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Prevalence of Anemia in Chronic Kidney Disease (CKD) Patients on Conservative Treatment in Benghazi- 2022

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الملخص:

الخلفية: فقر الدم هو أحد أكثر المضاعفات شيوعًا وأهمية لمرض الكلى المزمن، والذي يرتبط بانخفاض معدل الترشيح الكبيبي.

يُعرَّف فقر الدم عمومًا على أنه الهيموجلوبين أقل من 13.0 جم / لتر في الرجال وأقل من 12.0 جم / ديسيلتر في النساء قبل انقطاع الطمث. فقر الدم الناتج عن مرض الكلى المزمن من أصل متعدد العوامل، والمسببات المقبولة على نطاق واسع هي انخفاض الإنتاج الكلوي ((EPO للإريثروبويتين نظرًا لأن إنتاج الكلى للإريثروبويتين يعمل كمحفز أساسي لإنتاج خلايا الدم الحمراء، فإن مرضى لديهم مستويات أقل من إرثروبويتين، والذي يمكن أن يسبب فقر الدم. فقر الدم لدى مرضى الكلى المزمن تكون فيه كريات الدم الحمراء طبيعية في الشكل وكمية الهيموجلوبين طبيعية.

الهدف: تحديد نسبة وعوامل الخطر لفقر الدم لدى مرضى الكلى المزمن.

المواد والطريقة المقطعية للدراسة المقطعية مع حجم العينة كانت 91 مريضا من مرضى الكلى المزمن على العلاج المحافظ. تم استخدام استبيان لمقابلة المرضى الذين تم تسجيلهم في الدراسة. تضمنت البيانات الاجتماعية الديموغرافية، ومؤشر كتلة الجسم، والتاريخ الطبي السابق، وتاريخ الأدوية، وبيانات المختبر.

النتائج: بلغ معدل انتشار فقر الدم بشكل عام 35.2٪ بين مرضى الكلى المزمن على العلاج المحافظ. كان متوسط عمر المريض 62.9 ± 14.65 سنة. وكان متوسط مؤشر كتلة الجسم 27.65 ± 5.5 .كان معظم المرضى من عيادة العيادات الخارجية (معدل الترشيح الكبيبي> 15 مل / دقيقة / 1.73 م 2). كان 60٪ من المرضى يعانون من ارتفاع ضغط الدم والسكري. كان مستوى الهيموجلوبين ي10 .SD 2.7 ± 52. فيما يتعلق بنوع فقر الدم وفقًا لمتوسط الحجم ومتوسط الهيموجلوبين للكرية الحمراء، فقد كان نوعًا طبيعيًا صبغيًا عاديًا. تم وصف مكملات الحديد عن طريق الفم والحقن لمعظم المرضى.

الخلاصة: كان فقر الدم المصاحب لمرض الكلى المزمن سائدًا، وتزايدت شدته مع درجة الضرر الكلوي، ولكن تتم إدارته دون المستوى الأمثل. يجب أن يركز فحص وعلاج فقر الدم لمرضى أمراض الكلى بشكل أكبر على المرضى الذين يعانون من انخفاض معدل الترشيح الكبيبي.

الكلمات المفتاحية: أمراض الكلى المزمنة، فقر الدم، العلاج المحافظ.

Abstract

Background: Anemia is one of the most common and significant complications of chronic kidney disease (CKD) which is related to decreases in the glomerular filtration rate (GFR). Anemia is generally defined as a hemoglobin count of less than 13.0 g/ld in men and less than 12.0 g/dL in premenopausal women. Anemia of CKD is of a multifactorial origin; the widely accepted etiology being decreased renal production of erythropoietin (EPO). Since the kidney's production of erythropoietin serves as the primary stimulus for the production of red blood cells, CKD patients have lower levels of erythropoietin, which in turn can cause anemia. Anaemia in CKD patients is normocytic, normochromic and hypoproliferative.

Aim: Determination of proportion and risk factors of anemia in CKD patients.

Materials and method: A cross-sectional sectional study with a sample size of 91 CKD patients on conservative treatment. A questionnaire was used to interview patients who had been enrolled in the study. It included sociodemographic data, body mass index (BMI), past medical history, drug history, and laboratory data.

Results: The overall prevalence of anemia was 35.2% among CKD patients on conservative treatment. The mean age of patients was 62.9±14.65 SD years and the mean BMI was 27.65±5.5SD. Most of the patients were from the OPD clinic (GFR>15 ml/min/1.73 m2). 60% of the patients were hypertensive and diabetic. Hemoglobin (HB) levels were 10.52 ± 2.7 SD. According to to mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH), the type of anemia observed was normocytic and normochromic. Most of the patients were commonly prescribed an oral and an injectable iron supplement.

Conclusion: Anemia was prevalent in CKD patients and the severity increased with the degree of renal damage; however, it is sub-optimally managed. Screening and management of anemia for patients with renal disease should focus more on patients with lower GFR.

Keywords: chronic kidney disease, anemia, conservative treatment.

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1. INTRODUCTION

Chronic kidney disease (CKD) is indicated by a drop in the estimated glomerular filtration rate (eGFR) of less than 60 ml/min/1.73 m^2 (or albuminuria of 30 mg per 24 hours) for more than 3 months, as well as by functional or structural renal deformities. [1] According to eGFR and albumin, there are five stages of CKD: ratio of creatinine (eGFR > 90 + ACR > 30) Stage 1: (eGFR 60-89+ACR > 30) Stage 2 Stage 3 (eGFR 30-59) Stages 4 and 5 of renal disease are defined as (eGFR 29–15) and (eGFR 15), respectively.[2]

The global figures estimated that 8% to 16% of people have CKD, which is believed to affect nearly 10.4% of Africa's adult population. According to eGFR and the level of proteinuria, it is classified as a significant risk factor for developing cardiovascular disease.[3] Worldwide, diabetes and/or hypertension are the most frequently cited causes of CKD, but many developing nations in Asia and sub-Saharan Africa also experience high rates of glomerulonephritis, infection, and environmental exposures (such as air pollution, herbal remedies, and pesticides).[4]

CKD is associated with serious complications, such as an increased risk of cardiovascular disease, hyperlipidaemia, metabolic bone disease and anemia.[5] Anemia is generally defined as hemoglobin of less than 13.0 g/ld in men and less than 12.0 g/dL in premenopausal women.[6] Haemoglobin levels are lower in CKD patients than in the general population. Anaemia in CKD patients is typically caused by iron deficiency and inflammation. All CKD patients should have their haemoglobin checked during their initial CKD evaluation. In contrast to normal renal function, CKD has different definitions of iron deficiency.

Absolute iron deficiency in CKD is defined when the transferrin saturation (TSAT) is ≤20 percent and the serum ferritin concentration is ≤100 ng/Ml.[7][8]Anemia seems to be a CKD side effect that is linked to both a lower quality of life and a higher rate of death. It raises the possibility of CKD progression. [9]

Erythropoietin (EPO) is a hormone formed mainly in the kidneys. Normally, about 90 percent of all erythropoietin is formed in the kidneys, and the remainder is formed mainly in the liver. It is not known exactly where in the kidneys the erythropoietin is formed. EPO serves as the primary stimulus for the production of red blood cells. CKD patients have lower levels of EPO, which can cause anemia.[10]

Relevantly, iron has a number of intracellular pathways that may improve immune response, thermoregulation efficiency, energy metabolism, exercise capacity, or quality of work.[11][12]

Functional iron deficiency is characterized by sufficient iron stores despite insufficient iron availability for integration into erythroid precursors. Absolute iron deficiency is characterized by severely reduced or absent iron stores. The higher hepcidin levels are the cause of the latter.[7]

Patients with CKD frequently have an iron deficiency, which reduces the effectiveness of medications that stimulate erythropoiesis (ESA).[13][14] According to recommendations, intravenous iron supplementation is the method of choice for CKD stage 5 patients receiving dialysis.[7][15]

This cross-sectional study was undertaken to determine the proportion of anemia in patients with CKD who regularly follow up at the Benghazi Nephrology Center, as well as to identify the associated risk factors, with the aim to develop recommendations that could be valuable in minimizing the occurrence of anemia and its consequences in those patients.

2. PATIENTS AND METHOD:

Patient records were gathered from the Benghazi Nephrology Center to achieve the aim of the study. The Benghazi Nephrology Center is a public healthcare facility that receives the vast majority of CKD cases in Benghazi. Moreover, complicated cases are referred to this center from the other towns in eastern Libya. The data from the sample, which included 91 patients, was collected from January 15th to 15th March 2022 using a pre-designed questionnaire that was used to collect information from the files of patients. (See the appendix).

During the process of data collection, the following inclusion criteria were considered: outpatient department patients with regular follow-up (OPD from stage 1 to 4 and ESRD clinic for stage 5) who are on conservative treatment and who are over 18 years of age. The exclusion criteria included: patients who had a known cause of anemia other than renal disease, renal transplantation, hemodialysis patients, and pregnant women. After acquiring permission from the Nephrology Center and verbal consent from the patients, a questionnaire was used to interview patients who had been enrolled in the study.

The questionnaire had three main sections. The first section was used to obtain social demographic information such as name, age, and sex. Body mass index (BMI) was calculated. The second section was used to obtain medical history, duration of the renal failure and laboratory information obtained from patients' files such as hemoglobin values, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), Creatinine, phosphorus, calcium, renal function test (RFT), estimated GFR according to Modification of diet in renal disease (MDRD), parathyroid hormone (PTH). The third section included the medication history which was used to obtain information on the type of medication the patient was currently taking.

Data Analysis

Statistical Package of Social Sciences (SPSS) Version 21.0 was used for data entry processing and analysis. Descriptive and inferential analysis of the data were used accordingly to describe the study population and find the associations and correlations between the studied variables. Demonstrating graphs, diagrams and tables were displayed when applicable and a significance level of less than 5% and 95% confidence interval were considered.

3. RESULTS:

91 patients were involved and completed the study. The male-to-female ratio was approximately equal as shown in (figure 1.1). The results showed that the mean age of patients was 62.9 ±14.65 years and the mean BMI was 27.65±5.5SD. Most of the patients were from the OPD (figure 1.2).

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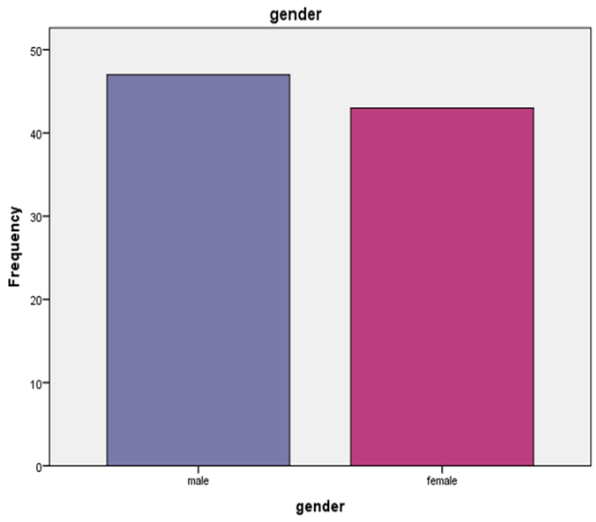


Figure 1.1 Distribution of gender among the study sample

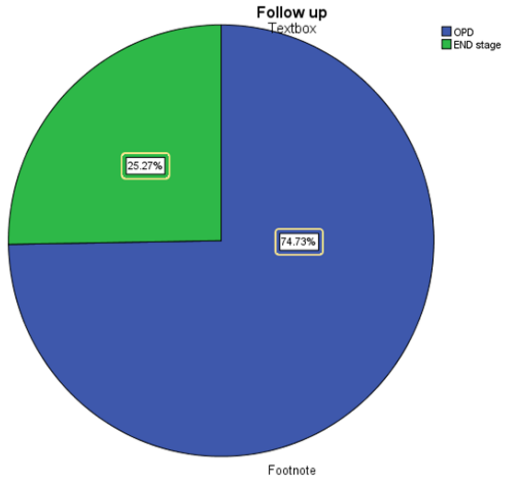


Figure 1.2 The stages of CKD among the sample

More than half of the patients (60%) had both diabetes and hypertension. The mean GFR was 53.2±16.4 and most of the patients were in the third and fourth stages according to the classification of CKD stages. Regarding the symptoms, most of the patients complained of fatigue (45.53%), dyspnea (16.28%), loss of appetite (15.12%) dizziness (15.12%) and other symptoms (8.14%). HB levels were 10.52 ± 2.7 SD. Furthermore, more than a third of the study sample (35.2%) was anemic. Most of the patients (82.4%) were commonly prescribed oral iron supplements and 17.6% of them were on injectable iron supplements. The laboratory data of the patients are shown in Table 1. There was a significant correlation between hemoglobin levels and estimated GFR with P value=0.002.

Table (1) Laboratory test results

	NUMBERS	Mean± St.D
RBC (*10^6\ul)	91	3.7152± 0.83956
HB (gm\dl)	91	10.5232±2.70730
MCV (fl)	91	83.7352±10.77507
MCH (pg)	91	29.7486±8.27576
CA (mg\dl)	90	8.9222±1.03863
UREA (mg\dl)	81	110.2370±78.14526
Creatinine (mg\dl)	89	1.5112±1.26771
Phosphors (mg\dl)	91	5.5112±5.60768
PTH (pg\ml)	82	211.5920±114.72065

RBC= red blood cell, HB = [hemoglobin], MCV= [mean corpuscular volume], MCH= [mean corpuscular hemoglobin.] MCHC= [mean corpuscular hemoglobin concentration], CA= [calcium], PTH = [parathyroid hormone].

4. DISCUSSION:

This cross-sectional study was undertaken to determine the prevalence of anemia in CDK patients with scheduled follow-ups in the Benghazi Nephrology Center, as well as to identify the associated risk factors. In this study, the median age of CKD patients was 62 years. A similar study conducted in Ghana [Carol Kimmy Maina] found that the median age was 55 years. Patients who are 65 years of age or older are more likely to have severe renal dysfunction.[16]

Regarding sex distribution, the current study revealed that the male-to-female ratio was approximately equal with regard to CKD. In contrast; A higher male-to-female ratio was found in studies conducted in Spain, the United States, and Nigeria [50–52]. This could be related to the fact that the size of the sample was small.[17]

About 60% of the patients in this study had both diabetes and hypertension. A study conducted by Erfanpoor in 2021 concluded that there is no synergic effect between diabetes and hypertension on the incidence of CKD.[18]

The occurrence and worsening of CKD are caused by hypertension. In the US, it ranks as the second most common cause of kidney failure. In modern nations, hypertension is the most prevalent chronic illness, accounting for nearly 7.1 million annual global fatalities. According to the US Renal Data System's annual reports, in 2013, hypertension may have contributed to up to 25% of cases of CKD.[19][20]This is most likely a result of the high prevalence of hypertension, which raises the risk of cardiovascular disease and CKD mortality.[21]

The leading medical issue among those who presented with anemia and the leading cause of CKD, respectively, was hypertension. According to other studies conducted in Tanzania and South Africa, the prevalence of anemia was 15% in US CKD patients, 45–55% in Asian CKD patients, and 50–90% in African CKD patients.[22][23][24][25]. Different results have been reported in the UK and the USA, where it was discovered that diabetes mellitus was the primary cause of CKD and ultimately anemia. [26][17]

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According to this study, stage 3 of CKD was the most common. This was in line with the multi-center study conducted in Saudi Arabia. Anemia was a frequent side effect in people with CKD. Anaemia was found to be highly prevalent in this study. Similar results have been reported from studies conducted in the UK (27.5%) and Singapore (35.4%) (NCGC, 2015).[27]

Anemia was also twice as common in people with CKD than in the general population, according to National Health and Nutrition Examination Survey (NHANES) data. Anaemia was highly prevalent, according to a prospective cross-sectional study done in a tertiary hospital in Ghana. The social and demographic factors and anemia of CKD did not correlate.[17]

Another study carried out in Saudi Arabia found a high prevalence of CKD-related anemia and a comparatively high burden of patients who needed erythropoietin treatment.[17][28][29], On the other hand, studies conducted in the US have revealed a lower prevalence.[30]

This study's laboratory data showed that the anemia was normocytic normochromic anemia. Anemia of CKD was a type of normocytic, normochromic, hypo proliferative anemia, according to Hira Shaikh et al. It carries a higher risk of death and was frequently linked to poor outcomes in CKD. [31]

The disparate results might result from variations in geographic location, lifestyle, racial makeup, and genetic makeup. Additionally, the variations in the study populations might be accounted for. CKD was the most typical cause of anemia. Other studies had reported obtaining similar results. [25]

The majority of anemic patients frequently receive an oral iron supplement prescription. According to recommendations, iron supplementation was advised in CKD patients with anemia and either an absolute or functional iron deficiency. CKD stage 5 patients receiving dialysis should take an IV iron supplement, and those receiving conservative treatment for their CKD should take either an IV or an oral iron supplement (CKD stages 3–5). [32]

Most CKD patients, especially those in stages 3, 4, or 5, should take an EPO-type medication because anemia becomes more prevalent as the glomerular filtration rate decreases below 30 to 60 mL/min and the negative consequences of anemia become more significant.[33][34][35]

A declining GFR has a strong correlation with anemia prevalence. This result was consistent with findings from a population-based study using the NHANES in the United States, which showed that anemia prevalence increased gradually as eGFR fell to below 60 mL/min/1.73 m^2.[36][24]

Even though elderly patients with damaged kidneys produce less EPO, a hormone

that signals in the bone marrow, anemia was likely to be more common in elderly

patients with CKD.[24][37]

5. CONCLUSION:

This paper presented an overview of the epidemiology, risk factors and treatment of anemia in CKD patients at the Benghazi Nephrology Center in Libya. The leading causes of treated CKD were DM and hypertension with the frequent co-morbidities of hypertension. There was a high prevalence of normocytic normochromic anemia of CKD. Reduction of synthesis of EPO and inappropriateness in drug prescription was noted in some patients. Early screening and optimal management of the anemia of CKD may contribute greatly to reducing morbidity and mortality from cardiovascular events. Proper knowledge, practice and attitudes toward the care of CKD patients should always be emphasized.

6. RECOMMENDATIONS:

- Early screening and optimal management of the anemia of CKD may contribute greatly to reducing morbidity and mortality.
- Another study including all modalities of treatment of CKD-hemodialysis, peritoneal dialysis, and kidney transplant- is strongly recommended.

7. LIMITATIONS:

The small size of the sample. Additionally, full investigations that may contribute to identifying the type and treatment of anemia, (e.g. serum iron, transferrin, serum ferritin) were not available in the patients' files.

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