blood Cell Counts in Male and Female Patients with Coronary Artery Disease

Table .2 shows the mean values of APTT, Red Blood Cell and White Blood Cell Counts in Male and Female Patients with Coronary Artery Disease.

The mean values of APTT (65.30± 14.48)secs in male patients with coronary heart disease was significantly increased when compared to female patients with coronary heart disease (48.60± 8.95)secs (t= 3.880, p= 0.035)

The mean values of RBC (2.36± 0.32) x 10^{12} /L in male patients with coronary heart disease was insignificantly increased when compared to female patients with coronary heart disease (1.92± 0.22) x 10^{12} /L (t= 1.827, p= 0.076)

The mean values of WBC (13.95± 2.20) x 10^{9} /L in male patients with coronary heart disease was insignificantly reduced when compared to female patients with coronary heart disease (16.60± 5.68) x 10^{12} /L (t= -1.421, p= 0.167)

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Parameters	No	Male (n=19)	Female (n=11)	t-value	P value
APTT (Secs)	30	65.3± 14.48	48.6± 8.95	3.88	0.035*.
RBC (10^{12} /L)	30	2.36±0.32	1.92±0.22	1.83	0.076
WBC (10^{9}/L)	30	13.95± 2.2	16.6± 5.68	−1.421	0.167

Key:
S.D- Standard Deviation
*- Significant p value
APTT- Activated Partial Thromboplastin Time
RBC- Red Blood Cell
WBC- White Blood Cell

Table 3: Correlation of APTT with Red Blood Cell and White Blood Cell Counts in Patients with Coronary Artery Disease

Table 3 showed the Correlation ofAPTT with Red Blood Cell and White Blood Cell Counts in patients with Coronary Artery Disease

There was a non- significant negative correlation of APTT with Red Blood Cell (r= -0.025, p=0.897) among Patients with Coronary Artery Disease, and a non- significant negative correlation with White Blood Cell (r= -0.038, p=0.843) among patients with Coronary Artery Disease

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Parameters	N	R	p-value
Red Blood Cell	30	-0.025	0.897
White blood cells	30	-0.038	0.843

4. DISCUSSION

This study observed that APTT and WBC counts were significantly elevated in CAD patients when compared to controls, while RBC counts were significantly reduced. These findings suggest a concurrent state of inflammation and potential coagulopathy in CAD, consistent with prior literature [3,4].

Elevated APTT in CAD patients may reflect an adaptive response to chronic endothelial damage or a prothrombotic state that is being compensated for by anticoagulant factors [7]. Similar findings were reported by Anvari et al., who observed a prolonged APTT in CAD patients and linked it to altered coagulation dynamics and increased cardiovascular risk [3]. Furthermore, the significantly higher APTT observed in male patients compared to females aligns with studies that suggest gender-based physiological differences in coagulation response and factor levels [6,8].

The elevated WBC count seen in CAD patients corroborates with earlier reports that leukocytosis serves as a biomarker for inflammation and is associated with the development and progression of atherosclerosis [4,9]. A study by Madjid et al. also established that higher leukocyte counts were linked to increased coronary heart disease risk and adverse outcomes [10].On the other hand, reduced RBC levels in CAD patients, although sometimes overlooked, can aggravate myocardial ischemia by impairing oxygen delivery [5]. Anemia has previously been associated with poor prognosis in CAD, particularly in elderly and female patients [11]

Interestingly, while APTT was significantly higher in males, WBC was insignificantly lower, and RBC insignificantly higher compared to females. These gender variations are similar to those noted in a study by Pradhan et al., who reported sex differences in inflammatory and coagulation profiles among cardiovascular patients [6].

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Correlation analysis in this study did not show a significant relationship between APTT, RBC, and WBC, indicating that these parameters may contribute independently to CAD pathophysiology. This independence reflects the multifactorial nature of CAD, where inflammation, anemia, and coagulopathy may all simultaneously affect patient outcomes [12].

In summary, the findings support previous evidence of hematological disturbances in CAD and suggest the need for routine hematologic assessments in CAD management. Further large-scale studies are necessary to explore these associations and validate their prognostic significance.

5. CONCLUSION

In conclusion, the study's findings highlight significant hematological and haemostatic alterations in CAD patients, with notable gender-based differences. These insights underscore the importance of incorporating hematological assessments into the clinical management of CAD and suggest avenues for personalized therapeutic strategies. Further research is warranted to elucidate the mechanisms underlying these alterations and their implications for CAD prognosis and treatment.

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