ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 6, Issue – 4, July – 2021 , Page No. : 188 - 192

Anaemia in diabetic patients with chronic kidney disease: A study in a tertiary care hospital

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Citation this Article: Megha Sharma, Subhash Bhardwaj, "Anaemia in diabetic patients with chronic kidney disease: A study in a tertiary care hospital", IJMSIR- July -2021, Vol – 6, Issue - 4, P. No. 188 – 192.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Introduction

Anaemia associated with chronic kidney disease has substantial clinical and public health importance in terms of morbidity,mortality and quality of life.(1) Patients with renal insufficiency have reduced hemoglobin levels. But the relationship between the degree of renal insufficiency and the magnitude of reduction in haemoglobin is not precisely defined.(1) There is an increasing realisation of importance of early detection and screening of mild to moderate CRF.

Kidneys produce erythropoietin, a signaling molecule that stimulates red blood cell production, in response to decrease oxygen levels in blood. Any disruption of this process due to CKD, has the potential to produce anaemia.(2) Other causes of anaemia in CKD include iron deficiency , inflammation and the accumulation of uremic toxins.(2,3) Anaemia in CKD is associated with cognitive impairment,sleep disturbance, CKD progression, cardiovascular comorbidites and higher mortality.(2,4-6)

WHO statistics identify around 150 million people with diabetes mellitus worldwide and suggest that this figure may double by 2025.(7) Diabetis mellitus is the single most common cause of end stage renal disease and consequently the most common cause of renal anaemia.(7) Patients with diabetes mellitus are also twice as likely to have anaemia as those with renal impairment from other causes.(8) Diabetic nephropathy occurs in app 30% of patients with type 1 diabetes and 20% of patients with type 2 diabetes and is now the single largest cause of patients starting renal replacement therapy(RRT)

Furthermore, declining haemoglobin levels may be observed before changes in renal function.(9) This early anaemia is thought to be mainly caused by relative resistance or absolute deficiency of erythropoietin production by the kidney.(10-12) Patients with diabetes may be more vulnerable to the effects of anaemia,since many also have significant cardiovascular disease and hypoxia induced organ damage.(13)

Material and method

All the adult patients (>18years) with chronic kidney disease attending the nephrology and diabetic outpatients in Super Specility Hospital for a period of six months from Jan 2019 to July 2019 were identified. Clinical details including age,sex, weight of all the patients were recorded.

A total of 280 subjects were included and investigated for haemoglobin levels.

Inclusion criteria

- Patients without erythropoietin or blood transfusion in 3 months preceding study.
- Stable kidney function.

Exclusion criteria

- Acute illness within last 2 weeks
- If the patients was on chemotherapyor immunosuppressants
- If patients had blood transfusion or exogenous recombinant erythropoietin within last 3 months.

Aim

The aim of the study was to determine the relationship between the degree of renal insufficiency and the magnitude of anaemia in diabetic patient and to assess the prevalence of anaemia in diabetic nephropathy even with less impairment of renal functions.

Results

There were 280 subjects in our study, which was conducted over a period of 6 months. Of the 280 participants, 160 had diabetes and 120 were non-diabetes. In the diabetic sample group (160 cases), 96 cases were male while 64 were female.

Table 1: Distribution of cases

Causes	Males	Females	Total
Diabetic	96	64	160(57 %)
Non diabetic	72	48	120 (43%)
Total	168	112	280

Table 2: Renal pathology

Renal Pathology	Diabetic	Non Diabetic
Diabetic Nephropathy	126(78.7%)	-
Chronic Glomerulonephritis	3 (1.8%)	24 (20%)
Hypertension	15 (9.3%)	46 (38.3%)
Obstruction/Reflux nephropathy	6 (3.7%)	20 (16.6%)
Autoimmune	2(1.2%)	12 (10 %)
Polycytic kidney	-	6 (5%)
Unknown	8 (5%)	12 (10%)
Total	160	120

Table 2 shows underlying renal pathology in both diabetic and non diabetic patients. The majority of patients (78.7%) in the diabetic group had underlying diabetic nephropathy(ranging from microalbuminuria to overt diabetic nephropathy) while the rest (21.2%) had other renal diseases.

Table 3: Prevalence of Anaemia

Parameters	Diabetic	Non Diabetic
Anaemic patients	72(45%)	26(21.6%)
Mean Hb	10 gm/dl	11.6 gm/dl
Mean MCV	74 fl/dl	82 fl/dl
Male:Female	1.5:1	1.5:1
Mean age	53 yrs	59 yrs

In all CKD stages ,including normal and mildly impaired renal functions, anaemia prevalence was significantly greater and mean haemoglobin level was lower in patients with diabetes .Out of 120 subjects without diabetes ,26 had anaemia. So, the prevalence of anaemia in patients without diabetes was 21.6% , while in the group with diabetes ,72 of 160 patients were anaemic amounting to prevalence of 45% and most of them were CKD 3 and CKD 4 cases.

As shown in table 3, the mean haemoglobin in diabetic patients was 10 gm/dl with mean MCV 74 fl/dl as compared to non diabetic patients depicting mean haemoglobin 11.6 gm/dl and mean MCV 82fl /dl. The mean age of developing renal insufficiency was also lower in diabetic cases than in non diabetic cases.

The prevalence of anaemia increased with the stage of CKD from 7.9% at stage 1 to 55.3% at stage 5.

Discussion

In the present study , we evaluated the prevalence of anaemia in relation to diabetic status. Significant difference in the haemoglobin values and prevalence of anaemia existed between patients with and without diabetes and this difference was also observed at all stages of kidney diseases (CKD1 to CKD5).The most powerful predictors of hemoglobin were diabetes mellitus and renal function. Indeed,the presence of diabetes conferred a fourfold increased risk of being anaemic.

In our analysis, anaemia was estimated to be present in 45% of diabetic people with any stage of CKD. The prevalence of anaemia increased with stage of CKD, from 7.9% to 55.3% at stage 5. A similar trend has been reported by several other authors (14, 15, 16). In contrast to our study, in the KEEP study anaemia prevalence in diabetic patients was significantly greater only CKD stage 2 and 3.(17)

Fishbane et al found high rates of iron deficiency in adult men(57.8 to 58.8%) and women (69.9 to 72.8%) with CKD stages 3-5 in the NHANES 3 and 1999-2004 surveys(18),indicating that anaemia in higher stage CKD may have multiple causes.

The relationship between diabetes and anaemia has been related to advancing kidney damage involving the tubulointerstitial compartment and leading to relative deficiency of and/ or resistance to erythropoietin(19-21,22,23) and ureamia. It has become clear that the failure to increase circulating erythropoietin levels in response to falling haemoglobin levels is the dominant factor in the genesis of anaemia associated with diabetic nephropathy as it is with CKD((24,25,26). Most importantly, failure to increase synthesis of erythropoietin in response to anaemia appears to be more extreme than that seen in other renal diseases.(8)

Anaemia identifies patient with increased risk of mortality and morbidity (27-31) and progression of diabetes complications.(32)

Conclusion

Diabetic subjects have lower haemoglobin values than their non diabetic counter parts for the same level of renal function and anaemia occurred in diabetic patients at earlier stages of CKD than in non diabetic patients. So, these findings have implications with regard to screening for anaemia in diabetic outpatients.

Anaemia remains under evaluated,under recognized and under treated as a potential risk for progression to diabetic complication. So this study suggests early screening and more aggressive management of diabetic anaemia with a view to improve quality of life.

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