

Neutrophil/Lymphocyte Ratio of Psychiatric Patients in a Federal Neuro-Psychiatric Hospital, Benin City, Nigeria.

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ABSTRACT

Objectives: Neuro inflammation has been reported to play a pivotal role in the etiology of psychiatric disorders. Neutrophil-Lymphocyte ratio (NLR) is inexpensive and reproducible biomarkers of inflammation that have shown positive correlation with established inflammatory markers. The aim of this study was to determine the effect of some psychiatric disorders on NLR. **Methods:** A total of 101 mentally-ill out-patients presenting at the Federal Neuro-Psychiatric Hospital, Benin City, without superimposing infection, and had complete record of complete full blood count and typing of the psychiatric disorder were used for the study. The matching control group was 21 apparently healthy non-mentally-ill subjects recruited from the surrounding community. The full blood count was determined manually. **Results:** Significantly higher percentage neutrophil count and neutrophil-lymphocyte ratio(NLR) were observed among the mentally-ill patient (Schizophrenia (64),Mental and Behavioural Disorders (13), Bipolar Affective Disorders (8) and Depression (16)) compared with apparently healthy non-mentally-ill subjects ($p<0.05$).In relation to type of mental illness expressed by the subjects, percentage neutrophil count of patients with mental and behavioural disorders associated with substance abuse (MBD) was significantly higher when compared with the non-mentally-ill control subjects($p<0.05$).Patients with depression had significantly lower percentage neutrophil count compared with those with schizophrenia and MBD ($p<0.05$). However, NLR was significantly higher($p<0.05$) in mentally-ill patient with MBD compared with control subject who are not mentally-ill. **Conclusion:** Mentally-ill patients had significantly higher NLR compared with apparently healthy controls. The elevated inflammatory response in the psychiatric patients remained significant in patients with MBD only. The data generated in this study will be useful in the management of the mentally ill in low resource environments.

Keywords: Neutrophil-lymphocyte ratio, Schizophrenia, Mental and behavioural disorders, bipolar affective disorders, depression, inflammation.

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INTRODUCTION

The etiology of psychiatric disorders entails genetic impairment in biochemical neurotransmission and receptors function, oxidative stress/antioxidant balance (1). Neuro-inflammation has also been reported to play a significant role in the onset and progress of psychiatric disorders (2-5).

Studies have shown significant correlations of neutrophil-lymphocyte ratio (NLR) with established markers of inflammation like C-reactive protein (CRP) and other pro-inflammatory cytokines (6-7). NLR can therefore be used as a biomarker for inflammation (8).

Inflammation could be due to infectious agents or substance abuse. A number of micro-organism have been reported to be associated with different types of psychiatric disorders such as virus, bacteria and parasites (9-10) as well as a number of substances (11-12). Laboratory investigation of inflammatory process usually involves the measurements of cytokines which are expensive and not practicable in resource-poor environments. NLR which is inexpensive and has shown a positive correlation with inflammatory markers can be employed (13). The management of psychiatric patient in our health setting does not usually involve laboratory investigations except in specialized hospitals for psychiatric patients where only FBC is used. Inflammatory processes resulting from infectious agents whose treatment has been reported to alleviate psychiatric symptoms (14-15) may therefore be missed. This may also hold true for substance of abuse.

A number of studies have been done on NLR and psychiatric disorders (1). However, none has been done in Benin City and perhaps in Nigeria. Against this background, this study aims to determine the effect of some psychiatric disorders on NLR.

MATERIAL AND METHODS

Study population

This is a retrospective study involving the use of laboratory records between December 2018 and March, 2019. Only data of patients with complete laboratory record and without superimposing infection were extracted for the study. A total of 101 mentally-ill patients that met these criteria were recruited and an additional 21 who was apparently healthy non-mentally ill subjects enlisted as controls. The controls had been evaluated by a psychiatrist who ascertains them not to be mentally ill. The study was done in line with Helsinki declaration.

Specimen collection and processing

Venous blood (5ml) was collected from each subject into ethylenediaminetetraacetic acid (EDTA) container, labeled and mixed. Manual total and differential white blood cell count was performed on all specimens. Absolute neutrophil and lymphocyte counts were determined by multiplying the percentage counts with their respective total white blood cell counts and dividing the results by 100. The neutrophil-to-lymphocyte ratio was determined by dividing the absolute neutrophil count by the absolute lymphocyte count.

Statistical analysis

The data obtained were analyzed with student t- test and analysis of variance (ANOVA) using the statistical software INSTAT® (Graph Pad Inc., La Jolla, CA, USA). Statistical significance was set at p<0.05.

RESULTS

A significantly (p<0.05) higher percentage neutrophil count and NLR was observed among the mentally ill patient (Table 1).

In relation to types of mental illness studied, the percentage neutrophil count of patients

with mental and behavioural disorder associated with substance abuse (MBD) was significantly higher when compared with the apparently healthy control subjects(p<0.05).Patients with depression had significantly lower percentage neutrophil count compared with those with Schizophrenia and MBD(p<0.05). However, NLR was significantly higher (p<0.05 in mentally-ill patient with MBD compared with control subjects (Table 2).

Table 1: White blood cell counts and indices among mentally ill and non-mentally ill subjects

Parameters	Mentally ill (n=101)	Control (n = 21)	P - v a l u e
Total white blood cell count (x 10 ⁹ /L)	6 . 7 7 ± 2 . 6 0	7 . 3 9 ± 1 . 7 9	0 . 3 0 4 7
Absolute neutrophil count (x 10 ⁹ /L)	3 . 7 6 ± 1 . 7 5	3 . 6 7 ± 1 . 0 3	0 . 8 1 7 9
Absolute lymphocyte count (x 10 ⁹ /L)	2 . 9 8 ± 1 . 3 9	3 . 4 3 ± 0 . 8 6	0 . 1 5 1 2
Neutrophil (%)	54.87 ± 11.14	49.29 ± 4.88	0 . 0 2 6 4
Lymphocyte (%)	44.42 ± 11.17	46.71 ± 5.35	0 . 3 5 9 8
Neutrophil-lymphocyte ratio	1.38 ± 0.64	1.08 ± 0.23	0 . 0 3 4 5

Table 2: Effect of type of mental illness on white blood cell counts and indices

Parameters	Schizophrenia	Depression	M B D	B A D	C o n t r o l	P value
Total white blood cell count (x 10 ⁹ /L)	6.19 ± 2.04	7.57 ± 4.35	7.70 ± 2.65	7.90 ± 1.88	7.39 ± 1.79	N / S
Absolute neutrophil count (x 10 ⁹ /L)	3.42 ± 1.48	4.04 ± 3.14	4.52 ± 1.55	4.50 ± 1.39	3.67 ± 1.03	N / S
Absolute lymphocyte count (x 10 ⁹ /L)	2.75 ± 0.94	3.50 ± 1.56	3.16 ± 1.43	3.37 ± 0.73	3.43 ± 0.86	N / S
Neutrophil (%)	54.22+9.85	44.58+13.59	59.10+10.94	56.17+6.65	49.29 ± 4.88	S *
Lymphocyte (%)	44.86+9.93	49.75+13.04	40.70+10.94	43.33+5.89	46.71 ± 5.35	N / S
Neutrophil-lymphocyte ratio	1.31+0.50	1.12+0.50	1.61+0.71	1.33+0.33	1.08 ± 0.23	S ^γ

BAD = Bipolar disorder; S = significant; N/S = Not significant; *Schizophrenia vs. Depression: p<0.01; Depression vs. MBD: p<0.01; MBD vs. Control: p<0.05; ^γMBD vs. Control: p<0.05

DISCUSSION

This study aimed to determine the effect of mental illness on NLR and to determine its possible use in the early detection of subclinical inflammation in the study subjects as against the cost involving conventional methods for detecting inflammation especially in resources poor setting.

In this study, percentage of neutrophils in the mentally-ill patients was observed to be significantly higher when compared with the control group. Neutrophils are the first line of immune defense exhibiting phagocytic and apoptotic action through the secretion of various inflammatory factors (16). However, absolute neutrophil count was not significantly different in the two groups. Percentage neutrophil count is derived in relation to total white blood cell count (WBC) while absolute value is actual neutrophil count. Findings from this study suggests a relative neutrophilia which may indicate a subclinical inflammatory or infectious process. This is confirmed by a significantly higher NLR in the mentally-ill patients as compared to the non-mentally-ill subjects - a finding that agrees with previous report (1). Inflammation and infection have been reported to be associated with the etiology of psychosis (9-10,17). This may explain the findings in this study. Comparing the WBC in relation to different

mental illness studied, only percentage neutrophil and NLR showed significant differences with only MBD having significantly higher percentage neutrophil count compared to control. With the exception of patient with depression, all other type mental cases studied had higher neutrophil count compared with the control reaching statistical significances between MBD and control. This may indicate that schizophrenia, MBD, BAD patients may have increased stress, inflammation or infectious process (9-10,17).

In comparison with depression, schizophrenia and MBD had significantly higher percentage neutrophil count. This may indicate more infection or inflammatory process in these conditions. The immune cells which acts as initial defense against invading microorganism are neutrophils (18). Indeed yeast, viral, parasitic and bacterial infection have been associated with some psychotic disorders (14,9,15).

Elevated NLR have been reported in schizophrenia, BAD and MBD when compared with healthy controls (1). This agrees with findings in this study. Statistical significance was only observed between MBD and control. Significantly higher NLR have been reported among heroin addicts (12). This agrees with the findings from this study. Increased NLR is considered an indicator of inflammation in persons with psychiatric disorders(12).Therefore among the psychiatric patient in this study

inflammation resulting from substances abuse are most likely the cause of increased NLR. Further studies with larger sample size are needed to confirm these findings as well as determine the infectious agent and/or substances of abuse responsible for the increased inflammation.

In conclusion, mentally ill patients had significantly higher percentage neutrophil count and NLR compared with healthy controls. The elevated inflammatory response in the psychiatric patient remained significant only in patients with MBD. The data generated in this study will be useful in the management of the mentally ill in low-resource environments.

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