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Prevalence of Malnutrition Among Patients Undergoing Dialysis in Sana'a, Yemen

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Abstract:

Malnutrition is a serious complication among patients undergoing dialysis, increasing morbidity and mortality. In Yemen, data on the nutritional status of dialysis patients are limited, restricting effective interventions. This cross-sectional descriptive study assessed malnutrition prevalence and associated factors among 103 patients aged ≥12 years receiving hemodialysis for at least three months at Al-Thawra and Al-Motawakel hospitals in Sana'a. Nutritional status was evaluated using the Subjective Global Assessment (SGA), and sociodemographic, clinical, and lifestyle data were collected via structured questionnaires. Data were analyzed with SPSS v26, and associations were tested using chi-square ($p<0.05$). Results showed 38.8% of patients were malnourished, 33.0% at risk, and 28.2% well-nourished. Malnutrition was more common among younger and middle-aged adults, those with lower education, and patients sleeping 2–4 hours ($p=0.003$), but was not associated with gender or dialysis frequency. These findings highlight the need for routine nutritional assessment and targeted interventions to improve dietary management, clinical outcomes, and quality of life in Yemeni dialysis patients.

Keywords:

Malnutrition, Dialysis, Chronic Kidney Disease, Yemen, Nutritional Assessment, Subjective Global Assessment, Risk Factors

الكلمات المفتاحية
سوء التغذية، الغسيل الكلوي، مرض الكلى المزمن، اليمن، تقييم التغذية، التقييم الشامل الذاتي، عوامل الخطر

1. Introduction

The global prevalence of chronic kidney disease (CKD) is rising at an estimated annual rate of 7%, representing a major public health challenge worldwide z(Francis et al., 2024). Diabetes mellitus, glomerulonephritis, and hypertension are the leading causes of CKD, accounting for more than 75% of adult cases (Collins et al., 2013). Among patients undergoing hemodialysis, malnutrition is a common and serious complication and is strongly associated with increased morbidity and mortality. Protein–energy wasting (PEW) is a well-established predictor of adverse clinical outcomes, emphasizing the importance of early nutritional assessment and intervention (Dukkipati & Kopple, 2009; de Mutsert et al., 2009).

Malnutrition in hemodialysis patients is multifactorial. Reduced appetite, medication-related side effects, restrictive therapeutic diets, and increased energy expenditure during dialysis sessions estimated to rise by approximately 20% all contribute to nutritional deterioration (Neyra et al., 2003; Chung et al., 2012). Additionally, metabolic and hormonal abnormalities, including insulin resistance, chronic inflammation, low triiodothyronine levels, and metabolic acidosis, promote protein catabolism and further impair nutritional status (Carrero et al., 2007; Price et al., 2010; de Brito-Ashurst et al., 2009; Wang & Ye, 2015).

Patients receiving hemodialysis frequently present with multiple comorbidities and experience functional decline, particularly among older adults, leading to reduced food intake and progressive malnutrition (Pupim et al., 2005; Kurella Tamura et al., 2009). Impaired functional status has been associated with an increased risk of mortality in this population (Jassal et al., 2016). Early identification of malnutrition and timely nutritional intervention are therefore essential to improve clinical outcomes (Ikizler et al., 2013). Although direct data on the prevalence of malnutrition among patients undergoing dialysis in Sana'a, Yemen are limited, evidence from nutritional research conducted in the same setting indicates a high burden of malnutrition among vulnerable populations. A study on stunting among primary school children in Sana'a City reported a high prevalence of chronic undernutrition associated with poor dietary intake and socioeconomic factors, reflecting widespread nutritional challenges in the community (Alsebaeai,

ترجمة الى العربية

مدى انتشار سوء التغذية بين المرضى الخاضعين للغسيل الكلوي في صنعاء، اليمن

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2025

الملخص

يُعد سوء التغذية أحد المضاعفات الشائعة والخطيرة لدى المرضى الخاضعين للغسيل الكلوي، إذ يسهم بشكل كبير في ارتفاع معدلات المراضة والوفيات. وفي اليمن، لا تزال البيانات المتعلقة بالحالة التغذوية لمرضى الغسيل الكلوي محدودة، مما يعيق تطوير تدخلات علاجية فعّالة. هدفت هذه الدراسة إلى تقدير مدى انتشار سوء التغذية بين مرضى الغسيل الكلوي في عدد من مستشفيات صنعاء، وتقييم حالتهم التغذوية باستخدام أدوات تقييم معتمدة، إضافةً إلى تحديد العوامل المرتبطة بسوء التغذية لدعم تصميم تدخلات موجهة.

أُجريت دراسة وصفية مستعرضة لمدة ثلاثة أشهر في مستشفى الثورة ومستشفى المتوكل، شملت 103 مرضى تبلغ أعمارهم 12 عامًا فأكثر ممن يتلقون الغسيل الدموي منذ ما لا يقل عن ثلاثة أشهر. تم تقييم الحالة التغذوية باستخدام التقييم الشامل الذاتي (SGA)، فيما جُمعت البيانات الاجتماعية والديموغرافية والسريرية ونمط الحياة عبر استبيانات منظمة. تم تحليل البيانات باستخدام برنامج SPSS الإصدار 26، وتحديد الارتباطات بين المتغيرات عبر اختبار كاي-تربيع عند مستوى دلالة $p<0.05$.

أظهرت النتائج أن 38.8٪ من المشاركين كانوا يعانون من سوء التغذية، و33.0٪ كانوا معرضين له، بينما تمتع 28.2٪ بتغذية جيدة. وتركز سوء التغذية بين البالغين الأصغر سنًا وذوي التعليم المحدود، وكذلك لدى من يعانون من قصر مدة النوم (2–4 ساعات؛ $p=0.003$). ولم تُسجل علاقة ذات دلالة إحصائية بين الحالة التغذوية والجنس أو تكرار الغسيل.

تنسجم هذه النتائج مع الأدبيات الدولية التي تشير إلى ارتفاع معدلات سوء التغذية بين مرضى الغسيل الكلوي. وتبرز الدراسة الحاجة الملحّة لإجراء تقييم تغذوي دوري وتفعيل تدخلات مستهدفة لتحسين الإدارة الغذائية والنتائج السريرية وجودة الحياة لدى هذه الفئة.

Karthami, et al., 2025). Similarly, an investigation of the nutritional status of children living in orphanages in Sanaa found considerable levels of malnutrition linked to inadequate dietary diversity and limited access to healthcare services (Alsebaeai, Al-Rahbi, et al., 2025). In addition, research examining the prevalence of pica disorder among pregnant women in Sana'a documented significant nutritional and micronutrient deficiencies, further highlighting the persistence of malnutrition among high-risk groups (Alsebaeai, Al-Qubati, et al., 2025).

In Yemen, prolonged conflict and severe socioeconomic challenges have significantly weakened healthcare infrastructure and food security. Dialysis patients in Sana'a face additional barriers, including high treatment costs, limited access to specialized nutritional care, and the absence of standardized nutritional assessment protocols. Despite these challenges, data on the prevalence and determinants of malnutrition among dialysis patients in this setting remain scarce. Therefore, this study aims to determine the prevalence of malnutrition among patients undergoing dialysis in selected hospitals in Sana'a, Yemen, evaluate their nutritional status using validated assessment tools, and identify key factors associated with malnutrition to inform targeted interventions and improve patient outcomes.

2. Research methodology

2.1. Study design

This cross-sectional descriptive study was conducted over a four-month period at two major dialysis centers in Sana'a, Yemen: Al-Thawra and Al-Motawakel hospitals. These centers provide routine hemodialysis services to patients from diverse demographic and socioeconomic backgrounds, making them representative of the local dialysis population.

2.2. Study Setting

The study population comprised patients aged ≥12 years who were receiving hemodialysis during the study period. Patients were eligible if they had been undergoing dialysis for at least three months and provided informed consent. Exclusion criteria included terminal illness.

2.3. Sample Size and Sampling

A total of 103 patients were recruited using a convenience sampling method over a four-month period. The sample size was determined based on prevalence estimates from previous studies and adjusted to reflect feasibility and the planned study duration (Hensrud, 1999; Detsky et al., 1987).

2.4. Variables

The primary outcome variable was nutritional status, categorized according to Subjective Global Assessment (SGA) scores. Independent variables included Gender, Age of participant, Residence area, Level of education, Sleeping hours Frequency of dialysis, dialysis duration.

2.5. Data Sources and Measurement

Data were collected using a structured questionnaire and the SGA, a validated nutritional assessment tool. The SGA was administered by trained healthcare professionals based on clinical history and physical examination (Detsky et al., 1987).

2.6. Bias

To minimize information bias, data collection was performed by trained personnel using standardized instruments.

2.7. Statistical Methods

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics (frequencies, percentages) were used to summarize participant characteristics. The prevalence of malnutrition was estimated based on SGA classification. Associations between malnutrition and selected variables were assessed using chi-square tests, where appropriate. Statistical significance was set at $p < 0.05$.

2.8. Ethical Considerations

Ethical approval was obtained from the Lebanese International University and the administrative authorities of Al-Thawra and Al-Motawakel hospitals. Written informed consent was obtained from all participants prior to data collection. Participant confidentiality and data anonymity were ensured throughout the study.

3. Results and Discussion

3.1. Demographic Characteristics and Other Factors Distribution

Table 1 presents the socio-demographic characteristics of the study population (n = 103). The findings indicate a higher proportion of male participants (62.1%) compared to females (37.9%). This gender disparity is consistent with dialysis populations in the Middle East, such as in Saudi Arabia (Alsuwaida et al., 2010) and Egypt (Ebazaway et al., 2015), and aligns with global registry data showing a higher prevalence of males receiving renal replacement therapy. This pattern may reflect a combination of higher CKD prevalence among males, gender-based differences in healthcare-seeking

behavior, and unequal access to dialysis services in Yemen.

Regarding age distribution, the majority of participants were middle-aged adults, with 41.7% aged 41–60 years and 36.9% aged 21–40 years, while smaller proportions were observed among younger (≤20 years, 11.7%) and older (>60 years, 9.7%) age groups. This concentration in productive middle years contrasts with patterns in high-income countries where the dialysis population is predominantly older (≥65 years) (Pippias et al., 2015), but mirrors findings from neighboring Oman, where the mean age of dialysis patients is similarly lower (Al Ismaili et al., 2017). This suggests CKD requiring dialysis in Yemen predominantly affects younger, working-age adults, potentially imposing a more severe socioeconomic burden.

In terms of residence, most participants resided in urban areas (78.6%), whereas only 21.4% were from rural settings. This urban predominance is commonly observed in developing nations due to centralized healthcare infrastructure and has been reported in similar studies from Pakistan (Rizvi & Anwar Naqvi, 1996). It likely reflects significant barriers to accessing sustained dialysis therapy in rural Yemen.

Educational status varied among participants, with nearly one-third being uneducated (29.1%), while the remaining participants had primary (20.4%), high school (27.2%), or college-level education (23.3%). The high rate of limited formal education is a notable risk factor, as lower educational attainment is strongly associated with poor health literacy and adverse outcomes in CKD patients globally (Taylor et al., 2018). This characteristic may critically influence dietary adherence and disease management understanding, increasing vulnerability to the poor nutritional status under investigation.

Table 1 : Socio-Demographic characteristics of the population of the study (n=103)

Variable	Number of participate	Percentage of participate
Gender		
Male	64	62.1%
Female	39	37.9%
Age of participant		
12-20 years	12	11.7%
21-40 years	38	36.9%
41-60 years	43	41.7%
>60 years	10	9.7%
Residence area		
City	81	78.6%
Country side	22	21.4%
Level of education		
Uneducated	30	29.1%
Primary	21	20.4%
High school	28	27.2%
College	24	23.3%
Sleeping hours		
2-4 hours	62	60.2%
4-8 hours	41	39.8%
Frequency of dialysis		
Once per week	3	2.9%
Twice per week	91	88.3%
Thrice per week	8	7.8%
>3 times per week	1	1.0%

Regarding sleep duration, a concerning pattern was observed: 60.2% of participants (n=62) reported sleeping only 2–4 hours per night, whereas 39.8% (n=41) slept 4–8 hours, within the typical healthy range. The high prevalence of short sleep duration may indicate sleep disturbances or poor sleep quality, potentially exacerbated by the physical and emotional demands of chronic kidney disease and dialysis, highlighting a critical area for further investigation and intervention

The majority of participants (88.3%, n=91) undergo dialysis twice per week, making it the most common treatment frequency, while smaller proportions undergo dialysis three times weekly (7.8%, n=8), once per week (2.9%, n=3), or more than three times per week (1.0%, n=1), suggesting that twice-weekly sessions reflect the standard or medically recommended frequency, with variations likely due to disease severity, access to care, or individualized treatment plans.

3.2. The prevalence of malnutrition among kidney patients undergoing dialysis

Table 2 The nutritional status of kidney patients in Yemen, based on our study (n=103), showed that 28.2% were well-nourished, 33.0% were at risk of malnutrition, and 38.8% were malnourished. When compared to international studies, this prevalence of malnutrition and risk of malnutrition is relatively consistent with findings from other countries. For example, Freitas et al. (Freitas et al., 2014) reported that 22.4% of hemodialysis patients in Brazil had mild to moderate malnutrition, while Ghorbani et al. (Ghorbani et al., 2020) found 18.8% mild-to-moderate and 10.9%

severe malnutrition among patients in Iran. In Jordan, Tayyem & Mrayyan (Tayyem & Mrayyan, 2008), observed that 56.2% of patients were moderately malnourished, with only 38.2% well-nourished, similar to the Yemeni cohort's proportion of normal nutrition.

Table 2 : The prevalence of malnutrition among kidney patients undergoing dialysis in Yemen (n=103)

Variable	Number of participate	Percentage of participate
Nutritional state		
Normal	29	28.2%
Risk of malnutrition	34	33.0%
Malnourished	40	38.8%

In Palestine, Badrasawi et al. (Badrasawi et al., 2021), reported 45.4% at high risk of malnutrition, while in Bangladesh, Reza et al. (Reza et al., 2018), found high rates of malnutrition linked to inadequate protein and energy intake. Nigerian patients also showed high malnutrition prevalence (Liman et al., 2015), and Vietnamese patients exhibited 73.7% mild-to-moderate malnutrition (Pham Thi Lan et al., 2024). Elderly dialysis patients in Italy were found to have 10–30% moderate-to-severe malnutrition[33]. Overall, the Yemeni findings are consistent with the global trend indicating a high prevalence of malnutrition among kidney patients undergoing dialysis, with a substantial proportion at risk, emphasizing the need for routine nutritional assessment and interventions. These comparisons also suggest that variations in malnutrition prevalence may reflect differences in socioeconomic factors, dietary intake, dialysis duration, and healthcare resources.

3.3. The Relationship between Nutritional Status and different factors among kidney patients

The present study assessed the nutritional status of 103 patients undergoing dialysis in Yemen and explored its association with demographic and lifestyle factors. According to Table 3, 17.5% of patients aged 12–20 years were malnourished, whereas 25% of patients aged 41–60 years and 12.5% of patients older than 61 years were malnourished. Although the association between age and malnutrition was not statistically significant (p=0.071), a trend was observed showing higher prevalence of malnutrition among younger and middle-aged adults, with relatively lower rates in elderly patients.

This trend partially aligns with the findings of Freitas et al. (2014) in Brazil, who reported higher malnutrition prevalence in patients under 29 years, suggesting that younger dialysis patients may be more vulnerable to nutritional deficits due to inadequate caloric and protein intake and longer dialysis vintage. Similarly, Ghorbani et al. (Ghorbani et al., 2020) reported a significant association between age and nutritional status, with younger patients showing higher malnutrition risk, consistent with our findings. Conversely, (Badrasawi et al., 2021) emphasized that elderly dialysis patients are also at high risk for malnutrition due to cardiovascular instability and dialysis-related complications, highlighting a possible difference between Yemeni and European/Western elderly populations, potentially related to socio-economic and lifestyle factors.

Regarding gender, our study found that 50% of females were malnourished compared to 50% of males, with a p-value of 0.085, indicating no statistically significant gender difference. This differs from Ghorbani et al. (Ghorbani et al., 2020), who reported a significant correlation between female gender and malnutrition, and Reza et al. [30], who highlighted gender differences in biochemical parameters such as albumin and hemoglobin contributing to malnutrition. Such discrepancies may reflect cultural, dietary, and healthcare access differences in the Yemeni population.

Educational level was significantly associated with nutritional status (p=0.023), with college-educated patients showing the lowest prevalence of malnutrition (15%) and uneducated patients showing the highest (35%). This finding supports the global evidence that higher education correlates with better nutritional knowledge and adherence to dietary recommendations (Freitas et al., 2014).

Interestingly, frequency of dialysis sessions in our study was not significantly associated with malnutrition (p=0.905), a finding consistent with Ghorbani et al. (Ghorbani et al., 2020)who also reported no significant correlation between weekly dialysis frequency and malnutrition status. This suggests that factors beyond dialysis frequency, such as dietary intake, inflammation, and comorbidities, may play a more critical role in nutritional outcomes.

Table 3 : The Relationship between Nutritional Status and different factors among kidney patients

p-value	Nutritional status			Variable (number of participates)
	Malnourished	Risk of malnutrition	Normal	
		Age		
0.071	7(17.5%)	5(14.7%)	0(0.0%)	12-20 years
	18(45.0%)	9(26.5%)	11(37.9%)	21-40 years
	10(25.0%)	17(50.0%)	16(55.2%)	41-60 years
	5(12.5%)	3(8.8%)	2(6.9%)	> 61 years
		Gender		
0.085	20(50.0%)	12(35.3%)	7(24.1%)	Female
	20(50.0%)	22(64.7%)	22(75.9%)	Male
		Residence area		
0.497	30(75.0%)	26(76.5%)	25(86.2%)	City
	10(25.0%)	8(23.5%)	4(13.8%)	Country side
		Educational level		
0.023	14(35.0%)	10(24.9%)	6(20.7%)	Uneducated
	11(27.5%)	5(41.2%)	5(17.2%)	Primary level
	9(22.5%)	14(41.2%)	5(17.2%)	Highschool
	6(15.0%)	5(14.7%)	13(44.8%)	College
		Frequency of dialysis		
0.905	1(2.5%)	1(2.9%)	1(3.4%)	Once/week
	34(85.0%)	31(91.2%)	26(89.7%)	Twice/week
	4(10.0%)	2(5.9%)	2(6.9%)	Thrice/week
	1(2.5%)	0(0.0%)	0(0.0%)	> Thrice/week
		Sleeping hours		
0.003	29(72.5%)	23(67.6%)	10(34.5%)	2-4 hours
	11(27.5%)	11(32.4%)	19(65.5%)	4-8 hours

Sleep duration, however, showed a significant association with nutritional status (p=0.003), with patients sleeping 2–4 hours exhibiting higher rates of malnutrition. While sleep is less frequently assessed in dialysis nutrition studies, this finding aligns with the notion that poor sleep may exacerbate catabolic processes, hormonal imbalance, and appetite reduction, indirectly contributing to malnutrition.

Overall, the prevalence of malnutrition in the Yemeni dialysis cohort appears high, consistent with international studies: Freitas et al. (Freitas et al., 2014) reported 22.4% malnutrition in Brazilian patients, Ghorbani et al. (Ghorbani et al., 2020) found 18.8% mild to moderate malnutrition in Iran, and Lan et al. (Pham Thi Lan et al., 2024), observed 73.7% mild to moderate malnutrition in Vietnam. Variability in prevalence rates across studies may be attributed to differences in assessment tools (SGA vs. Dialysis Malnutrition Score), socio-economic conditions, dietary practices, dialysis quality, and comorbidity profiles.

These findings underscore the urgent need for targeted nutritional interventions among Yemeni dialysis patients, particularly focusing on younger adults, patients with low educational levels, and those with inadequate sleep. Periodic assessment of nutritional status using validated tools is essential to mitigate morbidity and improve quality of life in this population.

4. Conclusion

Malnutrition is highly prevalent among patients undergoing dialysis in Sana'a, Yemen, with a substantial proportion also at risk. Younger and middle-aged adults, patients with lower educational levels, and those with inadequate sleep were particularly vulnerable. Gender and dialysis frequency did not significantly influence nutritional status. These findings emphasize the need for routine nutritional assessment and targeted interventions to improve dietary management, clinical outcomes, and quality of life among dialysis patients in Yemen.

5. Limitations of the Study

This study has several limitations. Its cross-sectional design prevents causal inferences, and the use of convenience sampling from only two dialysis

centers may limit generalizability. Some data, such as dietary intake and sleep duration, were self-reported, introducing potential bias, and biochemical measurements were limited. Despite these constraints, the study provides important insights into malnutrition prevalence and associated factors among dialysis patients in Yemen.

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