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ASSOCIATION BETWEEN HIGH ACHIEVED HEMOGLOBIN LEVEL AND PHYSICAL HEALTH RELATED QUALITY OF LIFE IN PATIENT WITH CHRONIC KIDNEY DISEASE

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Abstract

Background: Chronic kidney disease (CKD) is a long-term progressive condition that leads to gradual loss of kidney function. One of its most common complications is anemia, primarily caused by decreased production of erythropoietin. Anemia in CKD patients is associated with symptoms such as fatigue, decreased physical endurance, and difficulty in performing daily activities, all of which contribute to a decline in health-related quality of life (HRQoL). Effective management of hemoglobin levels may help improve physical health and overall patient well-being.

Objective(s): To assess the association between achieved hemoglobin levels and physical healthrelated quality of life in patients diagnosed with chronic kidney disease.

Methodology: A cross-sectional analytical study was carried out among 80 patients with diagnosed chronic kidney disease in a hospital setting using a convenience sampling technique. Participants were categorized into two groups based on their hemoglobin levels: ≥12 g/dL and <12 g/dL. Relevant demographic and clinical data, including age, gender, CKD stage, and hemoglobin levels, were collected using a structured data collection tool. Physical health-related quality of life was

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evaluated using a standardized questionnaire. Data analysis was performed using statistical software, applying descriptive statistics and appropriate inferential tests to determine the relationship between hemoglobin levels and quality of life.

Results: The results indicated that patients with higher hemoglobin levels demonstrated better physical health-related quality of life compared to those with lower levels. Increased hemoglobin was associated with improved physical functioning, lower levels of fatigue, and greater ability to carry out daily activities.

Conclusion(s): The study concludes that higher hemoglobin levels are significantly associated with better physical health-related quality of life in patients with chronic kidney disease. Proper diagnosis and management of anemia may play a crucial role in improving physical health outcomes and enhancing overall quality of life in this population.

INTRODUCTION

Chronic kidney disease (CKD) is strongly associated with anemia, particularly in patients with advanced non-dialysis CKD, where approximately 40% of individuals are affected. Anemia in CKD is linked to increased morbidity, reduced functional capacity, and higher mortality, making early detection and management essential for improving outcomes [60,25]. As CKD progresses, patients experience a significant decline in health-related quality of life (HRQoL), characterized by fatigue, physical weakness, and difficulty performing daily activities independently. In addition to physical impairment, CKD also negatively affects psychological well-being and social functioning, emphasizing the need to evaluate both clinical and patient-reported outcomes to identify modifiable factors that can improve overall well-being [3,4,5].

Quality of life (QoL) is a critical outcome in chronic renal failure, as patients with end-stage renal disease (ESRD) continue to experience poor QoL despite advances in dialysis therapies that have improved survival rates [1,6]. Multiple interrelated factors, including comorbid conditions such as diabetes, hypertension, anemia, and arthritis, contribute to the deterioration of QoL in CKD patients [8,41,47]. These conditions often require long-term polypharmacy, increasing the risk of

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adverse drug interactions and poor treatment adherence, further worsening patient outcomes. Additionally, CKD patients frequently report reduced energy levels and diminished physical capacity, highlighting the need for comprehensive disease management strategies that address both medical and functional limitations.

A substantial body of evidence suggests that hemoglobin (Hb) levels play a crucial role in determining physical HRQoL in CKD patients. Higher Hb levels are associated with improvements in physical functioning, vitality, and psychological well-being, whereas low Hb levels are linked to fatigue, reduced activity levels, and impaired daily functioning [4,13]. However, the relationship between Hb correction and outcomes remains complex, as aggressive anemia management using erythropoiesis-stimulating agents (ESAs) may increase the risk of cardiovascular complications [2,16,17]. While ESA therapy can improve energy levels and reduce anemia-related symptoms, optimal Hb targets remain debated due to potential safety concerns, highlighting the importance of balancing treatment benefits and risks [34].

Evidence from cohort and cross-sectional studies further supports the association between anemia severity and reduced HRQoL in CKD patients. Studies such as REACH-J and NHANES have demonstrated that patients with lower hemoglobin levels exhibit poorer physical functioning, increased fatigue, and reduced daily activity compared to those with higher Hb levels [45,16]. Similarly, multinational and regional studies have reported that individuals with Hb levels above 12 g/dL show better mobility, vitality, and overall physical health compared to anemic patients [35,32]. However, some studies in dialysis populations have found no significant association between Hb levels and overall HRQoL, suggesting that in advanced ESRD, other factors such as comorbidities and disease burden may play a more dominant role in determining quality of life [24,44,59].

Hemodialysis remains a life-sustaining treatment for ESRD patients, improving survival but also contributing to multiple complications that negatively affect both physical and psychological health [17]. Continuous assessment of HRQoL is therefore essential, as declining QoL is associated with increased morbidity and mortality in dialysis patients [44,59]. In addition to physical complications

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such as infections, cardiovascular events, and vascular access problems, patients also face significant psychological burdens influenced by biological, social, and environmental factors [63,60]. Mental health issues are common in CKD patients and further exacerbate functional limitations, underscoring the importance of integrated care approaches that address both physical and psychological dimensions of the disease to improve overall patient outcomes.

Literature Review

Hoshino et al. (2020) conducted a multinational observational study demonstrating that lower hemoglobin levels are consistently associated with reduced physical health-related quality of life (HRQoL) in chronic kidney disease (CKD) patients. They reported that severe anemia (Hb <10 g/dL) significantly impairs physical functioning and activity levels, while even mild-to-moderate anemia (Hb 10–12 g/dL) is associated with measurable reductions in HRQoL compared with Hb >12 g/dL (Hoshino et al., 2020). Similar dose–response relationships were observed in large multicenter analyses, where progressive increases in hemoglobin were linked with improvements in vitality, fatigue reduction, and better physical component scores of validated HRQoL instruments such as KDQOL and SF-36 (Finkelstein et al., 2009; Parker et al., 2022). These findings collectively support the current study's premise that anemia severity plays a central role in determining physical well-being in CKD patients.

Evidence from interventional and longitudinal studies further reinforces the beneficial role of hemoglobin improvement on physical outcomes. Alexander et al. (2007) demonstrated that correction of anemia using erythropoiesis-stimulating agents (ESAs) improves fatigue, vitality, and exercise tolerance in non-dialysis CKD patients, although the study design limited causal inference. In line with this, Ortiz et al. (2023) reported that patients whose hemoglobin increased from <10 g/dL to 11–12 g/dL experienced significant improvements in energy, physical functioning, and overall HRQoL. Similarly, Lee et al. (2022) identified an optimal hemoglobin range (11–12.5 g/dL) associated with the best functional outcomes, while higher levels (>13 g/dL) did not yield additional

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HRQoL benefits, suggesting a plateau effect. These findings align with the present study's observation that anemia-related fatigue, weakness, and reduced activity levels are key contributors to diminished physical quality of life.

However, randomized controlled trials and systematic reviews highlight important limitations and safety concerns regarding aggressive hemoglobin correction. Clement et al. (2009), synthesizing evidence from CHOIR, CREATE, and TREAT trials, reported only modest improvements in HRQoL with higher hemoglobin targets, while simultaneously identifying increased cardiovascular risks at higher Hb levels. Similarly, Guedes et al. (2020) found that although higher hemoglobin levels were associated with slight improvements in fatigue, gains in overall physical functioning were often small and clinically limited, with considerable heterogeneity across studies. These inconsistencies suggest that while anemia correction improves some patient-reported outcomes, the magnitude of benefit may be influenced by comorbidities, inflammation, and disease severity in CKD populations.

Further evidence indicates that anemia interacts with multiple physiological and functional domains, amplifying its effect on physical HRQoL. Studies have shown that low hemoglobin levels are associated with reduced exercise capacity, decreased gait speed, muscle weakness, and higher fatigue burden, all of which contribute to functional decline and reduced independence (Müller et al., 2024; Yamamoto et al., 2022; Ahmad et al., 2024). Additionally, anemia has been linked to poorer sleep quality, increased symptom burden, and reduced daily activity levels, further worsening physical well-being (Martinez-Lopez et al., 2024; Zhang et al., 2022). Collectively, these findings strongly support the results of the current study, emphasizing that anemia is a multifactorial determinant of reduced physical HRQoL in CKD patients, although optimal management requires balancing clinical benefits with potential cardiovascular risks and patient-specific factors.

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Materials and Methods

The study employed a cross-sectional analytical design conducted at Doctor Hospital, Lahore over a four-month period following synopsis approval. A total of 80 patients were included in the study using a non-probability convenience sampling technique. This design was selected to assess the association between hemoglobin (Hb) levels and physical health-related quality of life (HRQoL) in patients with chronic kidney disease (CKD), in line with the study objectives.

The study population consisted of adult patients aged 18 years and above diagnosed with CKD stages 3–5, including both dialysis and non-dialysis cases. Patients were required to have documented hemoglobin levels within the last three months and the ability to understand and complete the SF-36 questionnaire. Patients with acute kidney injury, recent blood transfusion, pregnancy, severe psychiatric illness, or terminal comorbid conditions were excluded to minimize confounding factors affecting hemoglobin levels and HRQoL outcomes.

Data collection was performed using multiple clinical and research tools, including a weighing scale, stadiometer, blood pressure apparatus, hematology analyzer, and structured performa sheets. Hemoglobin levels were measured through laboratory analysis, while physical health-related quality of life was assessed using the SF-36 questionnaire focusing on domains such as physical functioning, pain, and general health. Demographic and clinical data were also recorded systematically to ensure comprehensive profiling of participants.

The primary independent variable of the study was hemoglobin level (g/dL), while dependent variables included physical functioning, pain, and general health status as measured through SF-36 scores. The main outcome of interest was physical HRQoL, specifically the physical component summary score, while secondary outcomes included associations between hemoglobin levels and demographic or clinical characteristics. These measures were used to evaluate how variations in hemoglobin influence physical health outcomes in CKD patients.

Data were analyzed using IBM SPSS Statistics, with descriptive statistics applied to summarize participant characteristics, including means, standard deviations, frequencies, and percentages.

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Hemoglobin levels were categorized for comparative analysis, and inferential statistics such as Chi-square test, independent t-test, or ANOVA were applied where appropriate. A p-value of ≤0.05 was considered statistically significant, ensuring robust evaluation of the relationship between hemoglobin levels and physical HRQoL outcomes in the study population.

Results

The present study included 80 patients with CKD, with an age range of 19–71 years. The largest proportion of participants belonged to the 29–38 years age group (32.5%), followed by 39–48 years and 49–58 years groups (22.5% each), while fewer participants were observed in the 19–28 years (10%) and 59–71 years (12.5%) categories. Regarding gender distribution, females slightly outnumbered males, with 51.25% female and 48.75% male participants. In terms of disease characteristics, most patients were in CKD stage 3 (40%), followed by stage 4 (33.8%) and stage 5 (26.3%). Additionally, 58.7% of patients were not on dialysis, while 41.2% were undergoing dialysis, indicating a heterogeneous clinical profile across the sample.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.595	2	21.797	24.576	<.001
Within Groups	68.293	77	.887		
Total	111.888	79			

The analysis of physical quality of life (QoL) demonstrated significant differences across study groups. One-way ANOVA results showed a statistically significant variation in physical QoL ($F = 24.576$, $p < 0.001$), indicating that physical health status differed meaningfully between groups. The effect size analysis further confirmed the strength of this difference, with Cohen's d (3.088), Hedges' g (3.059), and Glass's delta (3.715) all indicating a very large effect. These findings suggest

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that differences in hemoglobin-related grouping or clinical stratification are strongly associated with substantial variation in physical QoL, both statistically and clinically.

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
Physical_QoL	Cohen's d	.64536	3.088	2.431	3.737
	Hedges' correction	.65165	3.059	2.407	3.700
	Glass's delta	.53647	3.715	2.787	4.631

The association between hemoglobin (Hb) group and dialysis status was highly significant (χ^2 = 68.745, $p < 0.001$), confirming a strong relationship between lower Hb levels and dialysis dependency. Cross-tabulation results showed that all patients with Hb levels >12 g/dL were not on dialysis (39 patients), whereas the majority of patients with Hb <12 g/dL were undergoing dialysis (33 out of 41). This pattern indicates that reduced hemoglobin levels are strongly associated with progression to dialysis-dependent CKD, reflecting worsening disease severity and clinical outcomes.

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	68.745[a]	3	<.001
Likelihood Ratio	88.358	3	<.001.
Linear-by-Linear Association	56.062	1	.001
N of Valid Cases	80		

Correlation analysis further demonstrated a strong and statistically significant negative relationship between hemoglobin group and physical QoL ($r = -0.542$, $p < 0.001$; reported matrix showing r up

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to -0.842). This indicates that as hemoglobin levels decrease, physical quality of life declines significantly. The findings collectively highlight that lower Hb levels are associated with poorer physical functioning and increased likelihood of dialysis, reinforcing hemoglobin as a key determinant of physical health outcomes in CKD patients.

Discussion

The present study demonstrated a clear and clinically meaningful association between hemoglobin levels and physical health-related quality of life (HRQoL) in patients with chronic kidney disease (CKD). Patients with higher hemoglobin levels consistently showed better outcomes in key physical domains, including physical functioning, bodily pain, and general health perception. This pattern is physiologically plausible, as hemoglobin is essential for oxygen transport, and its reduction leads to tissue hypoxia, fatigue, and decreased physical capacity. These findings reinforce that anemia is not merely a laboratory abnormality in CKD but a major determinant of functional status and daily activity performance.

The observed improvement in physical functioning with higher hemoglobin levels reflects enhanced oxygen delivery to muscles and tissues, resulting in better energy utilization and exercise tolerance. This contributes to improved mobility, independence, and ability to perform routine tasks, all of which are particularly important in CKD patients who already face significant disease-related limitations. Similarly, the association between hemoglobin levels and bodily pain suggests that anemia may indirectly worsen pain perception through fatigue, muscle weakness, and reduced physical resilience, while correction of anemia may improve overall comfort and reduce symptom burden.

General health perception was also positively influenced by higher hemoglobin levels, indicating that patients not only experienced physical improvements but also perceived their overall health status more favorably. This subjective improvement likely reflects a combination of reduced symptoms, better physical functioning, and improved ability to engage in daily life activities. The

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findings align with existing literature indicating that optimized hemoglobin levels contribute to better health-related outcomes, although overly aggressive correction of anemia may introduce risks such as cardiovascular complications, emphasizing the need for a balanced therapeutic approach.

Despite these positive associations, several limitations should be considered. The cross-sectional design limits causal inference, and the relatively small, single-center sample restricts generalizability. Additionally, reliance on self-reported SF-36 data may introduce response bias, and unmeasured confounders such as comorbid conditions, nutritional status, and medication use may have influenced the results. Nevertheless, the study provides valuable evidence supporting the role of hemoglobin optimization in improving physical HRQoL in CKD patients and highlights the importance of individualized anemia management strategies aimed at achieving optimal—not excessive—hemoglobin levels.

CONCLUSION(S)

This study concludes that hemoglobin levels are significantly associated with physical health-related quality of life in patients with chronic kidney disease. Individuals with higher hemoglobin levels showed better physical functioning, reduced pain, and a more positive perception of their overall health status. These findings suggest that effective management of hemoglobin levels is essential in improving the overall quality of life in patients with chronic kidney disease

The study highlights the importance of regular hemoglobin monitoring and timely management of anemia in chronic kidney disease (CKD) patients through appropriate interventions such as iron therapy and erythropoiesis-stimulating agents. Healthcare professionals should adopt a holistic approach that not only focuses on clinical management but also emphasizes improving patients' quality of life through supportive care and structured patient education programs aimed at increasing awareness regarding anemia and its consequences. Furthermore, future research should include larger, multi-center, and longitudinal studies to establish stronger causal relationships and enhance the generalizability of findings. However, the present study is limited by its relatively small

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sample size, cross-sectional design, reliance on self-reported questionnaire data that may introduce response bias, and its restriction to a limited clinical setting, all of which may affect the robustness and broader applicability of the results.

REFERENCES

Abd El-Hamed HM, Elsebai NA, Ramadan FA, Salam WI, Abdelhady TM. Impact of Teaching Guidelines on Quality of Life for Hemodialysis Patients. Nature and Science. 2011;9(8):214-222.

Abraham S, Venu A, Ramachandran A, Chandran PM, Raman S. Assessment of quality of life in patients on hemodialysis and the impact of counseling. Saudi J Kidney Dis Transpl. 2012;23(5):953-957.

Ahmad S, et al. Hemoglobin levels, gait speed, and functional independence in chronic kidney disease. BMC Geriatr. 2024;24:56.

Al-Shaikh SB, Hayati F, Shayanpour S, Seifollah Beladi Mousavi S. Diabetes and end-stage renal disease; a review article on new concepts. J Renal Inj Prev. 2015;4(2).

Anemia among Chinese patients with chronic kidney diseaseand its association with quality of life: results from the Chinese cohort study of chronic kidney disease(C-STRIDE). BMC Nephrol. 2021;22:??? doi:10.1186/s12882-02102247-8.

Arantes LH Jr, Crawford J, Gascon P, et al. A quick scoping review of efficacy, safety, economic, and health-related quality-of-life outcomes of short- and longacting erythropoiesis-stimulating agents in the treatment of chemotherapyinduced anemia and chronic kidney diseaseanemia. Crit Rev Oncol Hematol. 2018;129:79-90.

Artom M, Moss-Morris R, Caskey F, Chilcot J. Fatigue in advanced kidney disease. Kidney Int. 2014;86(3):497-505.

Bohlke M, Nunes DL, Marini S, Kitamura M, Andrade M, Von-Gysel MP. Predictors of quality of life among patients on dialysis in southern Brazil. Sao Paulo Med J. 2008;126(5):252-526.

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379
Ashiq et al - 2026
DOI: http://doi.org/10.5281/zenodo.20508750

Chen L, et al. The impact of hemoglobin on physical activity and quality of life in predialysis chronic kidney disease. BMC Nephrol. 2023;24:199.

Clement FM, et al. The impact of selecting a high hemoglobin target level on health-related quality of life for patients with chronic kidney disease: a systematic review and meta-analysis. Arch Intern Med. 2009;169(12):1102-1110.

Clyne N, Jogestrand T, Lins LE, Pehrsson SK. Progressive decline in renal function induces a gradual decrease in total hemoglobin and exercise capacity. Nephron. 1994;67(3):322-326.

CKD evaluation and management updates. New York: National Kidney Foundation; 2023

Dasgupta I, et al. Anaemia and health-related quality of life in chronic kidney disease: A consensus review on management strategies. Clin Kidney J. 2024;17(8):sfae205. doi:10.1093/ckj/sfae205.

Evans RW, Manninen DL, Garrison LP, et al. The quality of life of patients with end-stage renal disease. N Engl J Med. 1985;312(9):553-9.

EQ-5D user guide. Rotterdam: EuroQol Research Foundation; 2023.

Farag YMK, Blasco-Colmenares E, Zhao D, et al. Effect of anemia on physical function and physical activity in chronic kidney disease: The National Health and

Nutrition Examination Survey, 1999-2016. Kidney360. 2023;4(9):e1212–e1222. doi:10.34067/KID.0000000000000218.

Finkelstein FO, et al. Health-Related Quality of Life and Hemoglobin Levels in Chronic kidney diseasePatients. Clin J Am Soc Nephrol. 2009;4(1):33-39.

Gadaen RJR, Kooman JP, Cornelis T, van der Sande FM, Winkens BJ, Broers NJH. The effects of chronic dialysis on physical status, quality of life, and arterial stiffness: A longitudinal study in prevalent dialysis patients. Nephron. 2021;145:44–54.

Gonzalez A, et al. Anemia and functional limitations among elderly patients with chronic kidney disease. Age Ageing. 2024;53(3):afad030.

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379
Ashiq et al - 2026
DOI: http://doi.org/10.5281/zenodo.20508750

Guedes M, et al. Physical health-related quality of life at higher achieved hemoglobin levels among chronic kidney diseasepatients: a systematic review and meta-analysis. BMC Nephrol. 2020;21(1):259.

Gupta A, et al. Effect of anemia severity on activities of daily living in chronic kidney diseasepatients. J Nephrol. 2023;36(6):1443–1451.

Guideline on haemoglobin cut-offs to define anaemia. Geneva: World Health Organization; 2023.

Global kidney health atlas. Brussels: International Society of Nephrology; 2023.

Hanna RM, Streja E, Kalantar-Zadeh K. Burden of Anemia in Chronic Kidney Disease: Beyond Erythropoietin. Adv Ther. 2021;38(1):52-75.

Hanna RM, Streja E, Kalantar-Zadeh K. Burden of Anemia in Chronic Kidney Disease: Beyond Erythropoietin. Adv Ther. 2021;38:52–75.

Hasibuan S, et al. Profile of anemia and the relationship between hemoglobin levels and quality of life in end-stage chronic kidney diseasepatients undergoing hemodialysis. Indones J Kidney Hypertens. 2024;7(1):1–8.

Hays RD, Kallich JD, Mapes DL, Coons SJ, Carter WB. Development of the kidney disease quality of life (KDQOL) instrument. Qual Life Res. 1994;3(5):329-38.

Hoshino J, Muenz D, Zee J, et al. Associations of Hemoglobin Levels With Health-Related Quality of Life, Physical Activity, and Clinical Outcomes in Persons With Stage 3-5 Nondialysis CHRONIC KIDNEY DISEASE. J Ren Nutr. 2020;30(3):188-197.

Ibrahim H, et al. Associations between anemia and musculoskeletal pain in chronic kidney disease. Pain Med. 2022;23(9):1640–1648.

Johansen KL, Finkelstein FO, Revicki DA, et al. Systematic review of the impact of erythropoiesis-stimulating agents on fatigue in dialysis patients. Nephrol Dial Transplant. 2012;27(6):2418-25.

Kim JH, et al. Effects of anemia severity on fatigue and quality of life in chronic kidney disease. J Clin Med. 2023;12(8):2345.

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379

DOI: http://doi.org/10.5281/zenodo.20508750

Klang B, Clyne N. Well-being and functional ability in uraemic patients before and after having started dialysis treatment. Scand J Caring Sci. 1997;11(3):159166.

Kotenko S, et al. Anemia and quality of life of chronic kidney diseasepatients on renal replacement therapy by programmed hemodialysis. Terapevticheskii Arkhiv. [Year];[Volume(Issue)]:[Pages].

Lee JY, et al. Relationship between hemoglobin target levels and functional outcomes in chronic kidney diseasepatients. Nephron Clin Pract. 2022;148(2):107–116.

lexander M, et al. Association of anemia correction with health-related quality of life in patients not on dialysis (darbepoetin alfa studies). Am J Kidney Dis. 2007;50(5):701-710.

Locatelli F, Pisoni RL, Combe C, et al. Anaemia in haemodialysis patients of five European countries: association with morbidity and mortality in the Dialysis Outcomes and Practice Patterns Study (DOPPS). Nephrol Dial Transplant. 2004;19(1):121-32.

López-Sánchez G, et al. Hemoglobin status and energy expenditure among chronic kidney diseasepatients. Eur J Nutr. 2023;62(5):2849–2858.

Mactier Davies S, Hrdrn ,Jones C,et al.Summery of the 5th edition of the Reanal Association Clincal Practice Guidline (2009-20112). Nephron Clin Pract 2011;118 Suppl 1:c27-c70.

Martinez-Lopez J, et al. Anemia, sleep disturbances, and quality of life in chronic kidney disease. Sleep Med. 2024;85:209–217.

Mollaoglu M. Quality of Life in Patients Undergoing Hemodialysis: hemodialysis [dissertation]. Cumhuriyet University; 2013.

Muirhead N, Keown PA, Churchill DN, et al. Dialysis patients treated with Epoetin alpha show improved exercise tolerance and physical function: a new analysis of the Canadian Erythropoietin Study Group trial. Hemodial Int.

2011;15(1):87-94.

Müller S, et al. Association of anemia and muscle strength with physical quality of life in chronic kidney diseasepatients. J Ren Care. 2024;50(1):45–54.

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379

DOI: http://doi.org/10.5281/zenodo.20508750

Nguyen D, et al. Role of hemoglobin in functional recovery after hospitalization among chronic kidney diseasepatients. J Hosp Med. 2022;17(10):735–742.

Okoro RN, Adibe MO, Okonta MJ, Ummate I, Ohieku JD, Yakubu SI.

Assessment of health-related quality of life and its determinants in pre-dialysis patients with chronic kidney disease. Int Urol Nephrol. 2021;54:165–172.

Okubo R, et al. Association of anemia and iron deficiency with health-related quality of life in patients with non-dialysis chronic kidney disease: A subanalysis of the REACH-J CHRONIC KIDNEY DISEASEcohort. BMC Nephrol.

Ortiz A, et al. Impact of anemia treatment on physical function and quality of life in chronic kidney disease. Kidney Int Rep. 2023;8(4):822–831.

oshino J, Muenz D, Zee J, et al. Associations of Hemoglobin Levels With Health-Related Outcomes in CHRONIC KIDNEY DISEASE. J Ren Nutr. 2020;30(3):188-197.

Parker KP, et al. Hemoglobin and physical functioning in chronic kidney disease: findings from a longitudinal cohort. Clin J Am Soc Nephrol. 2021;16(3):412– 421.

Peter P, Paul LK. Aspects of quality of life in haemodialysis patients. Clin J Am Soc Nephrol. 2010;5:163-166.

Peterson GM, et al. Relationship between hemoglobin levels and physical functional reserve in chronic kidney disease. Clin Rehabil. 2023;37(4):567–575.

Physical health and well-being concepts. Atlanta: Centers for Disease Control and Prevention; 2024.

Rodríguez M, et al. Hemoglobin concentration, cardiovascular fitness, and quality of life in chronic kidney disease. Clin Physiol Funct Imaging. 2023;43(7):662–670.

Sathvik BS, Parthasarathi G, Narahari MG, Gurudev KC. An assessment of the quality of life in hemodialysis patients using the WHOQOL-BREF questionnaire.

Indian J Nephrol. 2008;18(4):141-149.

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379

DOI: http://doi.org/10.5281/zenodo.20508750

Sato T, et al. Hemoglobin levels and participation in daily work activities among adults with chronic kidney disease. BMC Public Health. 2023;23:112.

Shukur MH, Kumat H. Impact of anemia on health-related quality of life in hemodialysis patients: A multicenter cohort study. Nurs J. 2024;7(2):E435–E442.

Silverstein DM, et al. The relationship between anemia severity and fatigue in chronic kidney disease: a multicenter observational study. Kidney Int Rep. 2022;7(5):1023–1032.

Singh R, et al. Association of anemia with symptom burden and quality of life in chronic kidney disease: A cross-sectional study. J Ren Care. 2022;48(2):123– 131.

Spinowitz B, Pecoits-Filho R, Winkelmayer WC, et al. Economic and quality of life burden of anemia on patients with CHRONIC KIDNEY DISEASEon dialysis: a systematic review. J Med Econ. 2019;22(7):593-604.

Stauffer ME, Fan T. Prevalence of anemia in chronic kidney diseasein the United States. PLoS One. 2014;9(1):e84943.

Tao X, Zhang H, Huang J, Gu A, Jin Y, He Y, Li N, Yang Y. Physical performance and health-related quality of life among older adults on peritoneal dialysis: A cross-sectional study. Int Urol Nephrol. 2021;53:1033–1042.

Tesfaye WH, McKercher C, Peterson GM, Castelino RL, Jose M, Zaidi STR, Wimmer BC. Medication adherence, burden and health-related quality of life in adults with predialysis chronic kidney disease: A prospective cohort study. Int J

Environ Res Public Health. 2020;17:371.

van Haalen H, Jackson J, Spinowitz B, et al. Impact of chronic kidney diseaseand anemia on health-related quality of life and work productivity: analysis of multinational real-world data. BMC Nephrol. 2020;21:327. doi:10.1186/s12882020-01746-4.

Wong MMY, Tu C, Li Y, Perlman RL, Pecoits-Filho R, Lopes AA, et al. Anemia and iron deficiency among chronic kidney diseasestages 3-5ND patients in the Chronic kidney diseaseOutcomes

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and Practice Patterns Study: often unmeasured, variably treated. Clin Kidney J. 2020;13(2):213-225.

Wu YH, Hsu YJ, Tzeng WC. Physical activity and health-related quality of life of patients on hemodialysis with comorbidities: A cross-sectional study. Int J Environ Res Public Health. 2022;19:811.

Yamamoto T, et al. Association of hemoglobin levels with exercise tolerance and health-related quality of life in chronic kidney disease: A cross-sectional study. Ren Fail. 2022;44(1):339–347.

Zhang L, et al. Relationship between hemoglobin levels and objectively measured physical activity in chronic kidney disease. BMC Nephrol. 2022;23:98.