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Original Article

Prevalence of anemia in dialysis patients in Northwestern of Libya

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Abstract.

Background. Chronic kidney disease (CKD) is renal dysfunction lead to fail in body's ability to maintain metabolic, fluid electrolyte, and balance. It is mostly results in uremia or azotemia and can be classified into stages 1 to 5 based on the deterioration of glomerular filtration rate (GFR. These complications lead to the deficiency of erythropoietin (EPO) possible iron loss in patients on hemodialysis are considered the main factors in contributing anemia in CKD patients.

Aimes: This study aims to evaluate the prevalence of anemia in CKD patients aged 18 years and above. Methods: A cross sectional study was performed on a 90 participants from patient with confirmed stage 5 of CKD who were on follow up at the dialysis unit of Sabratha and Surman Hospitals.

Results: The prevalence of anemia in dialysis patients' was found to be extremely high as 97.8% (88/90), and most effected patient was belonged to age group 45-64 (54.4%). Interestingly, the elders (65-84) years old patients was the least effected group (17,8%) which also showed only one case of severe anemia (hemoglobin < 7 g/dl)

Conclusion: This study is strongly confirms the suggestions of anemia contributions in CKD patient spatially in late stages.

Recommendations: According to the high incidence of anemia among CKD patients, its highly recommended that routine hemoglobin checkup most be followed, and diet supplements might be required to replace the iron loose.

Keywords: Chronic kidney disease, erythropoietin, anemia, hemoglobin, iron loose, Sabratha.

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Introduction

Chronic kidney disease (CKD) is a progressive, irreversible deterioration of renal function in which the body's ability to maintain metabolic, fluid electrolyte, and balance fail, which results in uremia or azotemia. The National Kidney Foundation (NKF) and Kidney Disease Outcomes Quality Initiative (KDOQI) defines CKD based on glomerular filtration rate (GFR) and divides the disease into five distinct stages (Agarwal, 2007). In Stage 1 CKD, the GFR is ≥ 90 ml/min/1.73 m2. Stages 2, 3, and 4 CKD are defined by a GFR of 60–89 ml/min/1.73 m2, 30–59 ml/min/1.73 m2, and 15–29 ml/min/1.73 m2, respectively. Stage 5 occurs when the GFR is < 15 ml/min/1.73 m2 or when patients require dialysis (Akinsola et al, 2000 and Agarwal, 2007)

Complications of CKD included anemia, metabolic bone disease, metabolic acidosis, fluid and electrolyte imbalance and uremia, which imposed considerable burden on health care resources (Alemu et al, 2021), (Amoako, et al, 2014), (Annear et al, 2008) and (Bock et al, 2008).

Anemia is the commonest complication of CKD which accounts significant burden of cardiovascular diseases and development of heart failure and stroke, which decreases the quality life of patients (Brookhart et al, 2008). Anemia occurs due to the reduction of kidney function which contributes to impaired physical activity, neurocognitive dysfunction and poor quality of life (Annear et al, 2008) and (Batchelor et al, 2020), (Cappellini et al 2017) and (Fishbane et al, 2017)

Anemia in CKD is typically normocytic, normochromic, and hypoproliferative (Frazer et al, 2014). One of the kidneys functions is the production of erythropoietin, a signaling molecule that stimulates red blood cell production, in response to decreased oxygen levels in the blood (Goicoechea et al, 2005).

Disruption of this process may contribute anemia in CKD patients, a condition in which the number of circulating red blood cells, and therefore the level of hemoglobin, is lower than normal (Goicoechea et al, 2005).. Other possible causes of anemia in CKD patients include iron deficiency, inflammation, and the accumulation of uremic toxins (Hsu et al, 2002)Therefore, the introduction of recombinant human erythropoietin, erythropoiesis-stimulating agents (ESA) have become the cornerstone of CKD anemia treatment and have reduced requirements for transfusion, improved the quality of life and reduced left ventricular hypertrophy and morbidity and mortality in CKD patients (Inker et al, 2019). Taken all the international guidelines we should consider administration of ESA when the Hb level becomes <11 g/dl in pre-dialysis patients and <10

g/dl in dialysis patients (Jankowska et al, 2016). The aim of the present study was to evaluate the prevalence of anemia in chronic kidney disease patients in the adults (>18 years of age) at a tertiary care hospital.

Methods

Study design.

A cross sectional study was employed targeting patients with an established diagnosis of 5 stage CKD who were on follow up at Nephrology clinic and hemodialysis unit of Sabratha and Surman Hospitals. An interviewer administered questionnaire was used to collect information from the patients who met the inclusion criteria. The study was carried out during the period from October to December 2022

Study Population Sabratha Teaching Hospital

This study comprised of 121 patients aged > 18 years and above whom attending the hemodialysis units in Surman and Sabratha hospitals and confirmed CKD stage 5. Only patients consented to take part in the study were included. However, 31 participants did not meet the minimum required data were excluded

Exclusion Criteria

Patients with known cause of anemia other than kidney disease

Pregnant women.

CKD non dialysis

Results.

Socio-Demographic Characteristics of the Participants

In the present study, 90 participants were included. Out of these more than half, 53 (56.8%) of patients were males. The median age of the participants was 51.48, while the minimum and maximum ages of the patient were 18 and 83 years respectively.

Age groups:

The majority of participants were from age group 45-64 years old with percentage of 51.1% which is more than half of the study samples, while age groups 18-44 and 65-84 were 31.1% and 17.8% respectively. The data shown in figure1.

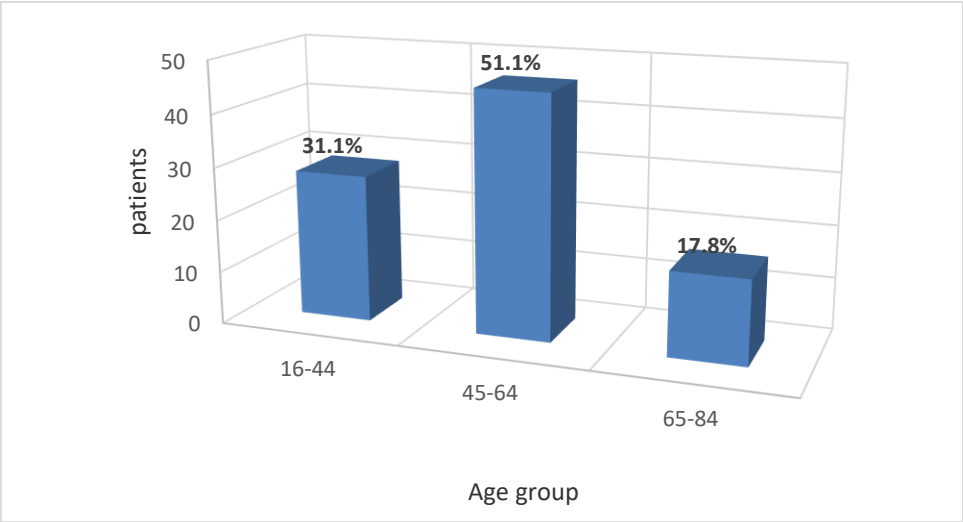

Figure 1: Age groups of dialysis patients attending Surman and Sabratha hospitals hemodialysis units, 2022 (N=90).

Gender groups:

Based on obtained data, out of 90 patients, 53 were males (about 59%) while females presented by only about 41% (table 1).

Table 1: Gender distribution of dialysis patients attending Surman and Sabratha Hospitals hemodialysis unit, (N=90).

Gender	N	%
Male	53	58,9
Female	37	41,1
Total	90	100,0

According to the gender in each age group, patients aged between 45-64 years old were the most effected with 26 males and 20 females. However, males appears to be more susceptible to disease than females in all age groups (figure 2).

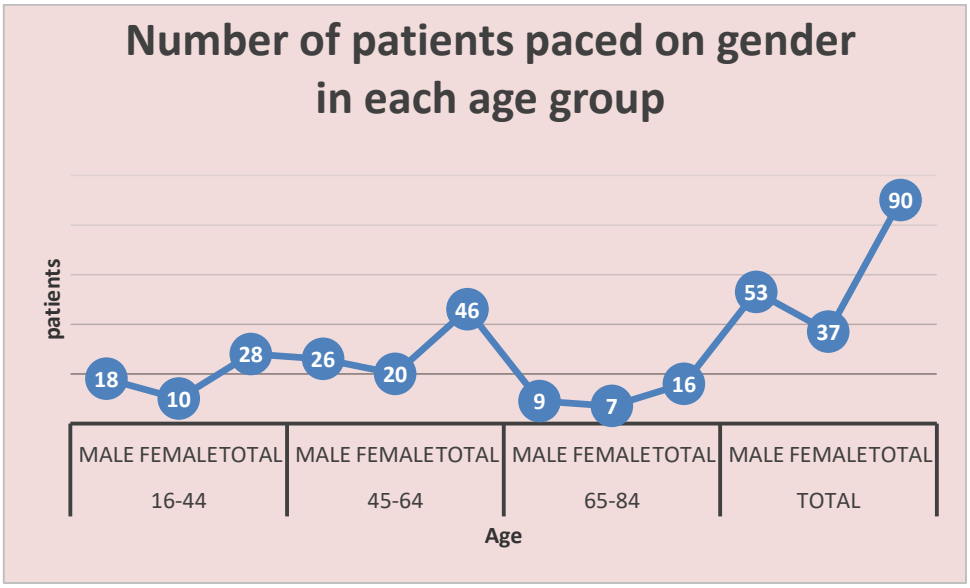

Figure 2: the prevalence of gender type (male and female) in each age group.

Prevalence of anemia

Study participants' charts were reviewed to assess the prevalence of anemia, and the clinical characteristics of the respondents. Accordingly, from a total of 90 patients who were on follow-up hemodialysis unit at Surman, and Sabratha hospitals, a total of 88 (97.8%) dialysis patients were found anemic.

The prevalence of anemia according age was varied. Patient aged between 16-44 years old revealed 33.3% of total participants, while age group 45-64 showed a higher prevalence (54.4%). However the lowest prevalence was in age group (65-84).

Severity of anemia was categorized according to WHO criteria who defined the anemia status as: normal if hemoglobin is 13 g/dl or higher for men, and 12 g/dl or higher for women. mild anemia is hemoglobin10 - 12.9 g/dl for men and 10 -11.9 g/dl for women. moderate anemia is hemoglobin 7 - 9.9 g/dl for both genders. severe anemia is hemoglobin < 7 g/dl for both genders. However, the normal hemoglobin level was only found in two cases one in age group 45-64 and the other in age group 65-84y.

Patients with mild anemia revealed 33.3% of all cases (30 cases). in which the majority of them were age group 45-64 years old 19 cases while other categories were approximately same on each age group.

The moderate anemia compromises the highest percentage of all participants with 49 cases which were 19, 22 and 8 cases in 16-44, 45-64 and 65-84 years old respectively.

The third part of anemia severity is severe anemia which the hemoglobin less than 7g/dl. In this study the prevalence of severe anemia was the lowest compared to mild and moderate anemia with total 9 cases. In

details, the prevalence of anemia was similar in both age groups 16-44 and 45-64 years old with total 4 cases in each groups. However, only one case was recorded in age group of 65-84.

The data demonstrated in figure 3. An overall prevalence of anemia with different age groups was analyzed and demonstrated in figure 3.

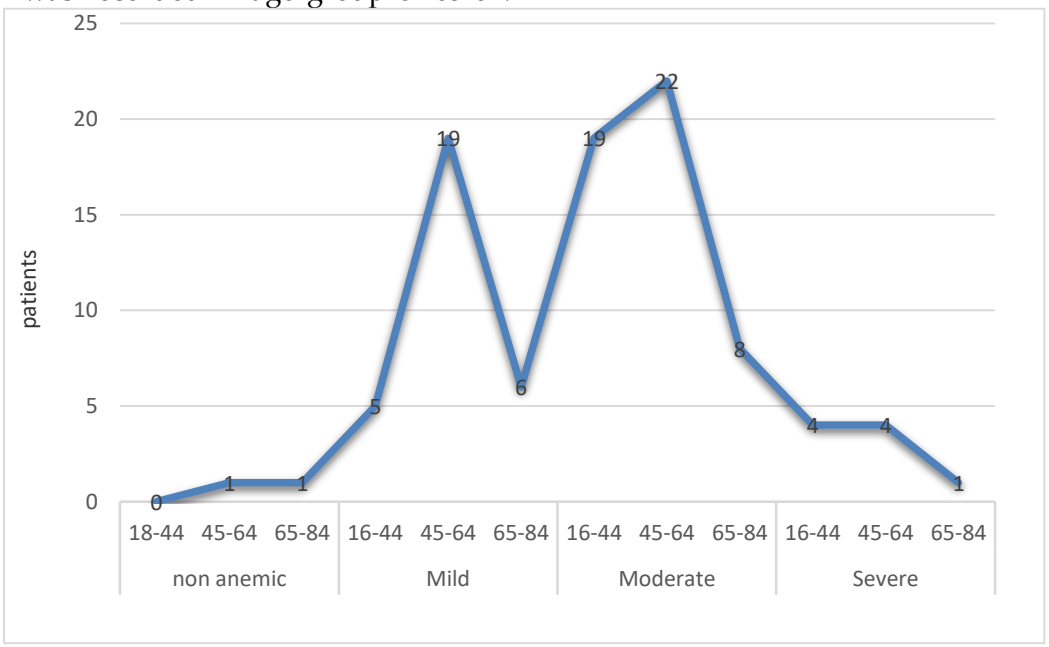

Figure 3: The prevalence of anemia in different age groups.

The number of anemic and non-anemic patient according to anemia level is shown in figure 4. The most recorded category was among moderate level of anemia which was about half of participants.

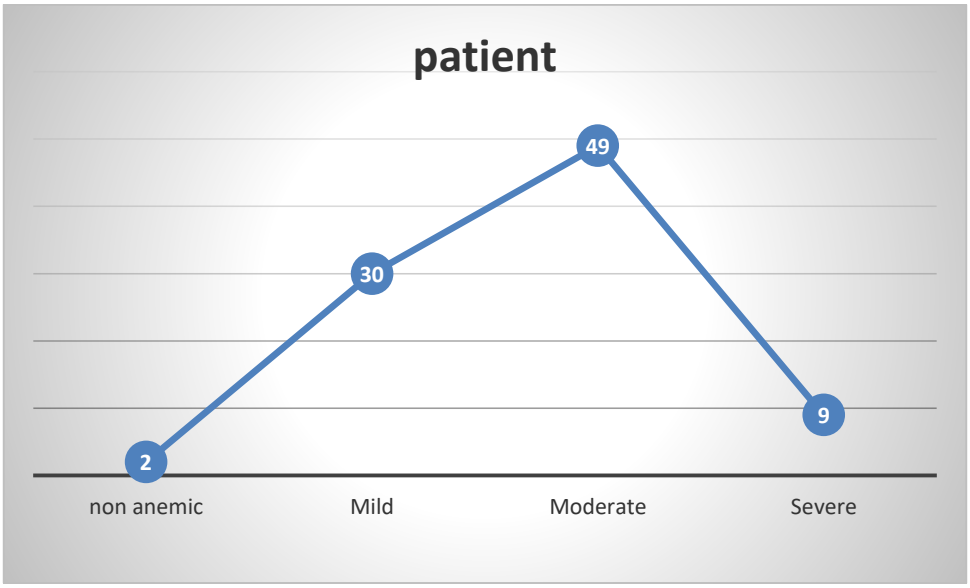

Figure 4: Normal and anemic patients' analysis in different categories.

Discussion

Social-demographic characteristics

This study showed male predominance (58.9%) compared to female percentage (41.1%). This finding consistent with findings of a study done in Ghana (Amoako et al, 2014). Studies done in Spain, USA and Nigeria also had higher male to female ratio (Goicoechea et al, 2005), (Ulasi et al, 2010). Male predominance could be a reflection of the fact that CKD and its risk factors such as hypertension, smoking and alcoholism are common in males than females. The range of age was 16-83 years old, most of them were in middle age 45-64 years old with 46 cases out of 90 with percentage (51.1%), this age group considered economically active. These findings are consistent with findings from a study done in Ghana (Amoako et al, 2014).

Prevalence of anemia among renal failure patients

Recent findings has demonstrated a very high prevalence of anemia in end stage CKD patients at Sabratha and Surman Hospitals with overall prevalence of 97.8%,

a finding similar to this was observed in two studies conducted in Tanzania whereby the prevalence was 92.4 % and 97% among 52 and 100 CKD patients (Kilonzo, 2010) and (Juma, 2012) respectively.

In addition, In India, Talwar et al, (2002) studied hematological profile in 27 chronic renal failure patients and the prevalence of anemia was 94% of which 60% had microcytic hypochromic anemia with Serum ferritin low in 62%, serum iron below in 74% of the patients and bone marrow study revealed 57%

of cases had negative bone marrow iron store, (Talwar and Gupta, 2002).

However, it is higher than the reports made by other researchers that showed, Korea 44.9% (kang et al, 2017), United States 15% (Stauffer and Fan, 2014) and Birhie, Ethiopia 53.5% (Birhie et al, 2021).

The high prevalence in current study is because of differences in the definition of anemia, study population, and survey period. The variation of the prevalence may be due to differences in the methodology, variation of quality of care and quality of reporting, policy, and strategic difference.

It is also possible that the high prevalence of anemia might be explained partly by other causes peculiar to environment including poor nutrition and parasitic infestations.

The prevalence of ferritin and transferrin saturation among anemic patients.

The laboratory criteria used to define iron deficiency and provide indication for treatment are different in CKD compared to normal renal function (Cappellini et al, 2017). In CKD, absolute iron deficiency is likely to be present when the TSAT is ≤20% and the serum ferritin concentration is ≤100 ng/ mL among predialysis and peritoneal dialysis (PD) patients or ≤200 ng/mL among patients undergoing hemodialysis. By comparison, with normal kidney function, iron deficiency anemia is typically defined as serum ferritin concentrations < 30 ng/mL. Functional iron deficiency, both ESA-induced functional deficiency and anemia of chronic disease are usually characterized by TSAT ≤20% and elevated ferritin levels (as high as 800 ng/mL) (Cappellini et al, 2017).

In this study the 88 anemic patients were analyzed for the frequency of iron deficiency anemia using the previous criteria. The result shows that 45 patients (51.1%) of total number had ferritin concentration less than 200 ng/ml. This result is higher than that reported by Cases-Amenós et al, (2014) when 36.3% had an iron deficiency (ferritin <100ng/ml and/or TSAT <20%). The reason for that is they used different criteria to determine iron deficiency (ferritin <100ng/ml and/or TSAT <20%) (Cases-Amenós et al, 2014) However, in current study the standard was used is ferritin <200ng/ml and/or TSAT <20%.

Among 88 anemic patients in this study there was only 15 cases has TSAT level less than 20% with percentage 17% of total number. This result is lower than that conducted in 2014 (Cases-Amenós et al, 2014), which revealed that the percentage of TSAT was 36.3%, it could be as a result of small number of participant 88 patients.

Conclusion

Results by recent study has demonstrated a very high prevalence of anemia in end stage CKD patients at Sabratha and Surman Hospitals with overall prevalence of 97.8%, where moderate degree of anemia is most frequent finding in both genders .

In this study the 88 anemic patients were analyzed for the frequency of iron deficiency anemia. The result shows that 45 patients (51.1%) of total number had ferritin concentration less than 200 ng/ml. and only 15 cases has TSAT

level less than 20% with percentage 17% of total number.

Recommendations

There is a need for early diagnosis and treatment of anemia in CKD patients as anemia leads to CKD progression and cardiovascular disease in these patients.

As mainstay treatment of anemia in CKD is ESAs and adequate iron store are necessary to permit an optimal response, therefore it is highly recommended to do iron studies to establish types of iron deficiency as functional iron deficiency will need intravenous iron supplement compared to absolute iron deficiency which needs oral iron.

This was an university based study, therefore the results does not reflect true community picture, it is therefore recommended to do similar study using large CKD sample size at the community level which would ascertain all stages of CKD and more factors related to anemia as in this 49 present study with high prevalence of anemia, only few factors were studied and skewed advanced CKD stage.

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