Original Research Article

EFFECTS OF VITAMIN C AND E ON SOME RED BLOOD CELL PARAMETERS OF MALE UNDERGRADUATE ASTHMATIC AND SMOKERS OF UNIVERSITY OF PORTHARCOURT

ABSTRACT.

Antioxidant is a substance that protects cells from the damage caused by free radicals (unstable molecules made by the process of oxidation during normal metabolism). Vitamin C and E are examples of antioxidants. This study was aimed at investigating the effect of VitaminC and E on some Red blood cell parameters using 35 Subjects. Which were grouped into 7 groups. (Group A- Negative control, Group B- positive control administered with Vitamin E, Group C- Asthmatic subjects administered with Vitamin C, Group D-Smokers subjects administered with Vitamin E.) Subjects in group B, C and D were orally administered with 1000IU of Vitamin E once daily for 28days. Subjects in group B, C served as the positive control that were administered Vitamin C and Vitamin E once daily for 28 days while group A served as negative control without any administration of vitamins. Blood samples were taken on the 8th, 15th, 22nd and 29th day of administration through the venal puncture. The result of the study showed that Vitamin C and E was unable to attenuate the effects of Asthma on Red blood cell parameters such as Red blood cell count, hematocit and Heamoglobin concentration as the value of $p>0.05$ In both male and female subjects, However Vitamin E though did not proof to improve Red blood cell count and other parameters, Vitamin E was able to decrease the Red blood cell distribution width, the value of $p<0.05$ which signifies that Vitamin E intake in asthmatic subjects is capable of maintaining the shape and sizes of Red blood cells in male subjects

1. INTRODUCTION

The lung is constantly exposed to higher oxygen concentrations than any hydrogen peroxide due to its huge surface area. As a result, the lung's exposure to free radicals is crucial. The burden of free radicals results from oxidative metabolism within cells, which produces oxygen species. Inhaled radicals (reactive oxygen species (ROS), nitrogen dioxide, and tobacco smoke), non-radicals (ozone), and other hazardous particles including oxides of nitrogen and sulfur further accelerate this in the lung. Many lung illnesses, including asthma and bronchopulmonary dysplasia, are largely caused by oxidants (Barnes, 2009). Patients with asthma have been found

to have markedly elevated serum levels of immunoglobin E (IgE), the antibody that is responsible for the immediate kind of immunological response (Ishizaka and Johansson, 2019).

The lungs do not just suffer from an oxidative attack. Instead, they are well-equipped with antioxidant defense mechanisms. Antioxidant enzymes, superoxide dismutase (SOD), glutathione peroxidase (GPx), expiratory maneuver during pulmonary function, and catalase (CAT) are some of the main processes. SOD is essential for defending tissues and cells from oxidative stress (Shanmugasundaram, Kumar, &Rajajee, 2001). The catalase and glutathione redox cycles work together to scavenge hydrogen peroxide and alkyl hydroperoxides, respectively. Significant information on oxidative stress can be learned from measuring these antioxidant defenses in the blood.

Asthma is a major public health problem in the world. The disease affects approximately 20.3 million people, nearly 6.3 million of whom are under the age of 18 years [1]. It accounts for an estimated 14.5 million lost workdays for adults and 14 million lost school days in children annually. The collective cost of the disease is estimated at $14.0 billion for the year 2002. The Environmental Protection Agency estimates that every year in the United States, 200,000 to a million children's asthma is made worse by secondhand smoke. Additionally, it is thought to be the cause of 8,000–26,000 new cases of asthma in children each year in the United States. A 1996 meta-analysis by DiFranza and Lew found that household smoking is linked to an increased prevalence of asthma, accounting for between 307,000 and 522,000 cases among children under the age of 15, and that secondhand smoke aggravates asthma already present, leading to about 0.5 million pediatric doctor visits annually [2].

According to some reports, the severity and course of asthma can alter blood cell lineages. Eosinophilia, neutrophilia, leukocytosis, and an elevated erythrocyte sedimentation rate are

common hematological abnormalities seen during asthma. Additionally, smoking has been proven to be one of the biggest causes of death worldwide. Smoking affects haematological markers both acutely and chronically. [3]. Hence this study sort to investigate the effect of vitamin C and vitamin E on red blood cell parameters of male asthmatic and smokers in University of Port Harcourt.

2. Materials and Methods

The study used a description cross sectional method. A total of 35 male/ subjects were recruited for the study. The 35 subjects include 35 were selected from the University of Port Harcourt according to the following categories:

Group 1 - Consist of 5 apparently healthy subject (male and female) used as normal control group and were not administered with any drug, they hit the period of the experiment. Group2 consist of 5 apparently healthy subject male and female which were administered with Vitamin C only, Group 3 5 apparently healthy control subjects administered with Vitamin E, Group4 consist of 5 asthmatic subjects administered with vitamin C, Group 5 consists 5 asthmatic subjects administered with Vit. E, Group 6 consists of 5 male smokers administered with vitamin C, while Group7 consist of 5 smokers (male administered with vitamin E

Prior to the start of the experiment, approval was send and gotten from the university of Port Harcourt research ethical committee. All participating subjects were send within the campus with appropriate sensitization of the research procedures and voluntarily gave their informed consent. Inclusion criteria for control group was subjects who were not on any form of drugs or tariffing. Currently on any disease condition. Asthmatic patients were recruited on the e base, that they

have not underlying treatment of any other health challenges. While smokers were selected on the base of duration of smoking with a minimum of 1 year smoking experience. Anthropometric parameters such as (Age, height, weight, BMI, systolic and diastolic blood pressure were measured at the beginning of the study.

1000mg of vitamin C and E respectively were administered daily for 28 days. Blood samples were collected from the cubital vein and transferred to EDTA bottle for haematological analysis using auto haematology analyses. Data obtained from the study were subject of statistical analysis using SPSS version 23 statistical significant was determined using one way analysis of variance followed by post hoc multiple comparism test and $p<0.05$ was considered statistically significant, the values were expressed as mean ± standard deviation

RESULTS

List 1.0: Anthropometric Parameters of Male Subjects

Groups	Age (years)	Height (m)	Weight (Kg)	BMI (Kg/m^2)	SBP (mmHg)	DBP (mmHg)	MAP (mmHg)
Group 1: Negative control (n=5)	21.00 ± 3.94 (18.00-27.00)	1.72 ± 0.12 (1.56-1.90)	77.60 ± 21.52 (58.00-113.00)	25.97 ± 5.57 (20.55-32.05)	118.00 ± 4.47 (110.00-120.00)	75.00 ± 8.66 (60.00-80.00)	89.33 ± 5.96 (80.00-93.33)
Group 2: PCVC (n=5)	23.00 ± 1.41 (22.00-25.00)	1.79 ± 0.03 (1.75-1.83)	68.20 ± 7.72 (60.00-78.00)	21.25 ± 3.02 (17.91-25.47)	116.00 ± 5.48 (110.00-120.00)	84.00 ± 6.52 (80.00-95.00)	94.66 ± 5.05 (90.00-103.33)
Group 3: PCVE (n=5)	23.50 ± 2.88 (20.00-27.00)	1.77 ± 0.10 (1.66-1.87)	72.75 ± 5.91 (64.00-77.00)	23.32 ± 3.83 (18.90-27.22)	115.00 ± 5.77 (110.00-120.00)	73.75 ± 9.46 (60.00-80.00)	87.50 ± 7.87 (76.67 ± 93.33)
Group 4: ASVC (n=5)	26.00 ± 2.83 [a] (24.00-28.00)	1.65 ± 0.06 (1.61-1.70)	68.00 ± 11.31 (60.00-76.00)	24.72 ± 2.23 (23.15-26.30)	112.00 ± 2.83 (110.00-114.00)	82.50 ± 3.53 (80.00-85.00)	92.33 ± 3.30 (90.00 ± 94.67)
Group 5: ASVE (n=5)	22.00 ± 0.00 (22.00-22.00)	1.75 ± 0.00 (1.75-1.75)	68.00 ± 0.00 (68.00-68.00)	22.20 ± 0.00 (22.20-22.20)	120.00 ± 0.00 (120.00-120.00)	80.00 ± 0.00 (80.00-80.00)	93.33 ± 0.00 (93.33-93.33)
Group 6: SVC (n=5)	22.80 ± 0.45 (22.00-23.00)	1.81 ± 0.09 [d] (1.69-1.92)	74.20 ±10.08 (60.00-85.00)	22.45 ± 2.17 (21.01-26.23)	134.00 ± 28.81 (110.00-180.00)	85.60 ± 15.39 (70.00-110.00)	101.73 ± 19.62 (83.33-133.33)
Group 7: SVE (n=5)	23.66 ± 3.78 (19.00-30.00)	1.72 ± 0.08 (1.60-1.82)	73.66 ± 13.21 (62.00-91.00)	25.11 ± 5.63 (19.97-35.15)	126.66 ± 10.33 (120.00-140.00)	87.16 ± 9.17 [c] (78.00-100.00)	100.33 ± 8.78 (92.00-113.33)

Values represent mean ± SD. The values in parenthesis indicate minimum and maximum limits of the respective variables. [a] Significant at $p<0.05$ when compared to Group 1; [b] Significant at $p<0.05$ when compared to group 2; [c] Significant at $p<0.05$ when compared to group 3; [d] Significant at $p<0.05$ when compared to group 4; [e] Significant at $p<0.05$ when compared to group 5; [f] Significant at $p<0.05$ when compared to group 6. BMI= Body Mass Index; SBP= Systolic Blood Pressure; DBP=Diastolic Blood Pressure; MAP=Mean Arterial Pressure

The data in table 1 shows the anthropometric parameters of male subjects used in this study. The age of the study subjects ranges between 21-26 years. Considering the mean age of group 4 (ASVC) in respect to the mean age of group 1, the mean age was significantly higher than group 1 thus, $p< 0.05$.

Considering the changes in the height of the respective study groups there were generally non-significant changes when the height of the groups were compared except from group 6 that showed significantly higher mean height when compared to group 4.

The weight of the respective subjects varied from 68-77kg. However, there was no statistical significance when compared among the groups thus $p> 0.05$.

Considering the BMI and SBP, there was no statistical significance when compared between their groups. The DBP of group 7 (SVE) was significantly higher when compared to group 3 (PCVE). There was also no statistical significance of the study MAP when compared between the groups thus $p> 0.05$.

Table 1: Investigation of weekly changes in some Red blood cell parameters of Group 1 (negative control) male subjects in Port Harcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 (n=5)	5.56± 0.29	13.76±2.29	47.40±5.02	85.30±6.78	24.64±3.53	28.84±2.11	47.90 ± 1.93	15.50± 1.13
8 (n=5)	4.90±0.10 [a, b]	12.65±2.61	38.45±5.30	78.40±9.05	25.70±4.81	32.70±2.26	43.80 ± 4.52	15.45 ± 3.04
15 (n=5)	3.59±0.25 [a, b]	12.50±3.53	27.85±5.87 [a]	77.30±10.75	34.50±7.35	44.45±3.32 [a, b]	42.75 ± 3.04 [a]	15.15 ± 2.76
22 (n=5)	3.01±0.05 [a, b, c]	11.70±3.39	22.80±3.67 [a, b]	75.8±10.61	44.50±2.40 [a, b]	50.75±6.72 [a, b]	37.40 ± 1.55 [a, b]	13.50 ± 1.98
29 (n=5)	2.74±0.08 [a, b, c]	12.25±2.89	20.45±3.75 [a, b]	74.60±11.17	44.50±9.19 [a, b]	59.60±3.25 [a, b, c, d]	40.60 ± 2.97 [a]	14.95 ± 2.90

Values represent mean ± SD, [a] Significant at $p<0.05$ when compared to Group 1; [b] Significant at $p<0.05$ when compared to group 2; [c] Significant at $p<0.05$ when compared to group 3; [d] Significant at $p<0.05$ when compared to group 4.

The result in table above indicates the investigation of possible weekly changes in some red blood cell parameters among group 1(Negative control) male subjects in port harcourt. The total red blood cell at day 8 was significantly lower than day 0 when compared, day 15 was significantly lower than day 0 and 8, day 22 and 29 was significantly lower than day 0, 8 and 15 when compared.But generally the total red blood cell of group 1 male subjects decreased from day 0 - 29.The haemoglobin generally showed no statistical significance when compared among the days but decreased from day 0 - 22 and then increased on day 29.The haematocrit at day 15 of group 1 male subjects was significantly lower than day 0, day 22 and 29 was significantly lower than day 0 and 8 however, the haemoglobin decreased serially from day 0 - 29.The mean corpuscular volume was generally non-significant when compared among the groups but decreased serially from day 0 - 29.The mean corpuscular haemoglobin of group 1 male subjects at day 22 and 29 was significantly higher when compared to day 0 and 8. Generally the mean corpuscular haemoglobin increased serially from day 0-29. The mean corpuscular haemoglobin concentration of group 1 male subjects at day 15 and 22 was significantly higher than day 0 and 8, day 29 was significantly higher than day 0,8,15 and 22. Generally the haemoglobin increased serially from day 0-29.The RDW-SD at day 15 and 29 was significantly lower than day 0, day 22 was significantly lower than day 0 and 8.

Table 2: A Investigation of possible weekly changes in some Red blood cell parameters of Group 2 (positive control vitamin C) male subjects in Port Harcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 (n=5)	2.48 ± 0.23	13.80 ± 1.64	41.50 ± 4.99	86.48 ± 2.79	28.74 ± 2.26	33.30 ± 2.76	42.08 ± 3.56	13.44 ± 0.83
8 (n=5)	2.76 ± 0.53 a, b	14.54 ± 1.11	30.76 ± 1.79 [a]	85.88 ± 1.69	40.48 ± 4.22	47.91 ± 15.21	43.18 ± 3.50	13.92 ± 0.98
15 (n=5)	2.83 ± 0.51 a, b	15.88 ± 3.79	23.32 ± 4.63 [a, b]	82.46 ± 1.93 [a]	59.86 ±19.31 [a, b]	68.64 ± 21.22 [a, b]	41.06 ± 2.75	13.07 ± 0.76
22 (n=5)	3.59 ± 0.18 a	14.76 ± 0.96	22.94 ± 4.79 [a, b]	83.00 ± 4.25	54.64 ± 6.01 [a, b]	65.88 ± 9.68 [a, b]	42.74 ± 3.36	14.12 ± 0.63
29 (n=4)	4.79 ± 0.49ab	14.25 ± 0.60	20.12 ± 2.23 [a, b]	80.82 ± 1.95 [a, b]	57.82 ± 7.03 [a, b]	73.57 ± 10.52 [a, b]	38.47 ± 3.01 [b]	12.82 ± 0.74 [d]

Values represent mean ± SD, [a] Significant at p<0.05 when compared to Group 1; [b] Significant at p<0.05 when compared to group 2; [c] Significant at p<0.05 when compared to group 3; [d] Significant at p<0.05 when compared to group 4.

The result in table 2 indicates the investigation of possible weekly changes in some red blood cell parameters among group 2 (positive control vitamin C) male subjects in port harcourt. The total red blood cell count at day 8 was significantly lower than day 0 when compared, day 15, 22 and 29 was significantly lower than day 0 and 8 when compared. Generally, the haemoglobin decreased serially from day 0-29.

The haemoglobin showed no statistical significance.

The haematocrit at day 8 was significantly lower than day 0, day 15, 22 and 29 were significantly lower than day 0 and 8. Generally the haematocrit decreased from 0-29.

The mean corpuscular volume at day 15 was significantly lower when compared to day 0, day 29 was significantly lower when compared to day 0 and 8. Generally the MCV from day 0-29.

The mean corpuscular haemoglobin at day 15, 22 and 29 was significantly higher than day 0 and 8 when compared.

The mean corpuscular haemoglobin concentration at day 15, 22 and 29 was significantly higher than day 0 and 8 when compared.

The RDW-SD at 29 was significantly lower than day 8 when compared.

The RDW-CDP at day 29 was significantly lower than day 22 when compared.

Table 3: Investigation of possible weekly changes in some Red blood cell parameters of Group 3 (positive control vitamin E) male subjects in Port Harcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 n=5	4.87 ± 0.15	13.57 ± 1.00	45.42 ± 2.48	93.32 ± 2.52	27.82 ± 1.45	29.82 ± 0.91	41.67 ± 2.15	12.37 ± 1.02
8 n=5	4.36 ± 0.41	14.42 ± 0.78	39.80 ± 3.92	91.30 ± 2.17	33.20 ± 3.51	36.40 ± 3.57 [a]	42.20 ± 2.05	12.82 ± 0.93
15 n=5	3.46 ± 0.39	14.07 ± 0.73	31.20 ± 3.47	90.17± 2.47	40.87 ± 4.36 [a]	45.40 ± 4.28 [a, b]	41.12 ± 2.01	12.62 ± 0.79
22 n=5	6.28 ± 5.81	16.05 ± 3.39	43.50 ± 28.98	83.15 ± 14.37	52.87 ± 12.36 [a, b, c]	47.90 ± 5.16 [a, b]	34.57 ,± 14.47	12.70 ± 0.24
29 n=5	2.51 ± 0.17	14.47 ± 0.75	21.67 ± 1.74 [a, d]	86.35 ± 2.98	57.92 ± 5.34 [a, b, c]	66.97 ± 5.75 [a, b, c, d]	40.07 ± 3.66	12.90 ± 1.29

Values represent mean ± SD, [a] Significant at $p<0.05$ when compared to Group 1; [b] Significant at $p<0.05$ when compared to group 2; [c] Significant at $p<0.05$ when compared to group 3; [d] Significant at $p<0.05$ when compared to group 4.

The result in table 3 indicates the investigation of possible weekly changes among group 3 (positive control vitamin E) male subjects in port harcourt. The total red blood cell count, haemoglobin, mean corpuscular volume, RDW -SD and CDP generally showed no significance when compared among the weeks.

The haematocrit at day 29 was significantly lower when compared to day 0 and 22.

The mean corpuscular haemoglobin at day 15 was significantly higher than day 0 when compared, day 22 and 29 was significantly higher than day 0, 8 and 15.

The mean corpuscular haemoglobin concentration at day 8 was significantly higher than day 0 when compared, day 15 and 22 was significantly higher than 0 and 8, day 29 was significantly higher than day 0, 8, 15 and 22 when compared. Generally, the mean corpuscular haemoglobin concentration increased serially from day 0-29.

Table 4: Investigation of possible weekly changes in some Red blood cell parameters of Group 4 (asthmatic vitamin C) male subjects in Port Harcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 n=5	5.01 ± 0.83	14.70 ± 2.54	45.20 ± 10.89	89.80 ± 6.79	29.25 ± 0.21	32.75 ± 2.33	45.95 ± 4.59	14.15 ± 0.35
8 n=5	4.52 ± 1.21	14.15 ± 1.90	40.70 ± 13.72	89.10 ± 6.50	31.80 ± 4.24	35.95 ± 7.42	45.95 ± 4.59	14.25 ± 0.35
15 n=5	2.72 ± 0.51 [a]	14.90 ± 0.85	23.00 ± 6.36	83.95 ± 7.56	55.30 ± 7.35 [a, b]	66.75 ± 14.78 [a, b]	41.70 ± 4.52	13.65 ± 0.35
22 n=5	3.04 ± 0.56 [a]	14.30 ± 2.83	26.05 ± 6.86	85.25 ± 6.86	46.90 ± 0.56 [a, b]	55.35 ± 3.75 [a]	39.70 ± 4.81	12.70 ± 0.56
29 n=5	2.38 ± 0.11 [a, b]	14.65 ± 1.48	19.65 ± 0.21 [a]	82.90 ± 4.81	61.70 ± 9.19 [a, b, d]	74.45 ± 6.72 [a, b]	40.85 ± 5.72	13.45 ± 1.34

Values represent mean ± SD, [a] Significant at p<0.05 when compared to Group 1; [b] Significant at p<0.05 when compared to group 2; [c] Significant at p<0.05 when compared to group 3; [d] Significant at p<0.05 when compared to group 4.

The result in table 4 indicates the investigation of possible weekly changes among group 4 (asthmatic vitamin C) males subjects in port harcourt. The total red blood cell count at day 15 and 22 were significantly lower than day 0 when compared, day 29 was significantly lower than day 0 and 8.

The haemoglobin, mean corpuscular volume, RDW-SD and RDW-CDP generally was non-significant when compared among the weeks.

The haematocrit at day 29 was significantly lower than day 0 when compared.

The mean corpuscular haemoglobin at day 22 and 29 was significantly higher than day 0 and 8, at day 29 , the haematocrit was significantly higher than day 0. 8 and 22.

The mean corpuscular haemoglobin concentration at day 15 and 29 was significantly higher than day 0 and 8, at day 22 the haemoglobin was significantly higher than day 0. Generally some of the parameters decreased while some increased but at day 22 there were general changes among the parameters where some increased(mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration), day 22 decreased, where some decreased (red blood cell count, haematocrit and mean corpuscular volume) day 22 increased

Table 5: Investigation of possible weekly changes in some Red blood cell parameters of Group 5 (asthmatic vitamin E) male subjects in Port Harcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 n=5	5.57 ± 0.63	14.40 ± 0.42	48.65 ± 1.20	95.75 ± 1.34	27.50 ± 0.00	28.70 ± 0.42	64.40 ± 0.42	18.80 ± 0.57
8 n=5	5.05 ± 0.21	15.30 ± 0.42	45.85 ± 0.35 [a]	93.50 ± 0.42	30.90 ± 0.42 [a]	33.00 ±0.28 [a]	43.05 ± 0.49 [a]	13.10 ± 0.56 [a]
15 n=5	3.41 ± 0.39 [a, b]	14.80 ± 0.42	13.55 ± 0.35 [a, b]	91.05 ± 0.92 [a]	39.90 ± 0.99 [a, b]	42.90 ± 0.84 [a, b]	43.10 ± 0.56 [a]	13.90 ± 1.13 [a]
22 n=5	2.73 ± 0.80 [a, b]	14.50 ± 0.71	24.15 ± 0.49 [a, b, c]	87.05 ± 1.20 [a, b, c]	53.45 ± 0.35 [a, b, c]	60.25 ± 1.34 [a, b, c]	40.15 ± 0.64 [a, b, c]	12..55 ± 0.35 [a]
29 n=5	2.43 ± 0.12 [a, b, c]	14.45 ± 0.49	18.55 ± 0.35 [a, b, c, d]	78.65 ± 0.64 [a, b, c, d]	59.10 ± 1.27 [a, b, c, d]	77.50 ± 0.71 [a, b, c, d]	36.70 ±.0.56 [a, b, c, d]	13.15 ± 0.64 [a]

Values represent mean ± SD, [a] Significant at $p<0.05$ when compared to Group 1; [b] Significant at $p<0.05$ when compared to group 2; [c] Significant at $p<0.05$ when compared to group 3; [d] Significant at $p<0.05$ when compared to group 4.

The result in table 5 indicates the investigation of possible wily changes in some red blood cell parameters among group 5 (asthmatic vitamin E) male subjects in Port Harcourt. The total red blood cell count at day 15 and 22 was significantly lower than day 0 and 8, day 29 was significantly lower than day 0, 8, and 15. Thus, > 0.05. Generally the total red blood cell count from day 0 to 29 decreased serially. The haemoglobin from day 0-29 was generally non-significant when compared among the weeks.The haematocrit at day 8 was significantly lower than day 0, day 15 was significantly lower than day 0 and 8, day 22 was significantly lower than day 0, 8 and 22, day 29 was significantly lower than day 0,8,15 and 22.

The mean corpuscular volume at day 15 was significantly lower than day 0, day 22 was significantly lower than day 0, 8, 15 when compared, day 29 was significantly lower than day 0, 8, 15 and 22 when compared. Generally, the mean corpuscular volume decreased from day 0-29 serially. The mean corpuscular haemoglobin at day 8 was significantly higher than 0, day 15 was significantly higher than day 0 and 8 when compared, day 22 was significantly higher than day 0, 8 and 15, day 29 was significantly higher than day 0, 8,15 and 22 when compared. Generally, the mean corpuscular haemoglobin increased serially from day 0-29 following the administration of vitamin E on asthmatic male subjects. The mean corpuscular haemoglobin concentration at day 8 was significantly higher than day 0, day 15 was significantly higher than day 0 and 8, day 22 was significantly higher than day 0,8 and 15, day 29 was significantly higher than day 0,8,15 and 22 when compared. Generally, the mean corpuscular haemoglobin concentration increased serially from day 0-29 following the administration of vitamin E on asthmatic male subjects.

The RDW-SD at day 8 and 15 was significantly lower than day 0, day 22 was significantly lower than day 0,8 and 15, day 29 was significantly lower than day 0,8,15 and 22 when compared.The RDW-CDP at day 0,15,22 and 29 was significantly lower than day 0

Table 6: Investigation of possible weekly changes in some Red blood cell parameters of Group 6 (smoker vitamin C) male subjects in Port Harcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 n=5	4.96 ± 0.68	15.00 ± 0.99	45.08 ± 5.48	91.18 ± 4.35	30.78 ± 5.87	33.80 ± 6.34	42.72 ± 2.61	13.02 ± 1.17
8 n=5	4.03 ± 0.55 [a]	15.14 ± 1.18	36.52 ± 4.97 [a]	90.84 ± 4.45	38.12 ± 6.44 [a]	42.08 ± 6.98 [a]	41.04 ±2.77	12.54 ± 1.19
15 n=5	3.15 ± 0.20 [a, b]	14.72 ± 0.74	28.46 ± 2.18 [a, b]	88.78 ±3.97	45.94 ±3.38 [a, b]	51.80 ± 3.07 [a, b]	40.18 ± 3.18	12.56 ± 1.18
22 n=5	2.68 ± 0.31 [a, b]	20.48 ± 13.44	23.20 ± 2.26 [a, b, c]	86.78 ±3.34	54.34 ±5.34 [a, b, c]	62.76 ± 5.57 [a, b, c]	40.60 ± 4.26	13.46 ± 0.96
29 n=5	2.20 ± 0.24 [a, b, c]	13.72 ± 1.19	18.48 ± 2.01 [a, b, c]	84.44 ± 4.00 [a, b]	64.78 ± 4.52 [a, b, c, d]	74.54 ± 6.27 [a, b, c, d]	40.28 ± 4.29	13.12 ± 1.00

Values represent mean ± SD, [a] Significant at $p<0.05$ when compared to Group 1; [b] Significant at $p<0.05$ when compared to group 2; [c] Significant at $p<0.05$ when compared to group 3; [d] Significant at $p<0.05$ when compared to group 4.

The result in table 6 indicates the investigation of possible weekly changes in some red blood cell parameters of group 6 (smoker vitamin C) male subjects in Port Harcourt. The total red blood cell count at day 8 was significantly lower than day 0, day 15 and 22 was significantly lower than day 0 and 8 when compared, day 29 was significantly lower than day 0, 8 and 15. Generally the total red blood cell count decreased from day 0-29.

The haemoglobin, RDW-SD and RDW-CDP generally showed no significance when compared among the weeks.

The haematocrit at day 8 was significantly lower than day 0, day 15 was significantly lower than day 0 and 8, day 22 and 29 was significantly lower than day 0,8 and 15. Generally the haematocrit decreased from day 0-29.

The mean corpuscular volume at day 29 was significantly lower than day 0 and 8 $p > 0.05$. Generally, the mean corpuscular volume decreased from day 0-29.

The mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration at day 8 was significantly higher than day 0, day 15 was significantly higher than day 0 and 8, day 22 was significantly higher than day 0,8 and 15, day 29 was significantly higher than day 0, 8, 15 and 22 when compared. Generally, both the mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration were increasing serially from day 0- 29.

Table 7: Investigation of possible weekly changes in some Red blood cell parameters of Group 7 (smoker vitamin E) male subjects in PortHarcourt.

Day	Red blood cell count (10^6/uL)	Hemoglobin (g/dL)	Hematocrit (%)	Mean corpuscular cell volume (fL)	Mean corpuscular cell haemoglobin (pg)	Mean corpuscular haemoglobin concentration (g/dL)	Red blood cell distribution width-standard deviation (fL)	Red blood cell distribution width-coefficient of variation (%)
0 n=5	5.66 ± 0.34	15.26 ± 0.61	50.04 ± 1.66	88.62 ± 3.45	26.92 ± 1.09	30.44 ± 0.53	46.18 ± 3.59	14.42 ± 1.08
8 n=5	4.75 ± 0.48 [a]	15.35 ± 1.08	41.71 ± 3.65 [a]	87.96 ± 3.46	32.43 ± 3.27	36.96 ± 3.87	45.74 ± 3.25	13.73 ± 1.91
15 n=5	3.03 ± 0.51 [a, b]	15.10 ± 0.63	25.62 ± 3.73 [a, b]	85.02 ± 2.69	51.00 ± 9.46 [a, b]	59.98 ± 9.60 [a, b]	42.74 ± 2.61	13.88 ± 0.61
22 n=5	2.67 ± 0.95 [a, b]	12.56 ± 5.92	22.72 ± 8.34 [a, b]	84.24 ± 2.13	42.76 ±12.98 [a, b]	50.30 ± 15.39 [a, b]	41.24 ± 2.57 [a, b]	13.50 ± 0.70
29 n=5	2.15 ± 0.53 [a, b, c]	13.34 ± 3.7	17.56 ± 4.08 [a, b, c]	81.44 ± 4.97 [a, b]	61.22 ± 3.56 [a, b, c, d]	75.40 ± 5.93 [a, b, c, d]	40.60 ± 2.10 [a, b]	13.70 ± 0.35

Values represent mean ± SD, [a] Significant at $p<0.05$ when compared to Group 1; [b] Significant at $p<0.05$ when compared to group 2; [c] Significant at $p<0.05$ when compared to group 3; [d] Significant at $p<0.05$ when compared to group 4.

The result in table 7 indicates the investigation of possible weekly changes in some red blood cell parameters of group 7(smoker vitamin E) male subjects in port harcourt. The total red blood cell count at day 8 was significantly lower than day 0, day 15 and 22 was significantly lower than day 0 and 8, day 29 was significantly lower than day 0,8 and 15. Generally the total red blood cell decreased serially from day 0-29.

The haemoglobin and RDW-CDP was generally non-significant.

The haematocrit at day 8 was significantly lower than day 0, day 15 and 22 was significantly lower than day 0 and 8, day 29 was significantly lower than day 0,8 and 15. Generally the haematocrit decreased serially from day 0-29.

The mean corpuscular volume at day 29 was significantly lower than day 0 and 8. Generally the mean corpuscular volume decreased serially from day 0-29.

The mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration at day 15 and 22 was significantly higher than day 0 and 8, day 29 was significantly higher than day 0,8,15 and 22 when compared.

The RDW-SD at day 15 and 22 was significantly lower than day 0 and 8. Generally, the RDW-SD decreased serially from day 0

Discussion of Findings

The results revealed that there was significant increase in mean corpuscular Heamoglobin, MCHC and MCH In male subjects administered with Vitamin C on the 8th day of the experiment, Vitamin E on the 8th day showed significant decrease in RBC count, hematocit, MCH and MCHC in Asthmatic subjects. In smokers subjects there was significant reduction in Red blood cell count, hematocit and Red blood cell distribution width in day 8, and increased MCH and MCHC.

RBC count has been reported to significantly increased as the intensity of smoking increases which was explained by the fact that tissue hypoxia caused by increased creation of carboxy hemoglobin leading to an increased secretion of erythropoietin, thereby increasing erythropoiesis [7,8].

Hemoglobin concentration is increased in group administered with Vitamin E.Some researchers hypothesized that an increase in hemoglobin levels in smokers' blood might represent a compensatory mechanism [9, 12]. The rise in hemoglobin concentration is thought to be mediated by exposure to carbon monoxide. To create carboxy hemoglobin, which is an inactive version of hemoglobin with no ability to deliver oxygen, carbon monoxide binds to hemoglobin (Hb). Additionally, carboxyhemoglobin pushes the left side of the Hb dissociation curve, which reduces Hb's capacity to carry oxygen to the tissue [15, 16]. Smokers continue to maintain a higher hemoglobin level than non-smokers in order to make up for the reduced oxygen-delivering capacity.In day 15, Asthmatic male subjects administered with Vitamin C showed no significant changes in Red blood cell parameters, however in male subjects, there was increased in MCV, MCH and MCHC, Studies have shown that mean corpuscular volume (MCV) and

mean corpuscular hemoglobin (MCH) are significantly higher among smokers [9, 10], ths shows that administration of Vitamin E and C causes no significant changes in MCV and MCh.In day 29 of the experiment, Asthmatic subjects administered with Vitamin E showed significant decrease in RBC count, heamoglobin, MCCV and Red cell Distribution width. (RDW).RDW computes as the measure of variations in the mean body volume (MCV) [13,19], higher values for RDW suggest greater variation in MCV (anisocytosis), and these is typically caused by a disruption in erythro maturing or degradation. This is because RDW computes as the mean corpuscular volume (MCV) itself. Accordingly, the current study's findings showed that Vitamin E improved red cell distribution width and smokers and asthmatic and, as such, has the ability to preserve the size and shapes of moving erythrocytes. There was an increase in MCH and MCHC in Male smokers administered with Vitamin C and E at day 29 showed significant decrease in RBC count, hematocrit and MCV while a significant increase in MCHC and MCHC.The increased MCV may reflect the presence of immature RBCs in the peripheral blood, perhaps arising from the body compensatory mechanism to cater for the smoke/asthma-induced deficit in RBC concentration [11, 19, 24].

Conclusions

The result of the study showed that Vitamin C and E was unable to attenuate the effects of Asthma on Red blood cell parameters such as Red blood cell count, hematocit and Heamoglobin concentration. In both male and female subjects, However Vitamin E though did not proof to improve Red blood cell count and other parameters was able to decrease the Red blood cell distribution width, which signifies that Vitamin E intake in asthmatic subjects is capable of maintaining the shape and sizes of Red blood cells in both male and female subjects.

References

1. Barnes P. J (2009). New concepts in the pathogenesis of bronchial hyperresponsiveness and asthma. J Allergy Clin Immunol; 83:1013-26.
2. Ishizaka K, Johansson S. G (2006). Physicochemical properties of reaginic antibody IV. Presence of an unique immunoglobin as a carrier of reaginic activity. J Immunol; 97:75–85.
3. Shanmugasundaram, K. R., Kumar, S. S., &Rajajee, S. (2001). Excessive free radical generation in the blood of children suffering from asthma.*ClinicaChimica Acta, 305(1-2), 107 114.* doi:10.1016/s0009-8981(00)00425-3.
4. Troisi, R. J., Willett, W. C., Weiss, S. T., Trichopoulos, D., Rosner, B., & Speizer, F. E. (2005). A prospective study of diet and adult-onset asthma. *American Journal of Respiratory and Critical Care Medicine, 151(5), 1401–1408.* doi:10.1164/ajrccm.151.5.7735592.
5. Vachier I, Damon M, Le Doucen C, Crastesde Paulet-A, Chanez P, Michel FB, et al (2002). Increased oxygen species generation in blood monocytes of asthma patients. Am Rev Respir Dis; 146:1161-6.
6. Rahman I, Morrison D, Donaldson K, Mac Nee W (1996). Systemic oxidative stress in asthma, COPD and smokers. Am J Respir Crit Care Med; 159:1055-60.
7. Nadia MM, Shamseldein HA, Sara AS. Effects of Cigarette and Shisha Smoking on Hematological Parameters: An analytic case-control study. *International Multispeciality Journal of Health.* 2015;1(10):44–51.

8. Verma RJ, Patel CS. Effect of smoking on Haematological parameters in Human Beings (2015). Journal of Cell and Tissue Research.;5(1):337.
9. Aitchison R, Russell N. Smoking - a major cause of polycythaemia. Journal of the Royal Society of Medicine. 1988;81(2):89–91.
10. Harel-Meir M, Sherer Y, Shoenfeld Y. Tobacco smoking and autoimmune rheumatic diseases. *Nature clinical practice Rheumatology.* 2007;3(12):707–15.
11. Lu JT, Creager MA. The relationship of cigarette smoking to peripheral arterial disease. *Reviews in cardiovascular medicine.* 2004;5(4):189–93.
12. Law MR, Morris JK, Wald NJ. Environmental tobacco smoke exposure and ischaemic heart disease: an evaluation of the evidence. *Bmj.* 1997;315(7114):973–80.
13. Messner B, Bernhard D. Smoking and cardiovascular disease: mechanisms of endothelial dysfunction and early atherogenesis. *Arteriosclerosis, thrombosis, and vascular biology.* 2014;34(3):509–15.
14. Shah RS, Cole JW. Smoking and stroke: the more you smoke the more you stroke. *Expert review of cardiovascular therapy.* 2010;8(7):917–32.
15. Jena SK, Purohit KC, Misra AK. Effect of Chrnoic Smoking on Hematological Parameteres. International Journal of Current Research. 2013;5(2):279–82.
16. Lakshmi AS, Lakshmanan A, Kumar GP, Saravanan A. Effect of Intensity of Cigarette Smoking on Haematological and Lipid Parameters. Journal of Clinical and Diagnostic Research. 2014;8(7):11–3.
17. Ishizaka K, Johansson S. G (2006). Physicochemical properties of reaginic antibody IV. Presence of an unique immunoglobin as a carrier of reaginic activity. J Immunol; 97:75–85.
18. Janoff A, Carp H, Lee P. H (2009). Cigarette smoke inhalation decreases antitrypsin activity in rat lung. Science 206:1313-1314.
19. Kelly, F.J. (2005). Vitamins and respiratory disease: antioxidant micronutrients in pulmonary health and disease. Proc. Nutr. Soc. 64, 510–526.

20. Kelly F. J, Mudway L, Blomberg A, Frew A, Sandstorm T (2009). Altered lung antioxidant status in patients with mild asthma. Lancet; 354:482-3.
21. Kharitinov S. A, Yates D, Robbins R. A, Logan-Sinclair R, Shinebourne E. A, Barnes P. J (2004). Increased nitric oxide in exhaled air of asthmatic patients. Lancet; 342:133-5
22. Kim K. B. and Lee B. M (2007). Oxidative stress to DNA, protein, and antioxidant enzymes (superoxide dismutase and catalase) in rats treated with benzo[a]pyrene, Cancer Lett. 113; 205–212.
23. Macpherson, A. (2004). Selenium, vitamin E and biological oxidation. In: Cole DJ, Garnsworthy PJ, eds. Recent Advances in Animal Nutrition. Oxford. Butterworth and Heinemann's, 3 –30
24. Machim L. I (2001). Vitamin E. In: MachIm II, ed. Handbook of vitamins. New York: Marcel Dekker: 99-144.
25. McDermoth, J.H. (2000). Antioxidant nutrients: current dietary recommendations and research update. J. Am. Pharm. Assoc. 40, 785–799.
26. McDowell, L.R. (2019). Vitamin A and E. In: Mc Dowell LR, ed. Vitamins in Animal Nutrition –Comparative Aspects to Human Nutrition. London: Academic Press: 10–52, 93–131.
27. Misso N. L. A, Brooks-Wildhaber J., Ray S., Vally H., Thompson P. J (2005). Plasma concentrations of dietary and nondietary antioxidants are low in severe asthma. European Respiratory Journal. 26: 257-264. DOI: 10.1183/09031936.05.00006705.

28. Nadeem, A, Raj, H.G, Chhabra, S. K (2008). Effect of vitamin E supplementation with standard treatment on oxidant-antioxidant status in chronic obstructive pulmonary disease. *IndianJournal of Medical Research,* 128(6): p 705-711.
29. Nadi Ebrahim, Tavakoli Farnaz, Zeraati Fatemeh, Mohamad Taghi Goodarzi and Seyed Hamid Hashemi (2012). Effect of Vitamin C Administration on Leukocyte Vitamin C Level and Severity of Bronchial Asthma. *Acta Medica Iranica*; 50(4): 233-238.
30. Niki E, Yamamoto Y, Takahashi M, et al (2008). Free-radical mediated damage of blood and its inhibition by antioxidants. J Nutr Sci Vita- minol (Tokyo): 34:507-12.
31. Pearson, P.J. et al. (2004). Vitamin E supplements in asthma: a parallel group randomised placebo -controlled trial. Thorax 59, 652–656.
32. Picado, C. et al. (2001). Dietary micronutrients/antioxidants and their relationship with bronchial asthma severity. Allergy 56, 43–49.
33. Pryor W. A (2016). The free radical chemistry of cigarette smoke and the inactivation of alpha-1protinase inhibitor. In: Mittman C, Taylor JC, eds. Emphysema and Proteolytic Damage, vol 2. New York: Academic Press.