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# Quality of life of hemodialyzed patients with the consideration of the type of vascular access

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## Abstract

Introduction: Kidney disease is a major challenge for modern medicine, despite advances in its diagnosis and therapy. Hemodialysis, as one of the key renal replacement therapies, sustains patients' vital functions, but is associated with significant challenges in terms of the quality of life.

Aim: The aim of this study was to assess the quality of life of patients undergoing hemodialysis with consideration of the type of vascular access.
Material and method: The study was conducted from November 2023 to March 2024 among patients of dialysis stations in the district of Jastrzębie, diversified in terms of age, place of residence, education, and marital status. The study used a diagnostic survey method with a self-constructed questionnaire and a KDQOL-SF™ tool.
Results and conclusions: Patients with a fistula tend to have a higher quality of life, better physical and social functioning, and better overall health than patients using a vascular catheter. Gender and place of residence have no significant effect on the quality of life of hemodialyzed patients, regardless of the type of vascular access. Patients under 60 years of age show better physical health than older patients. Secondary and higher education correlates with higher quality of life in terms of symptoms. Marital status has a significant impact on physical health, with married individuals showing better physical health. Shorter duration of dialysis treatment (up to 1 year) is associated with better quality of life in terms of symptoms, disease quality of life and mental health. The absence of dialysis complications correlates with higher quality of life in terms of symptoms, quality of life in disease and physical health. The results of the study highlight the importance of the type of vascular access and demographic and social factors in assessing the quality of life of hemodialyzed patients. The introduction of personalized therapeutic interventions and psychosocial support can significantly improve treatment outcomes and the quality of life in patients with renal failure.

Keywords: renal replacement therapy, kidney disease, quality of life, vascular access

## Introduction

Despite continuous medical advances and improving knowledge, kidney disease is a huge problem and a challenge for patients, their families, and medical staff alike. Acute kidney injury and chronic kidney disease require the introduction of effective therapeutic interventions, which are associated with enormous treatment costs, yet can be inadequate and often result in an inadequate quality of life. There are several treatments for renal failure. One

of these is hemodialysis, the implementation of which offers the possibility of preserving patients' basic vital functions. Renal replacement therapy is used in the therapeutic process of renal failure because, although there is no chance of full recovery, effective therapy makes it possible to slow down the progression of the disease and reduce its negative effects. The continued increase in the number of people undergoing dialysis illustrates the scale of the problem associated with kidney disease [1]. Quality of life is seen as a holistic state of physical, mental, and social well-being, and maintaining it at a high level is one of the key challenges of contemporary health care. Quality of life combines economic, sociological, psychological, and medical aspects. Each person defines quality of life differently, depending on their circumstances [2]. Regular dialysis sessions are demanding for patients not only physically, but also mentally. Renal replacement therapy disrupts earlier habits and behavior, as it requires the involvement of the patient and their loved ones in the treatment process. It is also associated with numerous somatic symptoms, which, together with the progression of the disease, can lead to permanent damage to mental health. The least absorbing treatment option for the patient and those close to them is a kidney transplant. If the transplantation and the recovery process proceed without complications, this solution gives the patient hope for an improved quality of life and increased level of independence. However, the chance of transplantation is slim due to the substantial number of people on the national organ transplant waiting list and the small number of donors [3,4].

**Aim of the study**

The main aim of this study was to assess the quality of life of hemodialyzed patients with consideration of the type of vascular access.

**Material and methods**

The study was conducted between November 2023 and March 2024 among 100 patients of dialysis stations in the district of Jastrzębie. The respondents were informed about the purpose of the study and voluntary participation. The criteria for inclusion in the study were: patient consent, age (over 18 years) and dialysis therapy. The diagnostic survey method, a questionnaire technique, was used to conduct the study. The research tool was a self-administered survey questionnaire prepared in paper form, consisting of twenty questions containing socio-demographic data and questions on various aspects related to renal replacement therapy, types of vascular access, quality of life and possible adverse symptoms

after dialysis. The second research tool was a Kidney Disease Quality of Life™ Short Form (KDQOL-SF™), which is a multidimensional, validated instrument specifically created for dialysis patients, includes both general and disease-specific questions available freely on RAND Corporation website. It consists of twenty-four questions and allows an assessment of the level of quality of life in different areas. Scores are included in a range of 0-100, with higher scores indicating higher quality of life. The study group consisted of 58 women and 42 men. The respondents were divided into two categories according to their age: under 60 (49%) and over 60 (51%). Half of the respondents came from urban areas, the other half from rural areas. The largest number of participants declared a vocational education - 47 people, 32 people had a secondary education, and people with a university education accounted for 19%. Only 2% of respondents declared primary education. Just over half of the respondents (55%) were married. The vast majority of respondents (82%) declared that they had children. Almost half (48%) of the respondents lived with their family, 29% with their partner and 23% alone. Pensioners/annuitants were the most numerous group among the total respondents (65.7%). Almost 40% (38%) of respondents reported that they consumed alcohol and/or smoked cigarettes and/or other tobacco products during the day. Eleven patients had undergone a kidney transplant but again required the initiation of renal replacement therapy. Almost a third of patients were not hospitalized for renal replacement therapy or related complications, while 25% of respondents declared one hospitalization. As many as 93.8% of patients undergo dialysis up to three times per week. The largest group was those with a permanent catheter (52%), followed by a natural fistula (38%), 11 respondents had a temporary catheter. Under renal replacement therapy for up to 1 year, there were 41 patients on dialysis in the total group, while over 1 year (58.6%) there were 58 patients. Detailed characteristics are shown in Table I.

Statistical calculations were conducted in the statistical environment R ver.3.6.0, the PSPP program and MS Office 2019. Parametric tests were used to analyze the quantitative variables presented by group (Student's T test) or their non-parametric counterparts (Mann-Whitney U test). Tests were selected based on the distribution of the variables, which was verified using the Shapiro-Wilk test. In all calculations, $p < 0.05$ was taken as the significance level.

## Results

There was no statistically significant difference in the age of patients according to the type of vascular access (mean age of patients with a fistula M=61.76 vs. those with a catheter

M=59.65). The duration of renal replacement therapy differed significantly between patients with a fistula and those with a catheter (M=2.84 vs. M=2.05). The mean weekly amount of dialysis for fistula patients was 3.00, for catheter patients 3.40 dialysis, which was not a statistically significant difference. The maximum number of vascular accesses created in the patients studied was 4. An average of 2 vascular accesses were implanted in each patient, irrespective of the type of access, which was also not a statistically significant difference. The mean symptom intensity in the group of patients using a fistula was M=78.34 and was higher compared to the group using a catheter - M=68.88 (p=0.003). Analysis of the data showed significant differences between the assessment of the impact of kidney disease on quality of life and the type of vascular access. The mean renal disease impact score was higher for patients using a fistula - M=61.35, compared to patients using a catheter - M=52.97. The mean renal disease severity score was higher for patients using a fistula (M=46.71), compared to patients using a catheter (M=37.90), which was not a statistically significant difference (p=0.097). The mean value of employment status was similar in both groups, being M=48.68 for fistula patients and M=42.74 for catheter patients, respectively. The mean cognitive function scores were higher for fistula patients (M=76.84) compared to catheter patients (M=64.30). The differences were statistically significant (p=0.010). The mean quality of interpersonal relationships was higher for patients using a fistula (M=76.49) compared to those using a catheter (M=65.81), a statistically significant difference (p = 0.019). The mean sexual function score was higher for patients using a fistula compared to those with a catheter (M=81.25 vs. M=72.18). The difference was not statistically significant. Both groups had very similar mean sleep quality scores (M=54.34 for fistula and 54.40 for catheter), indicating that there were no significant differences in subjective sleep assessment. The mean social support score of patients using a fistula was M=73.68 and M=64.52 among the catheter group, showing no statistically significant difference. The mean support score of dialysis station staff for the fistula patient was M=83.22 and for the catheter patient M=86.69 (p>0.05). The mean overall health status of the fistula patients was M=58.95 and that of the catheter patients was M=52.42 (p = 0.077). Among the fistula patients, the mean satisfaction was M=83.77 and among the catheter patients M=83.33 (p>0.05). Patients using a fistula had on average higher physical functioning scores compared to those using a catheter (M=65.26 vs. M=55.73). Patients using a fistula reported higher mean physical role limitations compared to patients using a catheter (M=47.37 vs. M=37.50). Patients with a fistula reported a higher mean level of pain compared to patients with a catheter (M=66.18 vs. 59.52), but the differences were not

statistically significant. Patients using a fistula had a higher mean overall sense of health (M=49.61) compared to patients using a catheter (M=41.45), which accounted for the statistical significance of the differences in overall sense of health scores between fistula and catheter patients. Patients using a fistula had a higher mean sense of mental health (M=67.79) compared to patients using a catheter (M=57.81) ($p = 0.020$). Fistula patients had higher mean emotional role limitations (M=71.93) compared to catheter patients (M=55.38) ($p>0.05$). Similarly, patients with a fistula had a higher mean value of social functioning (M=66.12) than patients with a catheter (M=55.65). Patients with a fistula had a mean vitality value of M=53.82, with a catheter M=48.55. The mean quality of life value for patients with a fistula was M=67.75, while for patients with a catheter M=61.57, which was not a statistically significant difference. The mean value of total physical health for fistula patients was M=40.12, while for catheter patients it was M=37.41. The fistula group had a mean value of total mental health of M=48.49, while catheter patients had M=43.25, which was a statistically significant difference. Detailed data are included in Table II.

Further analysis tried to determine whether gender differentiated the quality of life of the subjects. Among those with fistula, there were no statistically significant ($p > 0.05$) differences between men and women in quality of life in any of the areas studied. Among women, there was slightly higher quality of life with kidney disease and slightly better physical health overall, and slightly lower quality of life in terms of symptoms and slightly poorer mental health overall. Among those with a catheter, there were also no statistically significant ($p > 0.05$) differences between men and women in quality of life in any of the areas studied. Among men, there was a slightly higher quality of life in each area. Across the study group, gender differences were also statistically insignificant ($p > 0.05$) - men had only a slightly higher quality of life in the areas analyzed.

The effect of age of dialysis patients on quality of life was then examined. Among people with a fistula aged up to 60 years, total physical health averaged $M = 43.36$ ($SD = 8.55$), while among those aged over 60 years, the average was lower at $M = 36.87$ ($SD = 9.32$). The study was able to show that those with a fistula, aged up to 60 years, had statistically significant ($p < 0.05$) better physical health than those aged over 60 years. Among half of the people with a catheter, up to 60 years of age, total physical health was no less than $Me = 39.62$ (among the other half of people in this age group, it was no greater than $Me = 39.62$). The lowest score among this group was $Min = 24.73$ and the highest score was $Max = 54.78$. Among half of those aged 60 and over, physical health was no greater than $Me = 32.72$

(among the other half, it was no less than Me = 39.62). Those with a catheter, aged up to 60 years had statistically significant ($p < 0.05$) better physical health. Among half of the total subjects, those aged up to 60 years had physical health no less than Me = 43.42. The lowest score among this group was Min = 24.73 and the highest Max = 55.50. Among half of the subjects aged over 60 years, it was no greater than Me = 35.04. The lowest score was Min = 19.56 and the highest Max = 56.56. Those aged up to 60 years had statistically significant ($p < 0.05$) better physical health. In contrast, the study found no statistically significant differences between the age groups in quality of life in terms of symptoms, quality of life with illness and mental health, regardless of access type. Among the fistula, catheter and total group, quality of life in terms of symptoms, as well as quality of life with illness, was slightly higher among those aged up to 60 years, and mental health among those aged over 60 years. The differences were statistically insignificant ($p > 0.05$).

Considering the place of residence and its impact on the patients' quality of life, there were no statistically significant differences between rural and urban residents in any of the quality-of-life dimensions, regardless of the type of access. Among those with a fistula, quality of life in all dimensions was slightly higher in rural residents. Among those with a catheter, quality of life in terms of symptoms, quality of life with the disease and physical health were slightly better in urban residents and mental health in rural residents. In the total group, quality of life with illness, physical health and mental health were slightly better in rural residents and quality of life in terms of symptoms in urban residents. The differences were statistically insignificant ($p > 0.05$).

Due to the small numbers of individual education categories, the higher education category was merged with the secondary category, and the primary education category was excluded. This was necessary to perform a reliable analysis. The study found no statistically significant differences between education groups in quality of life in terms of symptoms, quality of life with the disease and physical and mental health among people with fistula. In all these areas, quality of life was slightly higher among those with a secondary or higher education. The differences were statistically insignificant ($p > 0.05$). Among half of the people with a catheter, with a vocational education, the quality of life in terms of symptoms was no greater than Me = 66.67. The lowest score among this group was Min = 0.00 and the highest Max = 97.92. Among half of the people with a secondary education or higher, it was no less than Me = 72.92. The lowest score was Min = 47.92 and the highest Max = 93.75. Those with a catheter, secondary or higher education had a statistically significant ($p < 0.05$) higher quality

of life in terms of symptoms than those with a vocational education. Among half of the people in the total group, quality of life in terms of symptoms was no greater than Me = 70.83. The lowest score among this group was Min = 0.00, and the highest Max = 97.92. Among half of the people with secondary or higher education, it was no less than Me = 77.08. The lowest score was Min = 47.92 and the highest Max = 97.92. People in the total group with secondary or higher education had a statistically significant ($p < 0.05$) higher quality of life in terms of symptoms than people with vocational education. There were no statistically significant differences between the education groups in quality of life with the disease and in physical and mental health among those with a catheter and in the total group. In all these areas, quality of life was slightly higher among those with secondary or higher education. The differences were statistically insignificant ($p > 0.05$).

In the next step, the marital status categories of single, divorced and widow/widower were merged to assess the impact of marital status on the subjects' quality of life. The study showed no statistically significant differences between the marital status groups in quality of life in terms of symptoms, quality of life with the disease and physical and mental health among those with a fistula and those with a catheter. In all these areas, quality of life was slightly higher among those in a relationship, except for mental health overall, which was slightly better among unmarried people. The differences were statistically insignificant ($p > 0.05$). In the total group, among those in a relationship, total physical health averaged M = 40.89 (SD = 10.42), while among those who were single the average was lower, at M = 35.45 (SD = 9.76). In the total group, those in a relationship were characterized by statistically significant ($p < 0.05$) better physical health. Overall, there were no statistically significant differences between marital status groups in quality of life for symptoms, quality of life with illness and mental health. In all these areas, quality of life was slightly higher among those in a relationship. The differences were statistically insignificant ($p > 0.05$).

Among those on renal replacement therapy for up to 1 year, quality of life in symptoms averaged M = 86.46 (SD = 8.96), quality of life with disease M = 75.85 (SD = 9.38), and mental health M = 55.78 (SD = 5.54). Among those treated for more than 1 year, symptom quality of life was M = 74.92 (SD = 10.03), disease quality of life M = 65.26 (SD = 12.67), and mental health M = 46.09 (SD = 9.75). Among those with fistula, those dialyzed for up to 1 year had statistically significant ($p < 0.05$) higher symptom quality of life, disease quality of life and mental health. The study found no statistically significant differences between treatment period groups in physical health among those with fistula. Those treated up to 1

year were characterized by slightly better physical health. The differences were statistically insignificant ($p > 0.05$). There were also no statistically significant differences between the treatment period groups in quality of life in terms of symptoms, quality of life with the disease and physical and mental health among those with a catheter and in the total group. Among those with a catheter treated up to 1 year, quality of life in terms of symptoms and physical health was slightly higher, and quality of life with illness and mental health was slightly lower. Overall, among those treated for up to 1 year, quality of life in terms of symptoms, physical health and mental health was slightly higher, and quality of life with illness was slightly lower. The differences were statistically insignificant ($p > 0.05$). When examining the impact of complications on the quality of life of hemodialyzed patients, there were no statistically significant differences among the fistula patients between the groups selected for the presence of complications in quality of life in terms of symptoms, in quality of life with the disease, and in physical and mental health. In all these areas, quality of life was slightly higher among those without complications. The differences were statistically insignificant ($p > 0.05$). Among half of the catheterized patients with no complications, quality of life in terms of symptoms was no less than Me = 72.92 and quality of life with disease was no less than Me = 65.64. Among half of the catheterized patients with complications, quality of life in terms of symptoms was no greater than Me = 67.71 and quality of life with disease was no greater than Me = 50.69. Those with a catheter who did not experience complications had a statistically significant ($p < 0.05$) higher quality of life in terms of symptoms and quality of life with disease. Among those with a catheter with no complications, total physical health averaged M = 39.82 (SD = 11.07), while among those with complications, the mean was lower, at M = 32.95 (SD = 9.49). Those with a catheter without complications had statistically significant ($p < 0.05$) better physical health. Among half of the people in the total group with no complications, quality of life in terms of symptoms was no lower than Me = 73.96, quality of life with illness no lower than Me = 69.44, and physical health no lower than Me = 42.41. Among half of the people with complications, quality of life in terms of symptoms was no higher than Me = 68.75, quality of life with illness no higher than Me = 55.76, and physical health no higher than Me = 32.91. Those in the total group without complications had a statistically significant ($p < 0.05$) higher quality of life in terms of symptoms, quality of life in illness and physical health.

The study found no statistically significant differences among the catheterized and total group for the presence of complications in mental health. Those without complications had

slightly better mental health in both cases. The differences were statistically insignificant ($p > 0.05$).

**Discussion**

Assessment of the quality of life of patients with advanced renal disease acts as a determinant of the effectiveness of renal replacement therapy. Optimal vascular access plays a key role in the hemodialyzed patient. The choice of the proper type of access should be tailored to the individual patient's needs, taking into account the patient's medical condition, the urgency to start dialysis and the potential risk of complications. An arteriovenous fistula is the preferred option due to its long-term benefits, but in situations requiring immediate intervention, a hemodialysis catheter may be necessary. In terms of the relationship between quality of life scores and socio- personal traits, it was found that many studies have reported socio-personal variables have greater impact on quality of life [5-7]. Analysis of our study showed that gender and place of residence did not significantly differentiate the quality of life of hemodialyzed patients as opposed to age. Regardless of the type of vascular access, patients under 60 years of age had significantly better physical health than those over 60 years of age. Otherwise, age did not significantly differentiate the quality of life. In view of this, it can be assumed that factors such as a lower number of comorbidities, greater ability to adapt to a new situation, physical activity, social support, and the effectiveness of applied therapies are responsible for a better level of QoL before the age of 60. Analyzing the results of the study by K. Kocki et al. [8], it can be observed that patients under 60 years of age scored slightly higher than older people. The differences were not statistically significant between the assessment of satisfaction with quality of life and satisfaction with their health. Furthermore, in somatic aspects, people under 60 years of age scored better on quality of life than people over 60 years of age. The results of our study are also in line with the analysis of A. Piernikowska [9], who also found no significant correlations between age and the assessment of quality of life in each of the domains studied. However, in terms of the somatic domain, it was observed that the highest scores were recorded among those in the 51-60 age range. In the self-analysis, respondents in the total group with secondary education or higher education had a slightly higher quality of life in terms of coping with kidney disease symptoms than those with vocational education. However, these differences were not statistically significant. For the rest, education did not differentiate the quality of life. The results of K. Kocki et al. [8] indicated a significant relationship between education level and quality of life. They proved

that people with primary and vocational education had the lowest scores, which translated into low quality of life. In contrast, the highest quality of health scores was characterized by patients with secondary education and higher education. It is worth noting, however, that respondents with secondary and higher education generally had a higher quality of life in most of the domains analyzed. Considering the marital status of the respondents, the results of our study show that in the overall study group, those in a relationship were characterized by significantly better physical health. In the other domains, marital status did not significantly differentiate quality of life. These assumptions are confirmed by a study by L. Kapka-Skrzypczak et al. [10] conducted among hemodialysis and peritoneal dialysis patients. Persons who were married or in partnered relationships achieved higher scores, indicating a better quality of life in all analyzed spheres of functioning. A study by M. M. Saad [11] suggests that social support plays a significant role in improving the quality of life of hemodialyzed patients. In view of the above, it can be hypothesized that the presence of loved ones and their support can have a positive impact on the quality of life of hemodialyzed patients, helping them to cope with the difficulties associated with disease progression. The life of a dialysis patient is subordinated to the dialysis sessions, which is closely linked to adaptation to the new situation. Quality of life is then also significantly affected. Long-term dialysis sessions are exhausting for the patient and the risk of complications associated with hemodialysis is considerable. Chronic dialysis patients report fatigue and weakness, and long-term treatment can be stressful due to, among other things, restrictive diets, or limitations in daily activities. Our study showed that among people with fistula, those on dialysis for up to 1 year had significantly higher quality of life in terms of symptoms, quality of life in illness and mental health. Elsewhere, treatment duration did not significantly differentiate the quality of life. The results of a study by D. Ponczek et al. [3] show a relationship between the duration of renal replacement therapy and its negative impact on the quality of life. However, a study by Grochans et al. [12] confirms that patients undergoing long-term renal replacement therapy have reduced life satisfaction and lower subjective quality of life. Patients experiencing a shorter duration of treatment may feel less psychological and physical burden and experience a lower risk of complications associated with long-term treatment. Among patients on renal replacement therapy, a factor determining better quality of life may be a lower rate of vascular access-related complications. This may equate to experiencing fewer symptoms and at the same time feeling more satisfied with life, both in the physical and psychological spheres. The choice of the best dialysis technique and vascular access contributes greatly to the quality of

life, and the accuracy of the selection of these elements can have an impact on reducing the risk of complications, the efficiency of dialysis delivery, and improving patient psychological wellbeing. In the present study, those with a catheter and those in the total group without complications had significantly higher quality of life in terms of symptoms, quality of life in illness and physical health. Otherwise, the presence of complications did not significantly differentiate the quality of life. B. Sapilak et al. [4], in a three-year analysis among dialysis station patients, showed that quality of life in patients undergoing renal replacement therapy was approximately 65% lower compared to healthy individuals, mainly due to significant limitations in physical activity. In addition, the researchers noted that patients who had higher quality of life scores showed better coping with the disease and greater compliance with medical advice. The above self-studies prove that complications increase disease symptoms, limiting physical activity, patient mobility and at the same time negatively impacting mental health. The effects of complications lead to a reduced quality of life for patients. In contrast, a lower rate of complications is associated with a better quality of life, fewer disease-related symptoms and higher levels of physical activity and life satisfaction. Statistical analysis showed that patients using hemodialysis fistula reported higher symptom intensity compared to those with a catheter. This is an important observation that may influence clinical decisions regarding the choice of type of vascular access in patients requiring long-term renal replacement therapy. An individualized approach and regular assessment of the benefits and risks when choosing the type of vascular access for hemodialysis is crucial. It should be considered in the context of the patient's individual needs and health conditions. This allows the treatment plan to be adapted to the patient's changing health situation and to minimize potential complications related to vascular access. It can be presumed, that patients using hemodialysis fistula may function better in society compared to patients with a catheter. The social functioning of patients with a fistula is more stable and less varied. Patients with a fistula may also tend to have better mental health, which may be due to the greater longevity and stability of fistula and the lower incidence of infections and surgical interventions. A fistula, being a natural connection between an artery and a vein, can provide optimal blood flow, which is crucial for effective hemodialysis. Patients using a fistula report a lower risk of infection and less frequent need for vascular access replacement, which may contribute to their quality of life. Economic benefits associated with fistula include a reduction in treatment costs and a decrease in the frequency of surgical interventions [13]. On the other hand, patients with a fistula report higher symptom intensity compared to patients with a catheter,

which may affect their daily life and comfort. The standard deviation in the catheter patient group indicates a greater variety of patient experiences, suggesting that comfort with the catheter may be more individualized. Analysis of the data showed that patients using a fistula have higher mean mental health scores (M=48.49) compared to patients with a catheter (M=43.25). These differences are statistically significant, suggesting that patients using a fistula may experience better mental health. In contrast, regarding relation to physical health, the analysis showed no significant differences between the groups, indicating comparable levels of physical health regardless of the type of vascular access. Analysis of the data showed that the mean quality of interpersonal relationships was significantly higher in patients using a fistula (M=76.49) compared to those with a catheter (M=65.81). These results suggest that patients with a fistula may experience a better quality of interpersonal relationships compared to patients using a catheter. The importance of social support in the context of hemodialysis treatment is an important aspect for patients. The analysis shows that the type of vascular access has no significant impact on the level of social support patients receive. Despite the significant difference in the quality of interpersonal relationships, this result suggests that social support is not solely determined by the type of vascular access but may depend on other factors such as interpersonal relationships, family structure or the patient's local community. Analysis of patient satisfaction showed no significant differences between groups, suggesting that fistula and catheter patients have similar levels of satisfaction with their care. Sleep quality was also similar in both groups, indicating that the type of vascular access had no significant effect on this aspect of quality of life. The findings suggest that fistula may be a more favorable choice in terms of mental health and social functioning of hemodialyzed patients. However, the decision on the type of vascular access should be tailored to the individual needs and conditions of each patient, considering the broad clinical context and patient preferences. Further research is needed to better understand the mechanisms underlying the observed differences and to improve the care of patients requiring hemodialysis.

## Limitations

The study was conducted in only one setting. Hence, larger patients' participation from various centers is needed.

## Conclusions

Patients with a fistula tend to have a higher quality of life, better physical and social functioning, and better overall health than patients using a catheter. Gender and place of residence did not significantly differentiate the quality of life of hemodialyzed patients, regardless of the type of vascular access. Patients with a fistula, catheter and in the total group, aged up to 60 years, have significantly better physical health than patients over 60 years. Patients with a catheter and patients in the total group with a secondary or higher education have a slightly higher quality of life in terms of symptoms than patients with a vocational education. In the total group, patients who are in a relationship are characterized by significantly better physical health. Among patients with a fistula, patients on dialysis for up to 1 year have significantly higher quality of life in terms of symptoms, disease quality of life and mental health. Patients with a catheter and patients in the total group with no complications have significantly higher quality of life in terms of symptoms, quality of life in illness and physical health.

Table I. Characteristics of the study group including vascular access

| | | | Vascular access | | |
|---|---|---|---|---|---|
| | | | Fistula | Catheter | Total |
| Sex | women | N | 20 | 38 | 58 |
| | | % | 52.6% | 61.3% | 58.0% |
| | men | N | 18 | 24 | 42 |
| | | % | 47.4% | 38.7% | 42.0% |
| Age range | up to 60 years old | N | 19 | 30 | 49 |
| | | % | 50.0% | 48.4% | 49.0% |
| | over 60 years old | N | 19 | 32 | 51 |
| | | % | 50.0% | 51.6% | 51.0% |
| Place of residence | rural | N | 20 | 30 | 50 |
| | | % | 52.6% | 48.4% | 50.0% |
| | urban | N | 18 | 32 | 50 |
| | | % | 47.4% | 51.6% | 50.0% |
| Education | primary | N | 0 | 2 | 2 |
| | | % | 0.0% | 3.2% | 2.0% |
| | vocational | N | 19 | 28 | 47 |
| | | % | 50.0% | 45.2% | 47.0% |
| | secondary | N | 11 | 21 | 32 |
| | | % | 28.9% | 33.9% | 32.0% |
| | higher | N | 8 | 11 | 19 |
| | | % | 21.1% | 17.7% | 19.0% |
| Marital status | single | N | 2 | 6 | 8 |
| | | % | 5.3% | 9.7% | 8.0% |
| | married | N | 21 | 34 | 55 |
| | | % | 55.3% | 54.8% | 55.0% |
| | divorced | N | 7 | 6 | 13 |
| | | % | 18.4% | 9.7% | 13.0% |

| | | | Vascular access | | |
|---|---|---|---|---|---|
| | | | Fistula | Catheter | Total |
| | widowed | N | 8 | 16 | 24 |
| | | % | 21.1% | 25.8% | 24.0% |
| Children | yes | N | 33 | 49 | 82 |
| | | % | 86.8% | 79.0% | 82.0% |
| | no | N | 5 | 13 | 18 |
| | | % | 13.2% | 21.0% | 18.0% |
| Living | alone | N | 7 | 16 | 23 |
| | | % | 18.4% | 25.8% | 23.0% |
| | with a partner | N | 12 | 17 | 29 |
| | | % | 31.6% | 27.4% | 29.0% |
| | with family | N | 19 | 29 | 48 |
| | | % | 50.0% | 46.8% | 48.0% |
| Employment status | student | N | 0 | 1 | 1 |
| | | % | 0.0% | 1.6% | 1.0% |
| | professionally active | N | 10 | 18 | 28 |
| | | % | 26.3% | 29.5% | 28.3% |
| | unemployed | N | 2 | 3 | 5 |
| | | % | 5.3% | 4.9% | 5.1% |
| | pensioner/annuitant | N | 26 | 39 | 65 |
| | | % | 68.4% | 63.9% | 65.7% |
| Alcohol consumption and smoking | yes | N | 14 | 24 | 38 |
| | | % | 36.8% | 38.7% | 38.0% |
| | no | N | 24 | 38 | 62 |
| | | % | 63.2% | 61.3% | 62.0% |
| Period of renal therapy | up to 1 year | N | 10 | 31 | 41 |
| | | % | 27.0% | 50.0% | 41.4% |
| | over 1 year | N | 27 | 31 | 58 |
| | | % | 73.0% | 50.0% | 58.6% |
| Method of treatment | dialysis | N | 34 | 55 | 89 |
| | | % | 89.5% | 88.7% | 89.0% |
| | dialysis + transplant | N | 4 | 7 | 11 |
| | | % | 10.5% | 11.3% | 11.0% |
| Number of hospitalizations | none | N | 11 | 21 | 32 |
| | | % | 28.9% | 33.9% | 32.0% |
| | 1 | N | 9 | 16 | 25 |
| | | % | 23.7% | 25.8% | 25.0% |
| | 2 | N | 6 | 8 | 14 |
| | | % | 15.8% | 12.9% | 14.0% |
| | 3 | N | 4 | 7 | 11 |
| | | % | 10.5% | 11.3% | 11.0% |
| | > 3 | N | 8 | 10 | 18 |
| | | % | 21.1% | 16.1% | 18.0% |
| Number of dialysis per week | up to 3 | N | 38 | 52 | 90 |
| | | % | 100.0% | 89.7% | 93.8% |
| | more then 3 | N | 0 | 6 | 6 |
| | | % | 0.0% | 10.3% | 6.3% |

Legend: N – number of answers given, % – percentage value

Table II. Descriptive statistics of the quality of life of hemodialyzed patients according to the KDQoL-SF™

| Veriable | Vascular access | *N* | *M* | *SD* | *Min* | *Maks* | *Me* | *p* |
|---|---|---|---|---|---|---|---|---|

| Veriable | Vascular access | *N* | *M* | *SD* | *Min* | *Maks* | *Me* | *p* | |
|---|---|---|---|---|---|---|---|---|---|
| Age | fistula | 38 | 61.76 | 11.80 | 31.00 | 84.00 | 62.00 | | |
| | catheter | 62 | 59.65 | 14.25 | 24.00 | 85.00 | 61.50 | 0.444 | |
| | total | 100 | 60.45 | 13.35 | 24.00 | 85.00 | 61.50 | | |
| Period of renal therapy | fistula | 37 | 2.84 | 2.22 | 0.25 | 10.00 | 3.00 | | |
| | catheter | 62 | 2.05 | 3.23 | 0.01 | 19.00 | 1.09 | 0.003 | ** |
| | total | 99 | 2.35 | 2.91 | 0.01 | 19.00 | 1.50 | | |
| Number of dialysis per week | fistula | 38 | 3.00 | 0.00 | 3.00 | 3.00 | 3.00 | | |
| | catheter | 58 | 3.40 | 1.24 | 2.00 | 7.00 | 3.00 | 0.116 | |
| | total | 96 | 3.24 | 0.98 | 2.00 | 7.00 | 3.00 | | |
| Number of vascular access | fistula | 37 | 1.51 | 0.56 | 1.00 | 3.00 | 1.00 | | |
| | catheter | 62 | 1.55 | 0.80 | 1.00 | 4.00 | 1.00 | 0.668 | |
| | total | 99 | 1.54 | 0.72 | 1.00 | 4.00 | 1.00 | | |
| Symptoms | fistula | 38 | 78.34 | 10.96 | 58.33 | 97.92 | 76.04 | | |
| | catheter | 62 | 68.88 | 17.06 | 0.00 | 97.92 | 69.79 | 0.003 | ** |
| | total | 100 | 72.48 | 15.67 | 0.00 | 97.92 | 72.92 | | |
| Impact of kidney disease | fistula | 38 | 61.35 | 16.75 | 21.88 | 90.63 | 59.38 | | |
| | catheter | 62 | 52.97 | 21.86 | 6.25 | 100.00 | 51.56 | 0.046 | * |
| | total | 100 | 56.16 | 20.40 | 6.25 | 100.00 | 56.25 | | |
| The burden of kidney disease | fistula | 38 | 46.71 | 24.30 | 0.00 | 100.00 | 50.00 | | |
| | catheter | 62 | 37.90 | 28.65 | 0.00 | 100.00 | 34.38 | 0.097 | |
| | total | 100 | 41.25 | 27.29 | 0.00 | 100.00 | 40.63 | | |
| Employment status | fistula | 38 | 48.68 | 39.40 | 0.00 | 100.00 | 50.00 | | |
| | catheter | 62 | 42.74 | 41.34 | 0.00 | 100.00 | 50.00 | 0.457 | |
| | total | 100 | 45.00 | 40.51 | 0.00 | 100.00 | 50.00 | | |
| Cognition | fistula | 38 | 76.84 | 18.19 | 26.67 | 100.00 | 80.00 | | |
| | catheter | 62 | 64.30 | 23.93 | 20.00 | 100.00 | 66.67 | 0.010 | * |
| | total | 100 | 69.07 | 22.67 | 20.00 | 100.00 | 73.33 | | |
| Quality of interpersonal relations | fistula | 38 | 76.49 | 20.07 | 26.67 | 100.00 | 80.00 | | |
| | catheter | 62 | 65.81 | 23.24 | 26.67 | 100.00 | 73.33 | 0.019 | * |
| | total | 100 | 69.87 | 22.59 | 26.67 | 100.00 | 73.33 | | |
| Sexual function | fistula | 38 | 81.25 | 29.17 | 0.00 | 100.00 | 100.00 | | |
| | catheter | 62 | 72.18 | 37.97 | 0.00 | 100.00 | 100.00 | 0.383 | |
| | total | 100 | 75.63 | 35.01 | 0.00 | 100.00 | 100.00 | | |
| Sleep | fistula | 38 | 54.34 | 22.74 | 5.00 | 95.00 | 55.00 | | |
| | catheter | 62 | 54.40 | 20.66 | 15.00 | 97.50 | 55.00 | 0.990 | |
| | total | 100 | 54.38 | 21.36 | 5.00 | 97.50 | 55.00 | | |
| Social support | fistula | 38 | 73.68 | 23.77 | 16.67 | 100.00 | 66.67 | | |
| | catheter | 62 | 64.52 | 31.00 | 0.00 | 100.00 | 66.67 | 0.183 | |
| | total | 100 | 68.00 | 28.69 | 0.00 | 100.00 | 66.67 | | |
| Support of dialysis center employees | fistula | 38 | 83.22 | 18.90 | 25.00 | 100.00 | 87.50 | | |
| | catheter | 62 | 86.69 | 19.32 | 0.00 | 100.00 | 100.00 | 0.278 | |
| | total | 100 | 85.37 | 19.14 | 0.00 | 100.00 | 100.00 | | |
| General health | fistula | 38 | 58.95 | 14.10 | 30.00 | 100.00 | 60.00 | | |
| | catheter | 62 | 52.42 | 19.64 | 10.00 | 100.00 | 50.00 | 0.077 | |
| | total | 100 | 54.90 | 17.95 | 10.00 | 100.00 | 50.00 | | |
| Patient's satisfaction | fistula | 38 | 83.77 | 20.68 | 50.00 | 100.00 | 100.00 | | |
| | catheter | 62 | 83.33 | 20.02 | 50.00 | 100.00 | 100.00 | 0.849 | |
| | total | 100 | 83.50 | 20.17 | 50.00 | 100.00 | 100.00 | | |
| Physical functioning | fistula | 38 | 65.26 | 24.41 | 5.00 | 100.00 | 65.00 | | |
| | catheter | 62 | 55.73 | 33.68 | 0.00 | 100.00 | 62.50 | 0.262 | |
| | total | 100 | 59.35 | 30.71 | 0.00 | 100.00 | 65.00 | | |
| Physical limitations in | fistula | 38 | 47.37 | 40.18 | 0.00 | 100.00 | 50.00 | 0.193 | |
| | catheter | 62 | 37.50 | 40.68 | 0.00 | 100.00 | 25.00 | | |

| Veriable | Vascular access | *N* | *M* | *SD* | *Min* | *Maks* | *Me* | *p* | |
|---|---|---|---|---|---|---|---|---|---|
| performing roles | total | 100 | 41.25 | 40.57 | 0.00 | 100.00 | 25.00 | | |
| Pain | fustula | 38 | 66.18 | 23.82 | 22.50 | 100.00 | 66.25 | | |
| | catheter | 62 | 59.52 | 28.55 | 0.00 | 100.00 | 67.50 | 0.315 | |
| | total | 100 | 62.05 | 26.92 | 0.00 | 100.00 | 67.50 | | |
| Overall sense of health | fistula | 38 | 49,61 | 15,87 | 25,00 | 90,00 | 47,50 | | |
| | catheter | 62 | 41,45 | 20,91 | 0,00 | 95,00 | 40,00 | 0,030 | * |
| | total | 100 | 44,55 | 19,48 | 0,00 | 95,00 | 45,00 | | |
| Mental health | fistula | 38 | 67,79 | 17,57 | 32,00 | 92,00 | 68,00 | | |
| | catheter | 62 | 57,81 | 20,79 | 24,00 | 100,00 | 58,00 | 0,020 | * |
| | total | 100 | 61,60 | 20,13 | 24,00 | 100,00 | 64,00 | | |
| Emotional limitations in fulfilling roles | fistula | 38 | 71,93 | 38,38 | 0,00 | 100,00 | 100,00 | | |
| | catheter | 62 | 55,38 | 44,33 | 0,00 | 100,00 | 66,67 | 0,055 | |
| | total | 100 | 61,67 | 42,74 | 0,00 | 100,00 | 83,33 | | |
| Social functioning | fistula | 38 | 66,12 | 26,46 | 12,50 | 100,00 | 75,00 | | |
| | catheter | 62 | 55,65 | 30,09 | 0,00 | 100,00 | 50,00 | 0,096 | |
| | total | 100 | 59,63 | 29,08 | 0,00 | 100,00 | 62,50 | | |
| Vitality | fistula | 38 | 53,82 | 17,87 | 20,00 | 85,00 | 52,50 | | |
| | catheter | 62 | 48,55 | 21,53 | 15,00 | 100,00 | 45,00 | 0,192 | |
| | total | 100 | 50,55 | 20,29 | 15,00 | 100,00 | 50,00 | | |
| Life with the disease | fistula | 38 | 67,75 | 12,70 | 43,01 | 91,70 | 69,44 | | |
| | catheter | 62 | 61,57 | 16,90 | 29,09 | 89,62 | 62,19 | 0,079 | |
| | total | 100 | 63,92 | 15,66 | 29,09 | 91,70 | 64,33 | | |
| Total physical health | fistula | 38 | 40,12 | 9,41 | 25,39 | 55,50 | 39,56 | | |
| | catheter | 62 | 37,41 | 10,97 | 19,56 | 56,56 | 37,14 | 0,205 | |
| | total | 100 | 38,44 | 10,44 | 19,56 | 56,56 | 38,32 | | |
| Total mental health | fistula | 38 | 48,49 | 9,73 | 26,66 | 65,75 | 50,39 | | |
| | catheter | 62 | 43,25 | 11,62 | 22,24 | 65,24 | 42,75 | 0,031 | * |
| | total | 100 | 45,24 | 11,19 | 22,24 | 65,75 | 46,51 | | |

N - abundance; M - mean; SD - standard deviation; Min - minimum; Max - maximum; Me - median; p - statistical significance.
* $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$

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