

# Haematological Changes in Patients of Chronic Kidney Disease in Umuahia, Abia State, Nigeria



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## Abstract

Chronic kidney disease is killing many persons in this part of the world at an alarming rate. The menace caused by chronic kidney disease to our people cut across all strata of persons here. Anemia is one of the major manifestations of this disease. This study was done to determine the hematological changes in patients of chronic kidney disease in Umuahia. The study was done in a secondary hospital in Umuahia. The subjects comprised of a total of one hundred (100) subjects, 50 subjects were chronic kidney disease patients aged 50-70years (20 females and 30 males) and 50 (25 females, 25 males) subjects were apparently healthy individuals aged matched as the control. The results were presented in tables as mean and standard deviation and student t-test used for analysis and the level of significance was set at  $P < 0.05$ . The haematological investigations were done using Mindray BC-5300. The results showed significant increase ( $P < 0.05$ ) in total white blood cell, neutrophil, monocyte, eosinophil of the chronic kidney disease (CKD) of the subjects ( $6.2 \pm 0.5 \times 10^9/L$ ,  $71.0 \pm 6.1\%$ ,  $3.0 \pm 0.2\%$ ,  $2.0 \pm 0.1\%$ ) compared to the control ( $4.6 \pm 0.2 \times 10^9/L$ ,  $57.0 \pm 4.1\%$ ,  $1.0 \pm 0.1\%$ ,  $0.1 \pm 0.1\%$ ), significant decrease in lymphocytes, red blood cell, hemoglobin, packed cell volume of the chronic kidney disease subjects ( $24.0 \pm 3.6\%$ ,  $3.67 \pm 0.2 \times 10^{12}/L$ ,  $11.0 \pm 0.8g/dl$ ,  $33.0 \pm 5.2\%$ ) compared to the control ( $41.9 \pm 6.5\%$ ,  $5.11 \pm 0.4 \times 10^{12}/L$ ,  $15.3 \pm 0.5g/dl$ ,  $46.0 \pm 7.2\%$ ) and no significant difference ( $P > 0.05$ ) in mean cell volume, mean cell haemoglobin and mean cell hemoglobin concentration of the chronic kidney disease subjects ( $89.91 \pm 8.1fl$ ,  $29.91 \pm 2.3pg$ ,  $333.33 \pm 4.6g/l$ ) compared to the control ( $90.0 \pm 10.2fl$ ,  $29.94 \pm 1.5pg$ ,  $332.61 \pm 3.5g/l$ ) respectively. Chronic kidney disease (CKD) is a progressive disease that results in significant morbidity and mortality. Our study shows a significant difference in all the hematological parameters measured between our subjects and controls except MCV, MCH and MCHC. The pattern of anemia in this study was predominantly normocytic and norm chromic as reported in other studies also. With the progression of the disease, MCV, MCH and MCHC remain within normal limits. Various therapeutic options available for the anemia of CKD include red blood cell transfusions, treatment of underlying cause and use of erythropoietin.

## Introduction

Chronic Kidney Disease (CKD) has been shown as a major health problem throughout the world [1]. It has been reported to be a global public health problem, with greater burden and very high cost of care especially in developing countries like Nigeria. The exact prevalence rate of Chronic Kidney Disease in Nigeria is not known. Hospital based data in Nigeria have reported prevalence rates expressed as ratios of hospital admissions of between 1.6-8% [2]. Chronic kidney disease has been defined as either a level of glomerular filtration rate (GFR)  $< 60ml/min$  per  $1.73m^2$ , which is accompanied in most cases by signs and symptoms of uraemia, or a need for initiation of renal replacement therapy [3].

Hematological parameters are shown to be commonly affected in CKD. Of all the parameters, red cell indices are the ones commonly and severely affected. This is because as high as 90% of erythropoietin is produced in the jute glomerular apparatus of the kidney while 10% are produced in the liver and

other organs. The degree of affectation depends on the stage of renal failure [4-7]. Changes in red cell indices are associated to a number of factors aside erythropoietin productions (Figure 1). Deficiencies of iron, vitamin B12 and float as a result of nutritional insufficiency or due to increased blood loss [8] are contributory factors. Shortened red cell survival Eschbach et al. [9], hyper parathyroidism [10], mild chronic inflammation and aluminum toxicity [11,12] have also been indicated. Anemia is a consistent and severe complication of CKD [13] and its occurrence as the disease progresses is well recorded [14]. The severity of anemia increases along with the progression of the disease. Severe anemia is a common feature in Nigerians with CKD and is strongly associated with severity of CKD [15]. Published researches on hematological profiles of patients with CKD in Umuahia, Nigeria are sparse. We therefore decided to evaluate the hematological profile of our patients with chronic kidney disease pre dialysis.

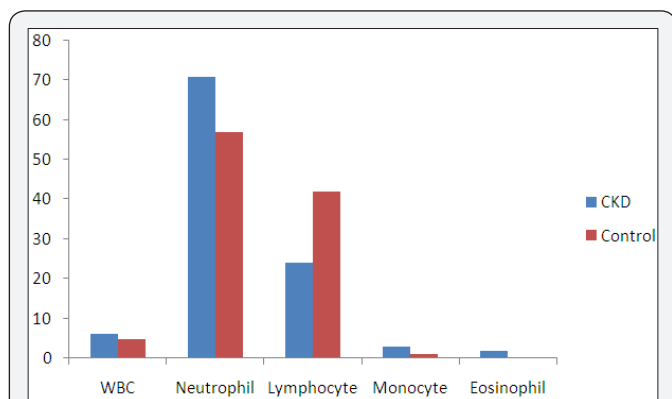


Figure 1: Showing WBC, neutrophil, lymphocyte, monocyte, eosinophil of CKD and the control.

**Aim**

The aim of the study was to determine the hematological changes in chronic kidney disease in Umuahia.

**Materials and Method**

**Study area**

The study was done in Daughters of Mary, Mother of Mercy, Ihie Ndume, Umuahia.

**Study design**

The study is a hospital based prospective cross sectional study using purposive sampling technique from May 2016 to May 2017.

**Subjects**

The subjects comprised of a total of one hundred (100) subjects, 50 subjects were chronic kidney disease patients aged 50-70years (20 females and 30 males) and 50 (25 females, 25 males) subjects were apparently healthy individuals aged matched as the control.

**Ethical consideration**

This study was performed in compliance with the guidelines of the Helsinki Declaration on biomedical research on human subjects. It was a prospective study, and confidentiality of the identity of the patients and personal health information was maintained.

**Statistical analysis**

The results were presented in tables as mean and standard deviation and student t-test used for analysis and the level of significance was set at  $P < 0.05$ .

**Haematological investigation**

The hematological investigations were done using Mind ray BC-5300. The hematological parameters investigated include, total white blood cells (WBC), neutrophils, lymphocytes, red blood cells, hemoglobin, packed cell volume (PCV), mean cell volume (MCV), mean cell hemoglobin (MCH) and mean cell hemoglobin concentration (MCHC).

**Result**

The results showed significant increase ( $P < 0.05$ ) in total white blood cell, neutrophil, monocyte, eosinophil of the chronic kidney disease (CKD) of the subjects ( $6.2 \pm 0.5 \times 10^9/L$ ,  $71.0 \pm 6.1\%$ ,  $3.0 \pm 0.2\%$ ,  $2.0 \pm 0.1\%$ ) compared to the control ( $4.6 \pm 0.2 \times 10^9/L$ ,  $57.0 \pm 4.1\%$ ,  $1.0 \pm 0.1\%$ ,  $0.1 \pm 0.1\%$ ), significant decrease in lymphocytes, red blood cell, hemoglobin, packed cell volume of the chronic kidney disease subjects ( $24.0 \pm 3.6\%$ ,  $3.67 \pm 0.2 \times 10^{12}/L$ ,  $11.0 \pm 0.8g/dl$ ,  $33.0 \pm 5.2\%$ ) compared to the control ( $41.9 \pm 6.5\%$ ,  $5.11 \pm 0.4 \times 10^{12}/L$ ,  $15.3 \pm 0.5g/dl$ ,  $46.0 \pm 7.2\%$ ) and no significant difference ( $P > 0.05$ ) in mean cell volume, mean cell haemoglobin and mean cell hemoglobin concentration of the chronic kidney disease subjects ( $89.91 \pm 8.1fl$ ,  $29.91 \pm 2.3pg$ ,  $333.33 \pm 4.6g/l$ ) compared to the control ( $90.0 \pm 10.2fl$ ,  $29.94 \pm 1.5pg$ ,  $332.61 \pm 3.5g/l$ ) respectively (Figure 2 & 3).

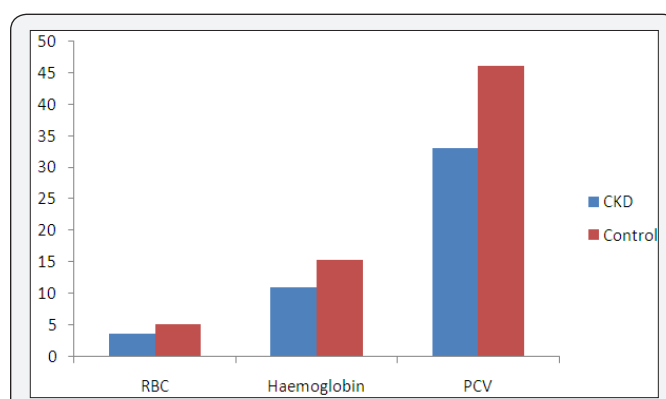


Figure 2: Showing RBC, haemoglobin and PCV of CKD and the control subjects.

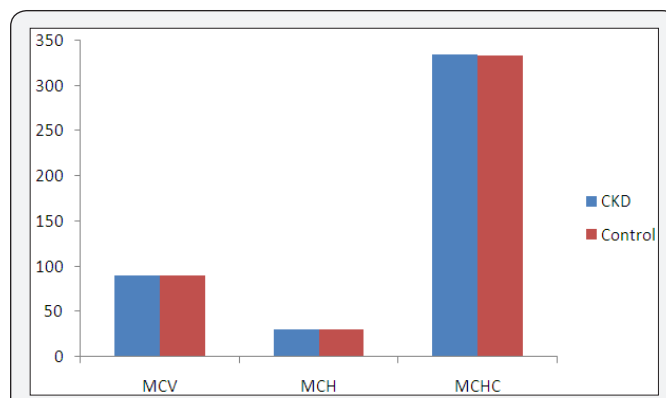


Figure 3 : Showing MCV, MCH and MCHC of CKD and the control subjects.

**Discussion**

Hematological investigations especially full blood counts are good indicators in health and disease states. It helps to understand the real disease presentation juxtaposed to the clinical features in the patients. Tandem spinal steno sis (TSS) is becoming a major threat especially from the middle aged to the elderly especially in the obese individuals and trauma patients [16-19]. Chronic kidney disease (CKD) is a progressive disease that results in significant morbidity and mortality (Table

1). Anemia is an independent risk factor for the mortality in these patients. Various studies have been conducted to see hematological changes in CKD patients. Anemia is a common feature becomes more severe with disease progression [20,21]. If left untreated, the anemia in these patients may be associated with other abnormalities like deterioration in cardiac function, decreased cognition and mental acuity, fatigue, and other signs and symptoms of anemia. All these complications particularly cardiac complications are one of the major causes for an increased risk of morbidity and mortality in these patients. So it is very important that these patients are monitored for the cause and severity of anemia and treated meticulously. Various therapeutic options available for the anemia of CKD include red blood cell transfusions, treatment of underlying cause and use of erythropoietin. Our study shows a significant difference in all the hematological parameters measured between our subjects and controls except MCV, MCH and MCHC. This is in keeping with the findings of other researchers in Nigeria [15-22]. The pattern of anemia in this study was predominantly normocytic and normochromic as reported in other studies also. With the progression of the disease, MCV, MCH and MCHC remain within normal limits. Total WBC count remained normal at the mild and moderate stages but was elevated above normal at the severe stage [23,24].

**Table 1:** Showing comparison of haematological parameters of chronic kidney disease subjects and control.

Parameters	CKD	Control	Level of Significance
WBC (X10 <sup>9</sup> /L)	6.2±0.5	4.6±0.2	P<0.05
Neutrophil (%)	71.0±6.1	57.0±4.1	P<0.05
Lymphocyte (%)		41.9±6.5	P<0.05
Monocyte (%)	3.0±0.2	1.0±0.1	P<0.05
Eosinophil (%)	2.0±0.1	0.1±0.1	P<0.05
RBC (X10 <sup>12</sup> /L)	3.67±0.2	5.11±0.4	P<0.05
Haemoglobin (g/dl)	11.0±0.8	15.3±0.4	P<0.05
PCV (%)	33.0±5.2	46.0±7.2	P<0.05
MCV (fl)	89.91±8.1	90.01±10.2	P>0.05
MCH (pg)	29.97±2.3	29.94±1.5	P>0.05
MCHC (g/l)	333.33±4.6	332.61±3.5	P>0.05

The results showed significant increase in total white blood cell, neutrophil, monotypes, and eosinophil of chronic kidney disease (CKD) subjects, significant decrease in lymphocytes, red blood cells, hemoglobin, packed cell volume of the chronic kidney disease (CKD) subjects and no significant difference in mean cell volume, mean cell hemoglobin and mean cell hemoglobin concentration of the chronic kidney disease subjects compared to the control. The white cell lines were significantly high may be as a result of inflammation and oxidative stress. This could be triggered based on the cause of the chronic kidney disease such as infection, drug, toxic chemical, hypertension, diabetes. There was reduction in red blood cell, hemoglobin and packed

cell volume portraying anemia in the chronic kidney disease subjects. This could be as a result of reduced erythropoietin, mutation in erythropoietin receptor (EpoR), increased haemolysis, destruction of cells in the spleen and bone marrow suppression.

### Conclusion

Chronic kidney disease (CKD) is a progressive disease that results in significant morbidity and mortality. Our study shows a significant difference in all the hematological parameters measured between our subjects and controls except MCV, MCH and MCHC. The pattern of anemia in this study was predominantly normocytic and normochromic as reported in other studies also. With the progression of the disease, MCV, MCH and MCHC remain within normal limits. Various therapeutic options available for the anemia of CKD include red blood cell transfusions, treatment of underlying cause and use of erythropoietin.

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