Evaluation of the Alterations in Haematological Parameters of Cervical Cancer Subjects in Port Harcourt

Abstract:

Cervical cancer remains a significant global health concern, with a high incidence and mortality rate among women. This study was aimed at evaluating the alterations in haematological parameters of cervical cancer subjects in Port Harcourt. This study is a case control study. A total of 40 participants (20 histologically confirmed cervical cancer positive subjects and 20 histologically confirmed cervical cancer negative subjects) within the age of 18-70 years were recruited for this study. The demography and informed consent of the study subjects was obtained with the use of a questionnaire. Three milliliters (3mls) of blood sample was collected using vacutainers from each participant. Full blood count (FBC) was analysed using auto-analyser (LABOREX HM-500×), Neutrophil-lymphocyte ratio (NLR), monocyte-lymphocyte ratio (MLR) and platelet – lymphocyte ratio (PLR) were calculated. Graph pad prism 8.0.2.263 version was used for data analysis. $P<0.05$ was considered significant. Results were presented as mean ± standard deviation (m±SD) in Tables. The results of this study showed that majority of cervical cancer patients were within the ages of 51-60 years. This research work also shows that there was a statistically significant increase in the white blood cell (WBC) platelet distribution width (PDW) ($p = 0.0489$), neutrophil to lymphocyte ratio (NLR) and monocyte to lymphocyte ratio (MLR) in cervical cancer patients. There was also a significant statistical decrease observed in red blood cell (RBC), haemoglobin concentration (HB), packed cell volume (PCV) and monocyte in cervical cancer patients, when compared with control subjects. This study indicates that patients with carcinoma of the cervix have severe degree of anaemia, this could be due to haemorrhage associated with iron deficiency, tumor bleeding. This study concludes that there is alteration in the haematological parameters of cervical cancer patients, so continuous monitoring is very important to help reduce mortality rate. This study will serve as a solution to possible complications that may arise in the diagnosis, treatment, and management of cervical cancer patients in Port Harcourt.

1.Introduction

Cervical cancer remains a significant global health concern, with a high incidence and mortality rate among women, particularly in developing regions (1). There are two main types of cancer of the cervix: Squamous cellcarcinomas and Adenocarcinomas. About 80% to 90% of cervical cancers are squamous cell carcinomas, while 10% to 20% are adenocarcinomas (2). Cervical carcinoma originates in the transformation zone from the ecto or endocervical mucosa. The complexity of cervical cancer necessitates a comprehensive understanding of the underlying molecular, inflammatory, and hematological aspects to improve diagnostic and prognostic approaches. Most cervical cancers are caused by the virus Human Papillomavirus (HPV), the most common sexually transmitted infection that causes warts in various parts of the body (3). Haematological parameters are parameters that are related to the blood and blood forming organs (4). Blood act as a pathological reflector of the status of exposed patient to infections and other conditions (4). Laboratory tests on the blood are vital tools that help detect any deviation from normal in the animal or human body (4). The examination of blood allows investigating the presence of several metabolites and other constituents in the body and it plays a vital role in the physiological, nutrition and pathological status of an organism.

Blood constituents change in relation to the physiological conditions of health. Change in haematological parameters are often used to determine various status of the body and to determine stress due to environmental, nutritional and pathological factors (4). The Full Blood Count (FBC) is a group of tests ordered routinely to evaluate the health of blood cells. The FBC determines the number of White Blood Cells (WBCs), Red Blood Cells (RBCs), Haemoglobin Level, Packed Cell Volume (PCV), Platelet and platelet indices, Red Cell Indices (Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Mean Corpuscular Volume (MCV). The major functions of the white blood cell and its differentials are to fight infections, defend the body by phagocytosis against invasion by foreign organisms, and to produce or transport and distribute antibodies in immune response (5). Low platelet concentration suggests that the process of clot-formation will be prolonged, resulting in excessive loss of blood in the case of injury (5).

2. Materials and Methods

2.1 Study Design

This is a case-control study. There were two groups: Group A and Group B. Group A served as a test group, women that have been histologically confirmed positive for cervical cancer, while Group B served as a negative control, women that were histologically confirmed negative for cervical cancer.

2.2 Study Area

This research was conducted in Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Nigeria. It lies along the Bonny Stream and is located in the Niger Delta.

2.3 Study Population

Forty (40) participants between the ages of 40-70 years were enrolled for this study. Twenty (20) participants were those who were histologically diagnosed with cervical cancer, while the other 20 participants were those negative for cervical cancer in Rivers State University Teaching Hospital (RSUTH). The demography and informed consent of the study subjects were obtained using a questionnaire.

2.4 Informed Consent and Ethical Clearance

Individuals recruited as participants in this study gave informed consent before commencement of sample collection. Ethical clearance was obtained from Rivers State University Teaching Hospital Research and Ethics Committee before commencement of this study.

2.5 Eligibility Criteria

2.5.1 Inclusion Criteria

Women age 18-70 years, without other health challenges, and women who are not yet on chemotherapy treatment, and who did not decline to give consent were included in this study**.**

2.5.2 Exclusion Criteria

Women 18 years below and above 70 years of age with other health challenges, women who were

already on chemotherapy treatment, women who declined to give consent were excluded from this study.

2.6 Sample Collection, Processing and Preservation

A rubber tourniquet was applied for one minute, and the site was punctured and disinfected with 70% methylated spirit. With the use of a vacutainer, 3mls of whole blood was taken from each patient by standard method of phlebotomy into dipotassium-ethylene diamine tetra-acetic acid (k2-EDTA). The blood samples taken was immediately transported to the laboratory. The sample was properly mixed with the anticoagulant by gentle inversions, and used to analyze for haematological parameters.

2.7 Sample Analysis

Determination of Haematological Parameters

Laborex HM-500× Automated Analyser (5 parts). Platelet-lymphocyte ratio (PLR) is calculated by dividing the platelet count by the lymphocyte count from a complete blood count (CBC) test. The neutrophil-to-lymphocyte ratio (NLR) is calculated by dividing the absolute neutrophil count by the absolute lymphocyte count from a complete blood count (CBC) test. Similar to NLR (Neutrophil-to-Lymphocyte Ratio) and PLR (Platelet-to-Lymphocyte Ratio), MLR is calculated using blood cell counts obtained from a complete blood count (CBC) test. Specifically, it is calculated by dividing the absolute monocyte count by the absolute lymphocyte count.

2.8 Statistical Analysis

The Graph-Pad Prism 8.0.2.263 version statistical package was used to obtain the mean and standard deviation of the study groups. The student t-test was used to determine the statistical difference between two means. Analysis of variance (ANOVA) was used for different groups,and Pearson correlation was used for the correlation study. The level of significance was set at $P<0.05$. Results were presented as mean ± standard deviation (m±SD) in Tables.

3. Results

3.1 Demographic Characteristics of the Study Population

A total of forty (40) participants were recruited for this study: twenty (20) histologically diagnosed cervical cancer patients and twenty (20) normal controls. Both groups reproductive age was within the range of 40 to 70. Details of the demographic characteristics of the study population are shown in Table 1.

Table 1 Demographic Characteristics of the Study Population

Participants (N=40)	Cervical cancer Group (N=20)	Control Group (N=20)
Number of Squamous cell carcinoma (SCC)	20	0
Age Range		
40-50years	6	7
51-60years	11	9
61-70years	3	4
Marital Status		
(Married)	16	20
(Widow)	4	
Occupation		
(Unemployed)	9	4
(Self Employed)	7	8
(Employed)	4	8
BMI		
<18.4 (Under weight)	0	0
18.5-24.9 (Healthy weight)	0	5
25.0-29.9 (Overweight)	7	7
>30.0 (Obesity)	13	8

3.2 Comparison of Haematological Parameters in Cervical Cancer Subjects and Control Subjects

There was a statistically significant increase in white blood cell (WBC), platelet distribution width (PDW), neutrophil to lymphocyte ratio (NLR) and monocyte lymphocyte ratio (MLR) in cervical cancer patients. Also, significant statistical decrease was observed in red blood cell (RBC), haemoglobin concentration, packed cell volume and percentage monocyte in cervical cancer patients, when compared with control subjects. Other parameters recorded no statistical significance. Details are shown in table 2.

Table 2: Comparison of Mean($\bar{x}$) ± Standard Deviation of Haematological Parameters in Cervical Cancer Subjects and Control Subjects

Parameters (Units)	Cerv ($\bar{x}$ ± SD) N = 20	Control ($\bar{x}$ ± SD) N = 20	p-value	Remark
WBC ($x10^9$)	6.0 ± 2.2	4.8 ± 1.2	0.0372	S
Neutrophils (%)	56.7 ± 15.3	55.5 ± 9.4	0.7724	NS
Lymphocytes (%)	27.1 ± 14.7	35.3 ± 13.8	0.0768	NS
Eosinophils (%)	3.7 ± 1.8	5.0 ± 3.4	0.1641	NS
Monocytes (%)	8.2 ± 1.6	11.0 ± 3.2	0.0010	S
Basophils (%)	0.0 ± 0.0	0.0 ± 0.0	0.1544	NS
RBC ($x10^{12}$)	2.8 ± 0.6	4.5 ± 0.5	<0.0001	S
HB (g/dl)	7.9 ± 1.2	11.9 ± 1.4	<0.0001	S
PCV (%)	23.0 ± 3.8	35.1 ± 4.3	<0.0001	S
MCV (fl)	80.6 ± 7.9	80.8 ± 7.0	0.9333	NS
MCH (pg)	27.9 ± 3.3	28.0 ± 3.2	0.9199	NS
MCHC (g/dl)	34.6 ± 1.2	34.8 ± 1.6	0.6428	NS
Platelets ($x10^9$)	195.8 ± 96.8	242.8 ± 65.2	0.0797	NS
PDW (fL)	18.3 ± 4.1	15.7 ± 3.9	0.0489	S
MPV (fL)	10.4 ± 1.0	10.0 ± 1.1	0.2541	NS
PCT (ml/l)	2.0 ± 1.0	2.4 ± 0.6	0.1924	NS
NLR	3.7 ± 3.5	1.9 ± 0.8	0.0285	S
MLR	0.5 ± 0.2	0.2 ± 0.1	0.0001	S
PLR	132.7 ± 107.0	166.6 ± 57.9	0.2194	NS

Key: Cerv = Cervical Cancer; $\bar{x}$ = Mean; SD = Standard Deviation; S = Significant; NS = Non-Significant; WBC=White Blood Cell; RBC =Red Blood Cell; HB =Haemoglobin Concentration; PCV=Packed Cell Volume; MCV=Mean Cell Volume; MCH= Mean Cell Haemoglobin; MCHC =Mean Cell Haemoglobin Concentration; MPV=Mean Platelet Volume; PDW=Platelet Distribution Width; PCT=Plateletcrit; NLR=Neutrophil to Lymphocyte ratio; MLR=Monocyte to Lymphocyte Ratio; PLR =Platelet to Lymphocyte Ratio.

4.1 DISCUSSION

The results of this study showed that the majority of cervical cancer patients were between the ages of 51-60 years, similar result was recorded by (6) who reported that the median age of cervical cancer patients was 51 years and (7) who also recorded that majority of the cervical cancer subjects were within the ages of 51-60 years,this finding is also consistent with the work of (8) who reported that 70% of cervical cancer in Nigeria was seen between 26-50 years. This could be as a result of the fact that women within this age range are of child bearing age and are already sexually active. The study recorded no statistically significant difference in the mean ±SD between the test and control groups of neutrophil, lymphocyte, eosinophil, basophil, mean cell volume (MCV) mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC), platelets, mean platelet volume (MPV), plateletcrit (PCT), platelet to lymphocyte ratio (PLR). This finding is in contrast with the work of (6); (7), who recorded that platelet, neutrophil, and PLR were significantly increased, and lymphocyte was significantly decreased compared with the controls. The present study showed statistically significant increase in white blood cell (WBC) platelet distribution width (PDW) ($p = 0.0489$), neutrophil to lymphocyte ratio (NLR) and monocyte to lymphocyte ratio (MLR) in cervical cancer patients. This could be attributed to increased suppression and inflammation of the immune system caused by cervical cancer disease which is in support of the study carried out by (9); (10) on cervical cancer patient, they discovered that there was a statistically significant increase of WBC count between the test group as against the control. Also, (6) reported that median values of NLR and MLR were higher in cervical cancer patients compared with controls. Platelet distribution width (PDW) reflects the variation in the size of platelets, inflammation leads to higher platelet production and increased PDW. This agrees with previous work of that stated that when platelets are excessively consumed,the bone marrow produces large number of immature platelets, which have larger volumes than the mature platelets. There was also a significant statistical decrease observed in red blood cell (RBC), haemoglobin concentration (HB), packed cell volume (PCV) and monocyte in cervical cancer patients, when compared with control subjects. Findings from the present study is run parallel to a previous study by (6) which indicated a significant decrease in the RBCs count, hemoglobin concentration and packed cell volume compared with the control subjects. This study is in support of the previous work of (11). It is also in support of the work by (7) who discovered that the mean packed cell volume, haemoglobin concentration and red blood cell valuewere significantly lower among cervical cancer patients compared to the healthy subjects.This study indicates that patients with carcinoma of the cervix have severe degree of anaemia, this could be due to haemorrhage associated with iron deficiency, tumor bleeding, as most times the women experience contact bleeding during sexual intercourse.

5.1 Conclusion

Cervical cancer has a significant impact on some haematological blood parameters. There is alteration in haematological parameters of cervical cancer subjects. This study showed that haemoglobin concentration and packed cell volume are both prognostic factors for the management and survival of cervical cancer patients.

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