Original Article

A Comparative Study Of Anemia In Normal Patients And Patients With Renal Failure

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DOI: 10.47750/pnr.2023.14.S02.321

Abstract

Anemia is a frequent consequence of chronic kidney disease (CKD), and it raises morbidity and death rates while also lowering quality of life. This research was conducted from March 2021 to July 2021 at the labs of Mardan Medical Complex with the goal of exploring the associations between the hematological parameters Hb, RBC, HCT, and MCV in patients with chronic renal failure and various physiological and biochemical characteristics. Thirteen patients with renal failure and 33 healthy individuals' blood samples were collected (Male n=19; Female n= 27). According to the current study, 63% of healthy individuals had severe anemia. Mean corpuscular low was seen in 87% of normal individuals (n=29) and 69% of renal failure patients (n=9), respectively. Further, thirteen healthy people and three patients with renal failure had low ferritin levels. RBC production, function, and other physical attributes were impacted by renal failure. The goal of treating anemia caused by chronic renal illness is to boost red blood cell production and renal function. As a result, erythropoiesis-stimulating agents (ESAs) and iron supplements are the preferred treatments for anemia of CKD.

Keywords: chronic kidney disease, renal failure, anemia, ferritin, iron deficiency

Introduction

The medical condition known as anemia is marked by unusually low levels of erythrocyte hemoglobin (Hb), hematocrit (Ht), and red blood cell concentration per unit of volume as compared to the peripheral blood parameters of a reference group [1]. Hematocrit and hemoglobin levels in healthy people fluctuate depending on the stage of development of the person, hormonal stimulation, oxygen pressure in the environment, age, and gender. The most typical kind of anemia in the general population is iron deficiency anemia. About 2% of men and 12% of women of reproductive age have iron deficiency [2]. Due to iron losses during pregnancy and menstruation, women are more at risk. Low serum ferritin levels are the initial test sign of iron insufficiency. A diagnostic of iron insufficiency with a high degree of reliability is a reading of less than 30 micrograms per liter, which almost invariably denotes the absence of iron storage [3]. Anemia is a frequent deficiency illness and a major worldwide public health issue that affects both developed and developing nations, having serious negative effects on people's health as well as those nations' social and economic development. Over 2 billion people worldwide, or one third of the population, are anemic as a result of an imbalance in their nutrient consumption, according to WHO (2004) data [4].

Anemia results from either having insufficient erythrocytes or having defective erythrocytes that are incompetent to transport sufficient oxygen all over the body. It is determined by the amount of hemoglobin, sometimes known as “Hb,” in the blood [5]. Blood is a complicated substance that assists our organs function properly by comprising many

proteins and several cellular components. These cells include erythrocytes, which facilitates the transport of oxygen, platelets, which help blood clot when we bleed, and white cells, which aid in infection prevention [6]. Numerous factors can contribute to anemia. If you are young and have not yet developed a store of iron, essential vitamins, and minerals, have a diet deficient in these nutrients, or have a number of illnesses like inflammatory bowel disease, bone marrow disorders, chronic diseases like rheumatoid arthritis, heart disease, chronic liver diseases, or severe infections, you are at a higher risk [7]. Due to the baby absorbing from the mother needed iron for its own growth, pregnant women may develop anemia. As our reserves of vitamins and minerals diminish with age, the risk of anemia also rises [8]. The objective of the study was exploring the associations between the hematological parameters Hb, RBC, HCT, and MCV in patients with chronic renal failure and various physiological and biochemical characteristics.

Material and Methods

From March 2021 to July 2021, blood samples were taken from 33 healthy individuals and 13 patients who had renal failure. The following patient information was directly gathered using an instructional written questionnaire: patient name and number, age, gender, background of diseases, CKD etc. Patients needed to be ambulatory, have stable kidney function ranging from CKD stages, and have valid blood tests during the specified time periods in order to be included in the study. Patients also needed to have not received erythropoietin or a blood transfusion in the three months prior to the study. Patients were disqualified if they had experienced an acute illness within the previous two weeks, if there was a lack of clinical or biochemical data on them, if they were taking immune suppressants or chemotherapy, or if they had received a blood transfusion or were taking exogenous recombinant human erythropoietin within the previous three months. Patients with macrocytic anemia (iron deficiency) or microcytic anemia (vitamin B12 and folate deficit) were also disqualified.

Using a disposable, sterile syringes 2.5 ml of blood were extracted, washed, and gently mixed in an EDTA container. In a buffered electrolyte solution, the blood was quite dilute. The participant's registration number was prominently displayed on the container's label. A CBC was conducted using a hematological analyzer with 20 parameters such as RBC, HGB, MCV, Ferritin, etc. Statistical Package for Social Science (SPSS software version 22) was used to examine the data. P values less than 0.05 were used to indicate statistical significance for all analyses.

Results

A total of 46 Participant took part in that research, according to gender distribution male patients were 19 (41.30%) and females patients were 27 (58.70%). Mardan Medical Complex Hospital's normal patients and patients with renal failure underwent CBC testing; the normal male patient population was 17.39% (n=8), the normal female patient population was 54.35% (n=25), and the renal failure patient populations for men (n=11) and women (n=2) were 23.92% and 4.34%, respectively (table 1). Additionally, the age range of the participants was from 10 to 70 years, with 71.7% of participants (n=33) being healthy individuals and 28% (n=13) being patients with renal failure (table 2).

Out of 33 normal individuals, 21 patients (63.63%) suffered from severe anemia and 12 patients (36.37%) did not suffer from severe anemia. While out of 13 patients with renal failure 11 patients (84.61%) with renal failure suffered from severe anemia and 2 patients (15.39%) with renal failure did not had severe anemia (figure 1). The results of correlation between the participants and the mean corpuscular volume showed that, 29 (87.87%) out of 33 normal patients and 9 (69.23%) out of 13 patients with renal failure had mean corpuscular low respectively (figure 2). Moreover, 13 (39.39%) out of 33 normal patients have low ferritin level while 20 patients (60.61%) have normal ferritin level. Further, 3 (23.07%) out of 13 patients with renal failure have low ferritin level (figure 3).

Table 1: Gender distribution of Patients

Gender	No. Tested	Normal	Patients With Renal Failure
Male	19	(8) 17.39%	(11) 23.92%
Female	27	(25) 54.35%	(2) 4.34%
Total	46	33	13

Table 2: Distribution of the participants according to age groups (years).

Age groups	No. tested	Normal	patients with renal failure
10-20	7	7	0
21-30	15	14	1
31-40	9	6	3
41-50	4	2	2
51-60	7	4	3
61-70	4	0	4
Total	46	(33) 71.73%	(13) 28.27%

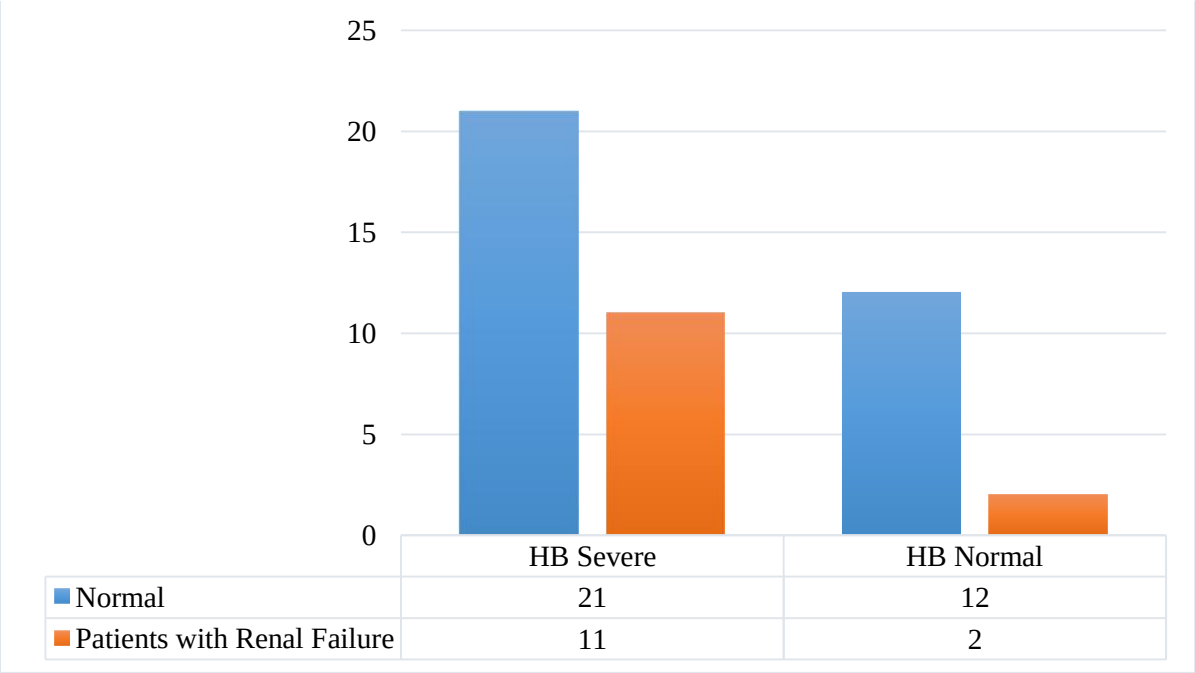

Figure 1: Distribution of the participants according to HB level

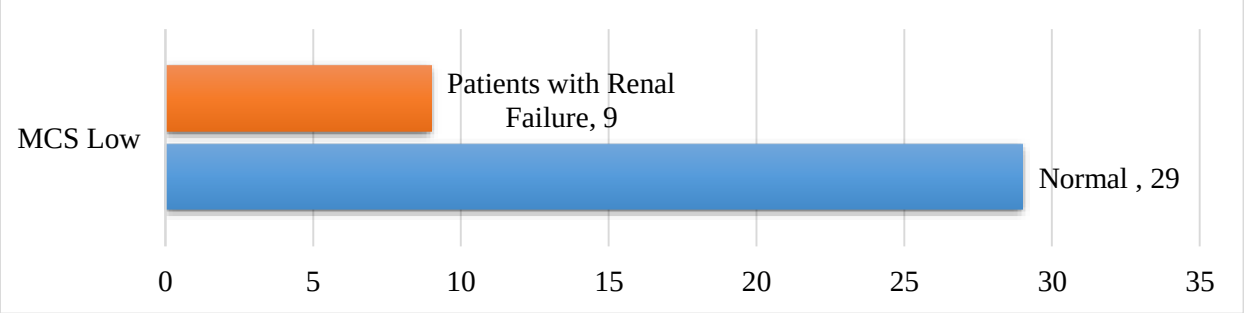

Figure 2: Correlation between the participants and the mean corpuscular volume

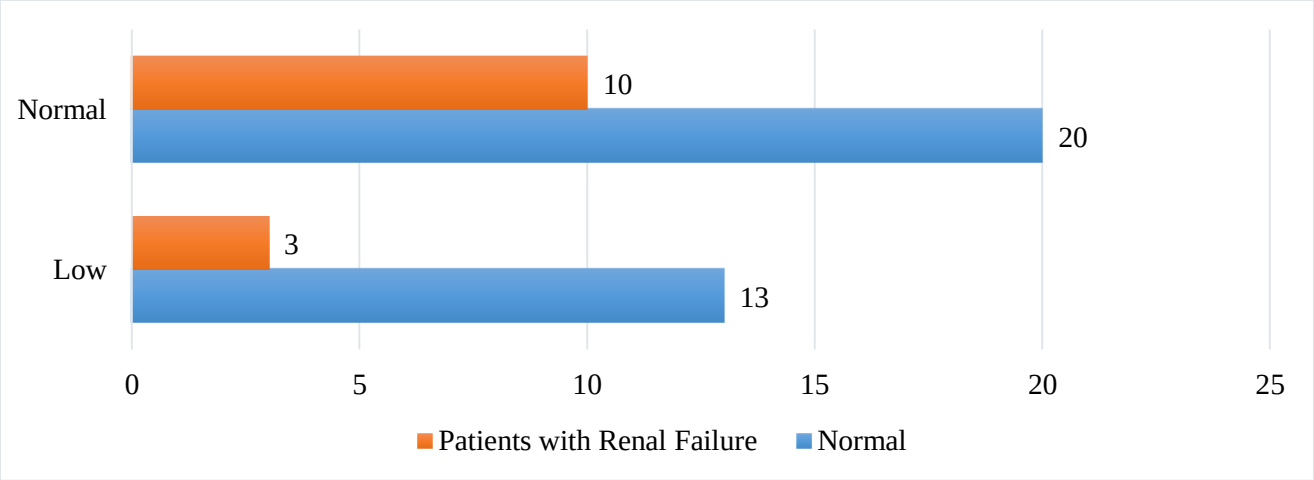

Figure 3: Distribution of the participants according to ferritin level.

Discussion

In this study, neither normal individuals nor patients with renal failure had substantially lower Hb levels. The overall trends in the CBC's most recent findings are consistent with research by Cook et al., (2003) [9]. According to our investigation, the mean corpuscular volume among renal failure patients was considerably high and these results are almost in line with earlier research [10-12]. Numerous studies have demonstrated that, despite a considerable decrease in RBC count for people with renal failure, this finding is consistent with findings from previous investigations [13,14].

The analysis revealed that chronic kidney failure reduced the generation of red blood cells (RBCs). Ferritin, an acute phase reactant, is typically increased in CKD patients. Because ferritin synthesis responds to inflammatory cytokines, higher ferritin levels in CKD are probably the result of underlying systemic inflammation; nevertheless, some researchers have also shown that normal or elevated ferritin levels do not prevent CKD [15,16]. To avoid the impact of other haematological variables that might alter the concentration of Hb in the presence of metabolic problems, anaemic patients were excluded from this study, which demonstrates a favourable correlation with the findings of other research. All of the factors mentioned above that would affect RBC count would have an impact on Hb concentration since Hb levels and RBC count are intimately connected.

Patient incidence of chronic kidney disease and its correlation with low erythropoietin production suggest that this hormone may be impacted by autonomic neuropathy, which reduces sympathetic stimulation of erythropoietin production in relation to renal denervation.

Conclusion

According to study, renal failure affects the physical characteristics, function, and generation of RBCs. Additionally, the existence of other chronic problems would shorten the lifespan of RBCs. The main mechanism of chronic anemia has been proposed to be failure to increase erythropoietin production in response to a lowering hemoglobin level. Anemia in people with CKD is frequently brought on by iron deficiency, which is a curable condition. ESAs and iron supplements are the preferred treatments for anemia of CKD.

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