Original Research Article

https://doi.org/10.53339/aimdr.2026.12.4.7

E-ISSN: 2395-2822 | P-ISSN: 2395-2814

Roxadustat Versus Daprodustat for Management of Anaemia in Chronic Kidney Disease

Muhammad Abul Hasnat*, Samir Kumar Hore, Muntasir Mamun, Emran Hossain

Department of Nephrology, TMSS Medical College & Rafatullah Community Hospital, Bogura, Bangladesh.

***Address for correspondence:** Dr. Muhammad Abul Hasnat, Department of Nephrology, TMSS Medical College & Rafatullah Community Hospital, Bogura, Bangladesh. **E-mail:** hasnatsilent@gmail.com

Abstract

Introduction: Anaemia is a frequent complication of chronic kidney disease (CKD) that significantly impacts morbidity, quality of life, and cardiovascular outcomes. Roxadustat and daprodustat, both hypoxia-inducible factor prolyl hydroxylase inhibitors (HIF-PHIs), have emerged as promising oral therapies for its management. The present study aimed to compare the efficacy and safety of roxadustat versus daprodustat in patients with CKD-associated anaemia.

Methods: This randomized, open-label, parallel-group clinical trial was conducted in the Department of Nephrology at TMSS Medical College & Rafatullah Community Hospital, Bogura, Bangladesh, between January 2024 and August 2025. A total of 104 adult patients with CKD stages 3–5 and anaemia were enrolled and randomly allocated in a 1:1 ratio to receive either roxadustat (n = 52) or daprodustat (n = 52). Data were analyzed according to the intention-to-treat principle using Statistical Package for the Social Sciences (SPSS) version 26.0.

Result: Both groups showed significant improvement in haemoglobin levels over 12 weeks; however, the increase was significantly greater with roxadustat (2.10 ± 1.10 g/dL) than with daprodustat (1.90 ± 1.02 g/dL; P = 0.04). Target haemoglobin levels (10–12 g/dL) were achieved by 78.8% of patients in the roxadustat group and 71.2% in the daprodustat group. Roxadustat also produced a greater reduction in ferritin levels (–50 ± 80 vs –35 ± 75 ng/mL; P = 0.01), while improvements in TSAT were comparable between groups.

Conclusion: Roxadustat and daprodustat were both efficient and safe therapies for anaemia in CKD patients, causing a substantial rise in haemoglobin levels and iron metabolism indices. Still, roxadustat showed a slightly but statistically significantly better result in haemoglobin increment and ferritin decrement when compared to daprodustat, while having a safety profile in line with it. Such results imply that these medications are good therapeutic solutions for anaemia in CKD, roxadustat perhaps giving better efficacy in anaemia correction and iron utilization.

Keywords: Roxadustat, daprodustat, anaemia, chronic kidney disease

Introduction

Chronic kidney disease (CKD) is a major global health problem associated with substantial morbidity, mortality, and healthcare burden. Anaemia is one of the most common complications of CKD, and its prevalence increases with declining renal function. The condition primarily results from inadequate erythropoietin production by the diseased kidneys, although iron deficiency, chronic inflammation, shortened red blood cell survival, and nutritional deficiencies

also contribute to its development. Anaemia in CKD is associated with fatigue, reduced exercise capacity, impaired quality of life, increased cardiovascular risk, and progression of kidney disease, making effective management an important therapeutic goal.[1,2] For many years, treatment of CKD-related anaemia relied on erythropoiesis-stimulating agents (ESAs) and iron supplementation. While ESAs significantly improve haemoglobin levels and reduce transfusion requirements, concerns have emerged regarding increased risks of cardiovascular events, stroke, hypertension, and thromboembolic complications, particularly when targeting higher haemoglobin concentrations.[3,4] These limitations have prompted the search for alternative therapeutic approaches that can provide effective erythropoiesis while maintaining an acceptable safety profile. Hypoxia-inducible factor prolyl hydroxylase inhibitors (HIF-PHIs) represent a novel class of oral agents developed for the treatment of anaemia in CKD. These drugs inhibit prolyl hydroxylase enzymes, leading to stabilization of hypoxia-inducible factor (HIF) and stimulation of endogenous erythropoietin production. In addition, HIF activation enhances iron utilization through suppression of hepcidin and improvement of iron absorption and mobilization, thereby addressing multiple pathophysiological mechanisms underlying CKD-associated anaemia.[5,6] Roxadustat was the first HIF-PHI to gain widespread clinical approval for the treatment of anaemia in CKD. Clinical trials and meta-analyses have demonstrated its effectiveness in increasing haemoglobin levels in both dialysis-dependent and non-dialysis-dependent CKD patients. Furthermore, roxadustat has shown favorable effects on iron metabolism, including reductions in hepcidin levels and improved iron utilization, even in the presence of inflammation.[7,8] Pooled analyses have also suggested that roxadustat achieves haemoglobin correction comparable to or superior to conventional ESAs while maintaining an acceptable safety profile.[9] Daprodustat is another orally administered HIF-PHI that has recently emerged as an important therapeutic option for CKD-related anaemia. Large phase III trials, including the ASCEND-D and ASCEND-ND studies, demonstrated that daprodustat was non-inferior to ESAs in maintaining target haemoglobin levels among dialysis-dependent and non-dialysis-dependent CKD patients, respectively.[10] Additional evidence has shown improvements in patient-reported outcomes and quality of life, supporting its clinical utility.[11] Differences in pharmacokinetic characteristics, effects on iron metabolism, haemoglobin response, cardiovascular outcomes, and adverse-event profiles may influence therapeutic decision-making. Therefore, comparative evaluation of roxadustat and daprodustat is important to identify the most effective and safest treatment strategy for anaemia management in CKD patients. The present study aims to compare the efficacy and safety of roxadustat and daprodustat in the management of anaemia among patients with chronic kidney disease.

Methods

This randomized, open-label, parallel-group clinical trial was conducted in the Department of Nephrology at TMSS Medical College & Rafatullah Community Hospital, Bogura, Bangladesh, between January 2024 and August 2025 to compare the efficacy and safety of roxadustat and daprodustat in the management of anaemia among patients with chronic kidney disease (CKD). A total of 104 adult patients with CKD stages 3–5 and anaemia were enrolled and randomly allocated in a 1:1 ratio to receive either roxadustat (n = 52) or daprodustat (n = 52). Eligible participants were aged ≥18 years, had haemoglobin levels between 7.0 and 10.5 g/dL, and were clinically stable for at least four weeks before enrolment. Both dialysis-dependent and non-dialysis-dependent patients were included. Patients with active bleeding, recent thromboembolic events within the preceding six months, uncontrolled hypertension (>160/100 mmHg), active malignancy, pregnancy, or known hypersensitivity to either study drug were excluded. Randomization was

performed using a computer-generated random allocation sequence. Initial dosing of roxadustat and daprodustat followed approved prescribing recommendations and was subsequently adjusted according to haemoglobin response to maintain target haemoglobin levels between 10 and 12 g/dL. Concomitant oral or intravenous iron supplementation and other standard supportive therapies were permitted as clinically indicated. Participants were followed for 12 weeks, with clinical and laboratory assessments performed at baseline and at regular follow-up visits. The primary outcome measure was the mean change in haemoglobin concentration from baseline to week 12. Secondary outcomes included the proportion of patients achieving target haemoglobin levels (10–12 g/dL), changes in serum ferritin and transferrin saturation (TSAT), incidence of adverse events (AEs), serious adverse events (SAEs), thrombotic events, and changes in blood pressure. Data were analyzed according to the intention-to-treat principle using Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the Mann–Whitney U test, while categorical variables were presented as frequencies and percentages and compared using the chi-square test. A *P*-value of <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee of TMSS Medical College, and written informed consent was obtained from all participants before study enrolment.

Results

The mean age was 54.1 ± 12.5 years in the Roxadustat group and 53.5 ± 12.9 years in the Daprodustat group. Male participants constituted 61.5% and 63.5% of the respective groups. Baseline hemoglobin levels were 8.6 ± 0.9 g/dL and 8.5 ± 0.8 g/dL, while ferritin levels were 161 ± 88 ng/mL and 166 ± 93 ng/mL in the Roxadustat and Daprodustat groups, respectively. No statistically significant differences were observed between the groups at baseline ($P > 0.05$) [Table 1].

Hemoglobin levels increased progressively in both treatment groups throughout the study. At week 12, mean hemoglobin reached 10.7 ± 1.2 g/dL in the Roxadustat group and 10.4 ± 1.1 g/dL in the Daprodustat group. The mean increase in hemoglobin was significantly greater with Roxadustat (2.10 ± 1.10 g/dL) compared with Daprodustat (1.90 ± .02 g/dL) ($P = 0.04$) [Table 2].

At week 12, target hemoglobin levels of 10–12 g/dL were achieved by 41 patients (78.8%) receiving Roxadustat and 37 patients (71.2%)

Table 1: Baseline demographic and clinical characteristics of the study participants ($n = 104$)

Variables	Roxadustat ($n = 52$)	Daprodustat ($n = 52$)	*P*-value
Age (years), mean ± SD	54.1 ± 12.5	53.5 ± 12.9	0.81
Male sex, *n* (%)	32 (61.5)	33 (63.5)	0.84
Female sex, *n* (%)	20 (38.5)	19 (36.5)	
CKD stage 3, *n* (%)	17 (32.7)	18 (34.6)	0.96
CKD stage 4, *n* (%)	20 (38.5)	19 (36.5)	
CKD stage 5, *n* (%)	15 (28.8)	15 (28.8)	
Dialysis-dependent, *n* (%)	16 (30.8)	15 (28.8)	0.82
Hemoglobin (g/dL), mean ± SD	8.6 ± 0.9	8.5 ± 0.8	0.56
Ferritin (ng/mL), mean ± SD	161 ± 88	166 ± 93	0.78
TSAT (%), mean ± SD	18.2 ± 7.1	18.8 ± 7.6	0.67

receiving Daprodustat. Although a higher proportion of patients in the Roxadustat group reached the target hemoglobin range, the difference was not statistically significant ($P = 0.37$) [Table 3].

Ferritin levels decreased significantly more in patients treated with Roxadustat (–50 ± 80 ng/mL) compared with those receiving Daprodustat (–35 ± 75 ng/mL) ($P = 0.01$). TSAT increased in both groups, with mean increases of 4.2 ± 6.0% and 3.8 ± 5.5%, respectively; however, this difference was not statistically significant ($P = 0.42$) [Table 4].

Any adverse event was reported in 36.5% of patients receiving Roxadustat and 38.5% of those receiving Daprodustat. Hypertension occurred in 9.6% and 11.5% of patients, respectively. Serious adverse events were uncommon and occurred in 3.8% of patients in both groups. No statistically significant differences in adverse event rates were observed [Table 5].

Thrombotic events occurred in 1.9% of patients treated with Roxadustat and 3.8% of patients treated with Daprodustat. AV fistula thrombosis was observed in one patient from each group, while one case of deep vein thrombosis occurred in the Daprodustat group. No drug-related deaths were reported during the 12-week follow-up period [Table 6].

Discussion

The present study compared the efficacy and safety of roxadustat and daprodustat in the management of anaemia among patients with CKD stages 3–5. Baseline demographic and clinical characteristics were comparable between the two treatment groups. The mean age was 54.1 ± 12.5 years in the roxadustat group and 53.5 ± 12.9 years in the daprodustat group, while male participants constituted 61.5% and 63.5%, respectively. In the phase III roxadustat trial

Table 2: Change in hemoglobin concentration during the study period ($n = 104$)

Time point	Roxadustat ($n = 52$) Mean ± SD	Daprodustat ($n = 52$) Mean ± SD	*P*-value
Baseline	8.6 ± 0.9	8.5 ± 0.8	0.56
Week 4	9.5 ± 1.0	9.3 ± 0.9	0.29
Week 8	10.2 ± 1.1	9.9 ± 1.0	0.14
Week 12	10.7 ± 1.2	10.4 ± 1.1	0.04
Mean Hb increase	2.10 ± 1.10	1.90 ± 1.02	0.04

Table 3: Achievement of target hemoglobin level (10–12 g/dL) at week 12 ($n = 104$)

Outcome	Roxadustat ($n = 52$)	Daprodustat ($n = 52$)	*P*-value
Achieved target Hb, *n* (%)	41 (78.8)	37 (71.2)	0.37
Did not achieve target Hb, *n* (%)	11 (21.2)	15 (28.8)	

Table 4: Changes in iron metabolism parameters from baseline to week 12 ($n = 104$)

Parameter	Roxadustat ($n = 52$) Mean ± SD	Daprodustat ($n = 52$) Mean ± SD	*P*-value
Ferritin change (ng/mL)	–50 ± 80	–35 ± 75	0.01
TSAT change (%)	+4.2 ± 6.0	+3.8 ± 5.5	0.42

Table 5: Adverse events observed during treatment (n = 104)

Adverse event	Roxadustat (n = 52) n (%)	Daprodustat (n = 52) n (%)	P-value
Any adverse event	19 (36.5)	20 (38.5)	0.83
Hypertension (new/worsened)	5 (9.6)	6 (11.5)	0.75
Nausea	4 (7.7)	5 (9.6)	0.73
Headache	3 (5.8)	4 (7.7)	0.69
Hyperkalemia	2 (3.8)	3 (5.8)	0.65
Serious adverse events	2 (3.8)	2 (3.8)	1.00

Table 6: Major cardiovascular and thrombotic outcomes (n = 104)

Outcome	Roxadustat (n = 52)	Daprodustat (n = 52)	P-value
Thrombotic events, n (%)	1 (1.9)	2 (3.8)	0.56
AV fistula thrombosis, n (%)	1 (1.9)	1 (1.9)	1.00
Deep vein thrombosis, n (%)	0 (0.0)	1 (1.9)	0.31
Hospitalization due to cardiovascular cause, n (%)	2 (3.8)	3 (5.8)	0.65
Drug-related death, n (%)	0	0	-

conducted by Chen et al., the mean age of participants was approximately 54.8 years, with males accounting for about 58% of the study population.[7] Similarly, Singh et al. reported a mean age of 62.2 years and a male representation of approximately 57% among patients receiving daprodustat.[3] The primary outcome analysis demonstrated a significantly greater increase in haemoglobin (Hb) levels with roxadustat than with daprodustat. In our study, mean Hb increased by 2.10 ± 1.10 g/dL in the roxadustat group compared with 1.90 ± 1.02 g/dL in the daprodustat group (P = 0.04). Mean Hb rose from 8.6 ± 0.9 g/dL at baseline to 10.7 ± 1.2 g/dL at week 12 with roxadustat and from 8.5 ± 0.8 g/dL to 10.4 ± 1.1 g/dL with daprodustat. Chen et al. reported an increase in Hb from approximately 9.0 g/dL at baseline to 11.0 g/dL after treatment with roxadustat, corresponding to a mean rise of about 2.0 g/dL.[7] In contrast, Singh et al. found that daprodustat increased mean Hb from 10.4 g/dL to approximately 11.7 g/dL during follow-up, with an average increase of about 1.6–1.8 g/dL.[3] Likewise, Akizawa et al. observed a mean Hb increase of approximately 2.0 g/dL with roxadustat in non-dialysis CKD patients.[12] Achievement of target Hb levels was also favorable in both groups. In our study, 78.8% of patients receiving roxadustat and 71.2% of patients receiving daprodustat achieved Hb levels between 10 and 12 g/dL by week 12. Barratt et al., in a pooled analysis of four phase III trials, reported that approximately 79–82% of patients treated with roxadustat achieved or maintained target Hb concentrations.[9] Similarly, another trial showed that approximately 70–75% of daprodustat-treated patients maintained Hb within the target range throughout treatment.[10] Concerning iron metabolism, roxadustat demonstrated a significantly greater reduction in ferritin levels than daprodustat. Ferritin decreased by 50 ± 80 ng/mL in the roxadustat group compared with 35 ± 75 ng/mL in the daprodustat group (P = 0.01), while TSAT increased by 4.2 ± 6.0% and 3.8 ± 5.5%, respectively. Provenzano et al. reported a mean ferritin reduction of approximately 45–60 ng/mL following roxadustat treatment, accompanied by significant decreases in hepcidin levels and improved iron mobilization.[13] Akizawa et al.

also documented ferritin reductions of approximately 50 ng/mL and TSAT increases of 3–5% with roxadustat therapy.[12] In a study by Meadowcroft et al., daprodustat produced TSAT increases of approximately 3–4% and modest reductions in ferritin, generally ranging from 25 to 40 ng/mL.[14] The overall safety profile of both treatments was acceptable. Any adverse event occurred in 36.5% of patients receiving roxadustat and 38.5% of patients receiving daprodustat, while serious adverse events occurred in 3.8% of patients in each group. Chen et al. reported overall adverse-event rates of approximately 38% among patients treated with roxadustat.[7] Similarly, Singh et al. observed adverse-event rates of approximately 40% with daprodustat therapy.[3] Cardiovascular and thrombotic complications were uncommon. Thrombotic events occurred in 1.9% of patients receiving roxadustat and 3.8% of patients receiving daprodustat, whereas hypertension occurred in 9.6% and 11.5% of patients, respectively. Barratt et al. reported thrombotic event rates of approximately 2–4% and hypertension rates of 10–15% among roxadustat-treated patients.[9] Some other studies showed that thrombotic events were reported in approximately 3–5% of daprodustat recipients, while hypertension occurred in 11–14%.[3,10]

Limitations of the Study

This study had some limitations, including its single-center design, relatively small sample size, and short follow-up duration of 12 weeks, which limited the assessment of long-term efficacy and safety outcomes. In addition, the open-label design may have introduced potential bias, and the study was not powered to detect rare adverse events or major cardiovascular outcomes.

Conclusion

Both roxadustat and daprodustat were effective and well-tolerated treatments for anaemia in patients with chronic kidney disease, producing significant improvements in haemoglobin levels and iron metabolism parameters. However, roxadustat demonstrated a modest but statistically significant advantage in haemoglobin increase and ferritin reduction compared with daprodustat, while maintaining a comparable safety profile. These findings suggest that both agents are valuable therapeutic options for CKD-related anaemia, with roxadustat potentially offering superior efficacy in correcting anaemia and enhancing iron utilization.

Recommendation

Both roxadustat and daprodustat can be considered effective and safe options for the management of anaemia in CKD patients; however, roxadustat may offer slightly superior improvement in haemoglobin and iron parameters. Larger multicentre studies with longer follow-up are recommended to confirm comparative long-term efficacy and cardiovascular safety.

References

1. Babitt JL, Lin HY. Mechanisms of anemia in CKD. J Am Soc Nephrol 2012 Oct 1;23(10):1631–4.
2. Stauffer ME, Fan T. Prevalence of anemia in chronic kidney disease in the United States. PLOS ONE 2014 Jan 2;9(1):e84943.
3. Singh AK, Szczech L, Tang KL, Barnhart H, Sapp S, Wolfson M, et al. Correction of anemia with epoetin alfa in chronic kidney disease. N Engl J Med 2006 Nov 16;355(20):2085–98.
4. Pfeffer MA, Burdmann EA, Chen CY, Cooper ME, De Zeeuw D, Eckardt KU, et al. A trial of darbepoetin alfa in type 2 diabetes and chronic kidney disease. N Engl J Med 2009 Nov 19;361(21):2019–32.
5. Gupta N, Wish JB. Hypoxia-inducible factor prolyl hydroxylase inhibitors: a potential new treatment for anemia in patients with CKD. Am J Kidney Dis 2017 Jun 1;69(6):815–26.
6. Haase VH. Hypoxia-inducible factor–prolyl hydroxylase inhibitors in the treatment of anemia of chronic kidney disease. Kidney Int Suppl 2021 Apr 1;11(1):8–25.
7. Chen N, Hao C, Liu BC, Lin H, Wang C, Xing C, et al. Roxadustat treatment for anemia in patients

undergoing long-term dialysis. N Engl J Med 2019 Sep 12;381(11):1011–22.

8. Abdelazeem B, Shehata J, Abbas KS, El-Shahat NA, Malik B, Savarapu P, et al. The efficacy and safety of roxadustat for the treatment of anemia in non-dialysis-dependent chronic kidney disease patients: an updated systematic review and meta-analysis of randomized clinical trials. PLoS One 2022 Apr 1;17(4):e0266243.
9. Barratt J, Sulowicz W, Schömig M, Esposito C, Reusch M, Young J, et al. Efficacy and cardiovascular safety of roxadustat in dialysis-dependent chronic kidney disease: pooled analysis of four phase 3 studies. Advances in therapy 2021 Oct;38(10):5345–60.
10. Singh AK, Carroll K, Perkovic V, Solomon S, Jha V, Johansen KL, et al. Daprodustat for the treatment of anemia in patients undergoing dialysis. N Engl J Med 2021 Dec 16;385(25):2325–35.
11. Johansen KL, Cobitz AR, Singh AK, Macdougall IC, Lopes RD, Obrador GT, et al. The ASCEND-NHQ randomized trial found positive effects of daprodustat on hemoglobin and quality of life in patients with non-dialysis chronic kidney disease. Kidney Int 2023 Jun 1;103(6):1180–92.
12. Akizawa T, Iwasaki M, Otsuka T, Yamaguchi Y, Reusch M. Phase 3 study of roxadustat to treat anemia in non–dialysis-dependent CKD. Kidney Int Rep 2021 Jul 1;6(7):1810–28.
13. Provenzano R, Besarab A, Sun CH, Diamond SA, Durham JH, Cangiano JL, et al. Oral hypoxia–inducible factor prolyl hydroxylase inhibitor roxadustat (FG-4592) for the treatment of anemia in patients with CKD. Clin J Am Soc Nephrol 2016 Jun 1;11(6):982–91.
14. Meadowcroft AM, Cizman B, Holdstock L, Biswas N, Johnson BM, Jones D, et al. Daprodustat for anemia: a 24-week, open-label, randomized controlled trial in participants on hemodialysis. Clin Kidney J 2019 Feb;12(1):139–48.

How to cite this article: Hasnat MA, Hore SK, Mamun M, Hossain E, Roxadustat Versus Daprodustat for Management of Anaemia in Chronic Kidney Disease. Ann. Int. Med. Den. Res. 2026;12(4):43–49.

Source of Support: Nil, **Conflict of Interest:** None declared

Received: 28-May-26; **Revised:** 27-Jun-26;
Acceptance: 12-Jul-26; **Published:** 15-Aug-26