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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2026;15(4):1602-8

Association of vascular access type with quality of life and access-related complications in hemodialysis patients: A cross-sectional study

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Received 04 September 2026; Accepted 02 November 2026
Available online 28 November 2026 with doi: 10.5455/medscience.2026.09.202

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Abstract

To investigate the associations of vascular access type (arteriovenous fistula (AVF) versus permanent catheter) with health-related quality of life and access-related complications in patients receiving maintenance hemodialysis. In this single-center, cross-sectional study, 100 adults receiving hemodialysis for at least 3 months were included (AVF, n = 68; permanent catheter, n = 32). Quality of life was assessed with the Turkish version of the Short Form-36 (SF-36). Access-related infection, thrombosis, hospitalization, and intensive care admission during the preceding 12 months were recorded. Permanent catheter use was associated with higher frequencies of access-related infection (43.8% vs. 11.8%; adjusted odds ratio (OR) 4.38, 95% confidence interval (CI) 1.47 – 12.98) and hospitalization (43.8% vs. 13.2%; adjusted OR 4.65, 95% CI 1.56 – 13.84). Intensive care admission occurred in 3 catheter patients and none of the AVF patients (Fisher's P = 0.031). Vitality scores were lower in the catheter group (mean difference -11.2 (-19.3 to -3.1) points; P = 0.007), but this finding did not remain significant after correction for eight domains (Holm-adjusted P = 0.059) and is considered exploratory. No clear differences were observed in the other domains, although CIs were wide. In this cross-sectional study, permanent catheter use was associated with more access-related infections and hospitalizations than AVF use, in line with current guidance. Quality-of-life differences, notably in vitality, were exploratory and cannot be interpreted causally. Larger prospective studies with prespecified outcomes are needed.

Keywords: Renal dialysis; arteriovenous shunt, surgical; catheters; vascular access devices; quality of life; health surveys

Introduction

Chronic kidney failure requiring renal replacement therapy places a substantial burden on healthcare systems worldwide, and hemodialysis remains the modality most commonly used to manage it. A durable, well-functioning vascular access is essential for effective dialysis delivery. Contemporary guidelines favor arteriovenous fistula (AVF) over central venous catheters whenever anatomically feasible, largely because of its longer functional survival and lower rate of access-related complications [1].

Beyond hard clinical endpoints such as infection and access longevity, health-related quality of life has gained recognition as a central patient-reported outcome in dialysis care. The Short Form-36 (SF-36) captures several dimensions of wellbeing, including physical capacity, role limitations, pain, energy, social participation, and emotional health. Evidence linking access type to SF-36 outcomes is not uniform: some reports describe a quality-of-life advantage for AVF, particularly in vitality and mental health, whereas others have found no meaningful difference or a mixed picture in which some aspects favor catheters [2,3].

Several features of the existing literature motivated the present study. Dialysis duration usually differs between patients with a mature fistula and those dialyzing through a catheter, and this difference is not always accounted for when quality of life is compared. In addition, objectively recorded access-related complications and domain-level patient-reported outcomes have seldom been examined together in the same cohort with effect estimates and explicit attention to multiplicity across the eight SF-36 domains. Finally, data from Turkish dialysis populations remain limited [4].

CITATION
Tanburoglu DB. Association of vascular access type with quality of life and access-related complications in hemodialysis patients: A cross-sectional study. Med Science. 2026;15(4):1602-8.

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DOI: 10.5455/medscience.2026.09.202

The aim of this study was therefore to describe the associations of vascular access type (AVF versus permanent catheter) with SF-36-assessed quality of life and with access-related complications in a cohort of hemodialysis patients, with adjustment for dialysis duration and other covariates. We hypothesized that catheter use would be associated with a higher frequency of complications and lower quality-of-life scores; because no single primary SF-36 domain was prespecified, domain-level analyses are reported as exploratory.

Material and Methods

Study Design and Reporting

This was a single-center, cross-sectional observational study. It is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [5]; the completed checklist is provided as a supplementary file. Questionnaires and patient interviews were conducted in July 2026, and laboratory values were taken from the routine dialysis assessments of the first week of July 2026. The study took place at a hemodialysis center affiliated with a tertiary-care training and research hospital. The study was approved by the Scientific Research Ethics Committee of Adana City Training and Research Hospital (Meeting No. 27, Decision No. 1470, dated 25 June 2026) and was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants.

Participants and Sampling

Patients aged 18 years or older who had been receiving regular hemodialysis for at least 3 months and who provided written informed consent were eligible. All eligible patients at the center (n = 150) were invited to complete the questionnaire during the study period, and those who agreed were enrolled (convenience sampling). Of the 150 invited patients, 100 (66.7%) accepted and were included in the analysis, and 50 did not take part because they or their relatives did not wish to participate; no information on non-participants was collected.

No a priori sample size calculation was performed; the sample comprised the eligible patients who consented during the study period. A sensitivity calculation showed that, with 68 and 32 patients per group, the study had 80% power (two-sided $\alpha = 0.05$) to detect a standardized mean difference of approximately 0.61 SD, so smaller differences may have gone undetected.

Data Collection and Definitions

Sociodemographic characteristics (age, sex, education, marital status, employment), dialysis-related characteristics (dialysis duration, weekly sessions, residual renal function, whether hemodialysis was initiated through a catheter), and comorbidities (diabetes mellitus, hypertension, cardiovascular disease) were obtained from patient records and interviews and entered into a standardized data form. Laboratory parameters (hemoglobin, albumin, Kt/V, urea, creatinine, phosphorus, parathyroid hormone (PTH)) were obtained from the patients' routine monthly hemodialysis assessment tests performed in the first week of July 2026.

Vascular access type was the access used for dialysis at the time of assessment (AVF or permanent tunneled catheter); no patient was using a temporary catheter. Access duration was the time from creation of the AVF or insertion of the catheter to the assessment. Access-related infection was defined as a clinician-diagnosed exit-site, tunnel, or bloodstream infection related to the vascular access, documented in the patient record and treated with antibiotics. Access thrombosis was defined as documented thrombosis of the access requiring thrombolysis, thrombectomy, or access replacement. Hospitalization was defined as any all-cause hospital admission of at least 24 hours, and intensive care unit (ICU) admission as any admission to an ICU during the preceding year. All four events were recorded for the 12 months preceding the assessment, irrespective of the access in use when the event occurred.

One patient had a missing PTH value, and PTH was therefore analyzed for 99 patients (complete-case analysis); all other variables were complete. Serum albumin is reported in g/L by the center laboratory and was analyzed in g/dL; one value had been entered in g/L (32 g/L) and was converted to 3.2 g/dL.

Assessment of Quality of Life

Quality of life was assessed with the SF-36 [6]. The original SF-36 (version 1.0, with the dichotomous yes/no response format for the role-physical and role-emotional items) was used in its Turkish adaptation, which was validated by Koçyiğit et al. [7]. The instrument comprises eight domains: general health, physical functioning, role-physical, role-emotional, social functioning, bodily pain, vitality, and mental health. Each subscale was linearly transformed to a 0 – 100 scale according to the standard SF-36 scoring algorithm, with higher scores indicating better health; no composite physical or mental summary score was calculated. The questionnaire was administered by the investigator in a face-to-face, interviewer-assisted manner, on a single occasion, immediately before or during the dialysis session.

Statistical Analysis

Normality was assessed with the Shapiro-Wilk test in each group. Normally distributed variables are presented as mean ± SD and compared with Welch's t-test; other continuous variables are presented as median (interquartile range (IQR)) and compared with the Mann-Whitney U test. Categorical variables are presented as n (%) and compared with the chi-square test (without continuity correction) when all expected cell counts were at least 5, and with Fisher's exact test otherwise; sparse categories were collapsed for testing (education: illiterate vs. literate; employment: unemployed vs. employed or retired; weekly sessions: 3 vs. other).

For effect sizes, we calculated mean differences (catheter minus AVF) with Welch 95% confidence intervals (CIs) and Hedges' g with 95% CIs for continuous variables, and odds ratios (ORs; Woolf 95% CIs, 0.5 added to all cells when a zero cell

DOI: 10.5455/medscience.2026.09.202

was present) and absolute risk differences (Wald 95% CIs) for binary outcomes. No primary outcome was prespecified; the eight SF-36 domains were therefore treated as exploratory, and Holm-adjusted P values are reported across the eight domains. Non-significant results were not interpreted as evidence of equivalence.

To address confounding, each SF-36 domain was modeled with linear regression, and infection and hospitalization with logistic regression. Model 1 was adjusted for the natural logarithm of dialysis duration. Model 2 additionally included age, sex, diabetes mellitus, and cardiovascular disease for SF-36 domains, and age and diabetes mellitus for the binary outcomes (fewer covariates because of the limited number of events). Firth penalized logistic regression was used as a sensitivity analysis. Access duration was not included in the main models because it is strongly determined by access type (catheters are newer by nature); it was added to the vitality model in a sensitivity analysis. Because the events were recorded over the previous 12 months, a further sensitivity analysis was restricted to patients whose current access had been in place for at least 12 months. Information on the reasons for access choice was not available. Analyses were performed in Python 3.13 (SciPy 1.18, NumPy, pandas); a two-sided $P < 0.05$ was considered statistically significant.

Results

Participants and Baseline Characteristics

A total of 100 patients (mean age 53.4 ± 13.3 years; 55% male) were included: 68 (68%) used an AVF and 32 (32%) a permanent catheter, and none used a temporary catheter. Baseline characteristics are shown in Table 1. Age, sex, education, marital and employment status, body weight, weekly sessions, residual renal function, diabetes mellitus, and hypertension did not differ significantly between groups. The overall median dialysis duration was 36.0 (13.8 – 75.5) months. Dialysis duration was longer in the AVF group (median 57.0 (18.0 – 96.0) vs. 24.0 (12.0 – 48.2) months; $P < 0.001$), and so was access duration (median 35.5 (16.5 – 66.8) vs. 10.0 (3.8 – 21.8) months; $P < 0.001$). Cardiovascular disease was more frequent in the AVF group (51.5% vs. 31.2%; $P = 0.058$), and hemodialysis had been initiated through a catheter in 50 of 68 AVF patients (73.5%) and 30 of 32 catheter patients (93.8%) ($P = 0.018$). The current access had been in place for less than 12 months in 17 of 32 catheter patients and 4 of 68 AVF patients.

Table 1. Baseline characteristics of patients according to vascular access type (n = 100)

Variable		AVF (n = 68)	Permanent catheter (n = 32)	P
Age (years), mean ± SD		54.3 ± 13.2	51.6 ± 13.3	0.352[a]
Sex	**Male, n (%)**	38 (55.9)	17 (53.1)	0.796[c]
	Female, n (%)	30 (44.1)	15 (46.9)	
Education level (illiterate vs. literate)	**Illiterate, n (%)**	18 (26.5)	10 (31.2)	0.620[c]
	Primary school, n (%)	31 (45.6)	13 (40.6)	
	Secondary school, n (%)	11 (16.2)	5 (15.6)	
	High school, n (%)	3 (4.4)	2 (6.2)	
	University, n (%)	5 (7.4)	2 (6.2)	
Marital status	**Married, n (%)**	49 (72.1)	25 (78.1)	0.519[c]
	Single/widowed, n (%)	19 (27.9)	7 (21.9)	
Employment status (unemployed vs. employed/retired)	**Unemployed, n (%)**	48 (70.6)	27 (84.4)	0.137[c]
	Retired, n (%)	13 (19.1)	4 (12.5)	
	Employed, n (%)	7 (10.3)	1 (3.1)	
Body weight (kg), mean ± SD		71.2 ± 15.5	70.7 ± 20.4	0.891[a]
Dialysis duration (months), median (IQR)		57.0 (18.0 – 96.0)	24.0 (12.0 – 48.2)	<0.001[b]
Access duration (months), median (IQR)		35.5 (16.5 – 66.8)	10.0 (3.8 – 21.8)	<0.001[b]
Hemodialysis started via catheter, n (%)		50 (73.5)	30 (93.8)	0.018[d]
Weekly HD sessions (3 vs. other)	**2 sessions/week, n (%)**	2 (2.9)	0 (0.0)	0.549[d]
	3 sessions/week, n (%)	65 (95.6)	32 (100.0)	
	4 sessions/week, n (%)	1 (1.5)	0 (0.0)	
Residual renal function	**Absent, n (%)**	46 (67.6)	18 (56.2)	0.268[c]
	Present, n (%)	22 (32.4)	14 (43.8)	
Comorbidities	**Diabetes mellitus, n (%)**	35 (51.5)	20 (62.5)	0.301[c]
	Hypertension, n (%)	64 (94.1)	31 (96.9)	1.000[d]
	Cardiovascular disease, n (%)	35 (51.5)	10 (31.2)	0.058[c]

[a]Welch t-test. [b]Mann-Whitney U test. [c]Chi-square test. [d]Fisher's exact test. Sparse categories were collapsed for testing as indicated in the group headings. Abbreviations: AVF, arteriovenous fistula; HD, hemodialysis; IQR, interquartile range; SD, standard deviation.

DOI: 10.5455/medscience.2026.09.202

SF-36 Domains

SF-36 scores are shown in Table 2, and unadjusted and adjusted estimates in Table 3. Vitality was lower in the catheter group (mean ± SD, catheter vs. AVF: 32.1 ± 17.8 vs. 43.3 ± 21.4; mean difference -11.2 (-19.3 to -3.1) points; Hedges' g -0.55 (-0.98 to -0.12); P = 0.007). Because eight domains were tested, the Holm-adjusted P value was 0.059; the vitality difference therefore did not remain significant after multiplicity correction and should be regarded as exploratory. After adjustment for dialysis duration (Model 1) and for age, sex, diabetes mellitus, and cardiovascular disease (Model 2), the estimates were similar (Model 2: -10.6 (-19.6 to -1.7) points; P = 0.021; Holm-adjusted 0.165). Adding access duration to the Model 2 vitality model did not materially change the estimate (-10.7 (-19.8 to -1.5), P = 0.023).

Table 2. SF-36 domains, access-related complications, and laboratory parameters according to vascular access type

Variable		AVF (n = 68)	Permanent catheter (n = 32)	Effect size (95% CI)	P	Holm P
SF-36 domains (0 – 100; higher = better)	General health	50.0 (41.0 – 54.0)	49.0 (40.8 – 54.8)	-0.08 (-0.50 to 0.34)	0.926[b]	1.000
	Physical functioning	50.0 (20.0 – 60.0)	47.5 (15.0 – 60.0)	-0.10 (-0.52 to 0.32)	0.613[b]	1.000
	Role-physical	0.0 (0.0 – 25.0)	0.0 (0.0 – 0.0)	-0.04 (-0.46 to 0.38)	0.501[b]	1.000
	Role-emotional	0.0 (0.0 – 33.3)	0.0 (0.0 – 33.3)	-0.23 (-0.65 to 0.19)	0.194[b]	1.000
	Social functioning	62.5 (46.9 – 68.1)	55.0 (35.0 – 67.5)	-0.19 (-0.62 to 0.23)	0.349[b]	1.000
	Bodily pain	55.0 (45.0 – 77.5)	55.0 (30.6 – 77.5)	-0.12 (-0.54 to 0.30)	0.732[b]	1.000
	Vitality	43.3 ± 21.4	32.1 ± 17.8	-0.55 (-0.98 to -0.12)	0.007[a]	0.059
	Mental health	39.5 (20.0 – 52.2)	33.0 (19.0 – 45.5)	-0.46 (-0.89 to -0.04)	0.064[b]	0.447
Access-related events (previous 12 months), n (%)	Infection	8 (11.8)	14 (43.8)	5.83 (2.11 to 16.11)	< 0.001[c]	–
	Thrombosis	8 (11.8)	4 (12.5)	1.07 (0.30 to 3.86)	1.000[d]	–
	Hospitalization	9 (13.2)	14 (43.8)	5.10 (1.89 to 13.72)	< 0.001[c]	–
	ICU admission	0 (0.0)	3 (9.4)	16.25 (0.81 to 324.69)*	0.031[d]	–
Laboratory parameters	Hemoglobin (g/dL)	10.40 (9.40 – 11.20)	10.70 (10.17 – 11.20)	0.06 (-0.36 to 0.48)	0.473[b]	–
	Albumin (g/dL)	4.20 (3.90 – 4.40)	4.20 (3.80 – 4.43)	-0.02 (-0.45 to 0.40)	0.772[b]	–
	Kt/V	1.70 (1.70 – 1.80)	1.70 (1.70 – 1.80)	0.08 (-0.34 to 0.50)	0.941[b]	–
	Urea (mg/dL)	170.5 (153.8 – 191.2)	175.5 (167.2 – 193.0)	-0.01 (-0.43 to 0.41)	0.564[b]	–
	Creatinine (mg/dL)	6.25 (5.80 – 7.10)	6.60 (5.88 – 7.22)	0.02 (-0.40 to 0.44)	0.695[b]	–
	Phosphorus (mg/dL)	5.10 (4.30 – 5.30)	5.15 (4.67 – 5.53)	0.33 (-0.09 to 0.76)	0.160[b]	–
	PTH (pg/mL)†	462.0 ± 123.7	473.2 ± 137.1	0.09 (-0.33 to 0.51)	0.696[a]	–

Values are mean ± SD for normally distributed variables and median (IQR) otherwise. Effect size: Hedges' g (catheter minus AVF; negative values indicate lower values in the catheter group) for continuous variables and odds ratio (catheter vs. AVF) for events. Holm P: Holm-adjusted P across the eight SF-36 domains (no primary domain was prespecified; domain-level results are exploratory). [a]Welch t-test. [b]Mann-Whitney U test. [c]Chi-square test. [d]Fisher's exact test. *0.5 added to each cell (zero cell). †PTH, n = 99 (one missing value). Abbreviations: AVF, arteriovenous fistula; CI, confidence interval; ICU, intensive care unit; IQR, interquartile range; Kt/V, dialysis adequacy index (urea clearance × dialysis time / urea distribution volume); PTH, parathyroid hormone; SD, standard deviation; SF-36, Short Form-36.

Table 3. Unadjusted and adjusted differences in SF-36 domain scores (catheter minus AVF)

Domain	Unadjusted mean difference (95% CI)	Model 1 (95% CI)	Model 2 (95% CI)	P (Model 2)	Holm P (Model 2)
General health	-1.4 (-9.1 to 6.3)	0.5 (-7.8 to 8.8)	0.4 (-7.9 to 8.7)	0.922	1.000
Physical functioning	-2.7 (-14.0 to 8.6)	-2.7 (-14.7 to 9.4)	-3.4 (-15.1 to 8.3)	0.567	1.000
Role-physical	-1.5 (-17.0 to 14.0)	-4.3 (-20.0 to 11.5)	-5.1 (-20.9 to 10.6)	0.519	1.000
Role-emotional	-7.4 (-20.3 to 5.6)	-9.8 (-23.9 to 4.4)	-10.7 (-24.8 to 3.4)	0.135	0.810
Social functioning	-4.9 (-15.6 to 5.8)	-2.7 (-13.9 to 8.5)	-3.1 (-14.2 to 8.0)	0.582	1.000
Bodily pain	-3.4 (-16.8 to 9.9)	-4.8 (-17.8 to 8.3)	-4.4 (-17.0 to 8.2)	0.489	1.000
Vitality	-11.2 (-19.3 to -3.1)	-10.2 (-19.4 to -1.0)	-10.6 (-19.6 to -1.7)	0.021	0.165
Mental health	-10.2 (-18.7 to -1.6)	-10.4 (-20.2 to -0.5)	-10.9 (-20.9 to -0.9)	0.033	0.230

Linear regression; Model 1: adjusted for ln(dialysis duration); Model 2: Model 1 plus age, sex, diabetes mellitus, and cardiovascular disease. Negative values indicate lower scores in the permanent catheter group. Holm P: Holm adjustment across the eight domains. Unadjusted differences are Welch mean differences irrespective of the test used in Table 2. Abbreviations: AVF, arteriovenous fistula; CI, confidence interval; ln, natural logarithm; SF-36, Short Form-36.

DOI: 10.5455/medscience.2026.09.202

For mental health, the median (IQR) was 33.0 (19.0 – 45.5) in the catheter group and 39.5 (20.0 – 52.2) in the AVF group; the difference was not statistically significant by the Mann-Whitney test (P = 0.064), whereas the mean difference (-10.2 (-18.7 to -1.6) points; g -0.46 (-0.89 to -0.04)) and the adjusted Model 2 estimate (-10.9 (-20.9 to -0.9) points; P = 0.033) had intervals excluding zero. This divergence between the rank-based and mean-based analyses, together with the Holm-adjusted values (0.447 and 0.230, respectively), indicates that this finding is also uncertain.

No significant differences were observed for general health, physical functioning, role-physical, role-emotional, social functioning, or bodily pain (all unadjusted P ≥ 0.19). Standardized differences ranged from -0.04 to -0.23 SD, but the 95% CIs were wide, extending to about -0.5 to -0.65 SD for several domains, so clinically relevant differences cannot be excluded in this sample.

Access-Related Complications and Hospitalization

Crude and adjusted estimates are shown in Table 2 and Table 4. Access-related infection, n (%), occurred in 14 (43.8) catheter patients and 8 (11.8) AVF patients (OR 5.83 (2.11 – 16.11); risk difference 32.0 (13.2 to 50.8) percentage points; P < 0.001). The association persisted after adjustment (Model 1: OR 4.59 (1.59 – 13.20); Model 2: OR 4.38 (1.47 – 12.98); Firth Model 2: OR 3.95 (1.37 – 11.37)). Hospitalization, n (%), occurred in 14 (43.8) and 9 (13.2) patients, respectively (OR 5.10 (1.89 – 13.72); risk difference 30.5 (11.5 to 49.5) percentage points; P < 0.001), with adjusted ORs of 4.77 (1.67 – 13.61) (Model 1) and 4.65 (1.56 – 13.84) (Model 2). ICU admission occurred in 3 (9.4) catheter patients and in no AVF patient (Fisher's P = 0.031; risk difference 9.4 (-0.7 to 19.5) percentage points); with only three events, this estimate is imprecise (Firth OR 16.3, 95% CI 0.79 – 333) and should be interpreted cautiously. Access thrombosis did not differ between groups (AVF 8 (11.8) vs. catheter 4 (12.5); OR 1.07 (0.30 – 3.86); Fisher's P = 1.000).

Table 4. Crude and adjusted odds ratios for access-related events (catheter vs. AVF)

Outcome	Crude OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Firth Model 2 OR (95% CI)
Infection	5.83 (2.11 – 16.11)	4.59 (1.59 – 13.20)	4.38 (1.47 – 12.98)	3.95 (1.37 – 11.37)
Hospitalization	5.10 (1.89 – 13.72)	4.77 (1.67 – 13.61)	4.65 (1.56 – 13.84)	4.21 (1.45 – 12.19)
ICU admission	16.25 (0.81 – 324.69)*	not estimated	not estimated	16.25 (0.79 – 333.01)‡
Thrombosis	1.07 (0.30 – 3.86)	not estimated	not estimated	not estimated

Logistic regression; Model 1: adjusted for ln(dialysis duration); Model 2: Model 1 plus age and diabetes mellitus (22 – 23 events). Firth: penalized-likelihood estimate of Model 2. *0.5 added to each cell. ‡Firth crude estimate (three events); not adjusted. Adjusted models were not fitted for ICU admission and thrombosis (few events). Abbreviations: AVF, arteriovenous fistula; CI, confidence interval; ICU, intensive care unit; ln, natural logarithm; OR, odds ratio.

Laboratory Parameters

Hemoglobin, albumin, Kt/V, urea, creatinine, phosphorus, and PTH did not differ significantly between groups (all P > 0.15; Table 2); PTH was analyzed in 99 patients.

Sensitivity Analysis

When the analysis was restricted to patients whose current access had been in place for at least 12 months (AVF, n = 64; catheter, n = 15), the direction of the associations was unchanged but the estimates were less precise: infection, catheter vs. AVF, 4 (26.7) vs. 6 (9.4) (Fisher's P = 0.089), hospitalization 4 (26.7) vs. 8 (12.5) (Fisher's P = 0.227), and vitality mean difference -5.1 (-14.7 to 4.4) points (P = 0.278) (Table 5). The smaller catheter subgroup (n = 15) limits inference.

Table 5. Sensitivity analysis restricted to patients with current access in place for at least 12 months

Outcome	AVF (n = 64)	Permanent catheter (n = 15)	P
Access-related infection, n (%)	6 (9.4)	4 (26.7)	0.089[d]
Hospitalization, n (%)	8 (12.5)	4 (26.7)	0.227[d]
SF-36 vitality, mean ± SD	43.2 ± 21.6	38.1 ± 14.7	0.278[a]
SF-36 mental health, mean ± SD	41.9 ± 22.5	36.5 ± 15.9	0.509[b]

Vitality: mean difference (catheter minus AVF) -5.1 (-14.7 to 4.4) points. Mental health tested with the Mann-Whitney U test; mean difference -5.5 (-15.7 to 4.7) points. [a]Welch t-test. [b]Mann-Whitney U test. [d]Fisher's exact test. Abbreviations: AVF, arteriovenous fistula; SD, standard deviation; SF-36, Short Form-36.

DOI: 10.5455/medscience.2026.09.202

Discussion

In this cross-sectional study of hemodialysis patients, permanent catheter use was associated with substantially higher frequencies of access-related infection and hospitalization than AVF use, and these associations persisted after adjustment for dialysis duration and other covariates. Vitality scores were lower among catheter users, but because no primary domain was prespecified and the difference did not remain significant after correction for eight domains, this finding is exploratory. Differences in the remaining SF-36 domains were small, with wide CIs.

Complications and Hospitalization

The roughly fourfold excess of infection in the catheter group is in line with earlier work and with guideline documents, which identify catheters as the access type with the greatest bloodstream-infection risk [1]. In a Georgian cohort of 386 patients, infection was about 17-fold more frequent among catheter users than AVF users [8], and an Ethiopian study linked longer catheter dwell time to a higher risk of catheter-related bloodstream infection [9]. Practical prevention strategies for catheter-related bloodstream infection in dialysis facilities have been described [10]. The association we observed was not explained away by the longer dialysis duration of the AVF group, although residual confounding cannot be excluded. A seven-year cohort study reported better survival among AVF users than catheter users [11], and a Korean cohort of incident hemodialysis patients examined survival, quality of life, and depression according to access type [12].

Two aspects of our data warrant caution. First, events were recorded over the preceding year, whereas access type was assessed at a single time point; the current access had been in place for less than 12 months in 17 of 32 catheter patients, so some events may have occurred under a previous access. In the restricted analysis the point estimates remained in the same direction but were less precise. Second, access type is not randomly assigned: patients with catheters may be those in whom a fistula could not be created or failed, and the same factors (vascular health, frailty, comorbidity) may influence both infection and hospitalization. Data on the reasons for access choice were unavailable, and confounding by indication is therefore likely.

Quality of Life

Evidence on quality of life is less consistent. A Portuguese study of patients treated with online hemodiafiltration reported better physical and mental health perception among AVF users than catheter users [13], and a recent systematic review concluded that AVF is generally associated with better health-related quality of life, with heterogeneity across studies and some domains favoring catheters [2]. An Irish study reported a mixed picture: AVF users reported greater satisfaction and fewer complications, whereas catheter users reported fewer difficulties with bleeding and bruising but a greater effect on social activities such as bathing [3]. These findings suggest that each access type carries partly offsetting burdens. Our vitality finding is directionally consistent with the reports favoring AVF, but it did not survive multiplicity correction and should not be treated as confirmatory; differences in the other domains, including bodily pain, were small.

Regarding clinical relevance, the unadjusted vitality difference of 11.2 points corresponds to about half a SD ($g = 0.55$). Differences of roughly half an SD are commonly regarded as the threshold for a perceptible change in health-related quality of life [14], but the 95% CI (3.1 to 19.3 points) is compatible with both small and large differences. Non-significant domains should not be read as showing equivalence between groups: the intervals were compatible with differences of up to about half an SD in several domains. In a Turkish study of 92 hemodialysis patients, quality of life was below the moderate level [4], and kidney transplant recipients report better SF-36 scores than hemodialysis patients [15], suggesting that dialysis itself, independent of access type, limits quality of life.

Clinical Implications

Our findings do not change the existing recommendation to prefer AVF where feasible [1]; rather, they quantify the burden of catheter-associated infection and hospitalization in a local dialysis population, and they suggest that the quality-of-life dimension of access choice, if present, is domain-specific and modest compared with the difference in complication rates. These observations may help to support counseling and access-planning discussions, but they cannot show that converting a catheter to an AVF would improve outcomes.

Strengths and Limitations

Strengths include the joint assessment of objectively recorded complications and patient-reported quality of life, the use of effect sizes with CIs, and adjusted and sensitivity analyses. The study also has important limitations. The cross-sectional, single-center design precludes causal inference and captures a single time point. No a priori sample size calculation was performed, the catheter group was small ($n = 32$), and the regression models, particularly for binary outcomes, had limited events per variable. Dialysis and access duration differed markedly between groups; although we adjusted for dialysis duration, unmeasured confounders (reasons for access choice, access switching, frailty, comorbidity burden) may remain. Events during the previous year may have occurred under a different access. Definitions of events relied on medical records. Administration of the SF-36 before or during dialysis may have influenced scores, for example through intradialytic symptoms or post-dialysis fatigue, and its timing relative to the session may vary between patients. Participation was voluntary (100 of 150 invited patients, 66.7%), and no data on non-participants were available, so selection bias cannot be excluded. Finally, eight domains were tested without a prespecified primary outcome, so domain-level results are exploratory.

DOI: 10.5455/medscience.2026.09.202

Conclusion

In this cross-sectional study, permanent catheter use was associated with a higher frequency of access-related infection and hospitalization than AVF use, also after adjustment for dialysis duration and other measured covariates, consistent with current guidance. Lower vitality scores among catheter users were an exploratory finding that did not persist after multiplicity correction, and differences in other quality-of-life domains were small and imprecisely estimated. Larger prospective studies with prespecified primary outcomes and more complete adjustment are needed.

Ethical Approval
Scientific Research Ethics Committee of Adana City Training and Research Hospital (Meeting No. 27, Decision No. 1470, 25 June 2026).

Patient Consent
Written informed consent was obtained from all participants included in the study.

Conflict of Interest
The author confirm the absence of any conflicts associated with this work.

Funding
The author declare that they have received no financial support for the study.

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