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Received: 1 December 2021 | Revised: 14 February 2022 | Accepted: 11 June 2022

DOI: 10.1111/ctr.14757

Clinical TRANSPLANTATION
The Journal of Clinical and Translational Research
WILEY

ORIGINAL ARTICLE

Employment and ability to work after kidney transplantation in the Netherlands: The impact of preemptive versus non-preemptive kidney transplantation

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Abstract

Background: Work can have a major positive impact on health and wellbeing. Employment of kidney transplant recipients (KTR) of working age is much lower than in the general population. The first aim of this study was to examine the impact of a preemptive kidney transplantation (PKT) on employment, in addition to other possible influencing factors. The second aim was to explore differences in work ability, absenteeism and work performance among employed KTR with different types of transplantations.

Methods: A cross-sectional survey study was conducted between 2018 and 2019 in nine Dutch hospitals. PKT as potential predictor of employment was examined. Furthermore, work ability, absenteeism and loss of work performance were compared between employed preemptive recipients with a living donor (L-PKT) and non-preemptive recipients with a living donor (L-nPKT) and with a deceased donor (D-nPKT).

Results: Two hundred and twenty four KTR participated; 71% reported having paid work. Paid work was more common among PKT recipients (82% vs. 65% in L-nPKT and 55% in D-nPKT) and recipients who were younger (OR .950, 95%CI .913–.989), had no comorbidities (1 comorbidity: OR .397, 95%CI .167–.942; 2 comorbidities: OR .347, 95%CI .142–.844), had less fatigue (OR .974, 95%CI .962–.987) and had mentally demanding work tasks (only in comparison with physically demanding tasks, OR .342, 95%CI .145–.806). If recipients were employed, D-nPKT recipients worked fewer hours (mean 24.6±11.3 vs. PKT 31.1±9.6, L-nPKT 30.1±9.5) and D-nPKT and L-nPKT recipients received more often supplemental disability benefits (32 and 33.3%, respectively) compared to PKT recipients (9.9%). No differences were found for

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self-reported ability to work, sick leave (absenteeism) and loss of work performance with the exception of limitations in functioning at work.

Conclusions: Preemptive kidney transplantation recipients with a kidney from a living donor are employed more often, work more hours per week (only in comparison with D-nPKT) and have a partial disability benefit less often than nPKT recipients. More knowledge regarding treatments supporting sustainable participation in the labor force is needed as work has a positive impact on recipients' health and wellbeing and is also beneficial for society as a whole.

KEYWORDS
ability to work, kidney transplant recipients, living donation, preemptive transplantation, sustained employment

1 | INTRODUCTION

Work gives meaning, purpose and structure to everyday lives, and has a positive influence on physical and mental health[1,2]; also in people having kidney disease.[3] However, the ability of many people with end-stage kidney disease (ESKD) to work or remain employed is limited by physical and mental issues and their intensive medical treatment, which puts them at risk for long-term sickness absenteeism and withdrawal from the labor force.[4–8]

Kidney transplantation is the preferred treatment for people with ESKD. Transplantation is not only associated with better survival, better quality of life and lower use of healthcare resources[9,10]; it also optimizes persons' possibilities to work compared with dialysis[11,12] which will have a positive influence on physical and mental health.[13] More than half of the working-age persons with ESKD (younger than 66) receive a kidney transplantation in Europe.[14,15] Hence optimally taking advantage of the labor potential not only benefits the recipients themselves, it also has major societal impact by saving costs related to sickness absenteeism, work disability and loss of productivity.[16]

The per-country employment rate 1 year or longer after kidney transplantation ranges between 14 and 85%.[8,17]A large part of this variation can be explained by differences in the definition of employment, by heterogeneity in clinical and demographic characteristics of the study populations and social safety net in a country. There are multiple factors associated with employment of kidney transplantation recipients (KTR) that fall into four main categories: sociodemographic, clinical, health-related and work-related. Sociodemographic factors, such as younger age, being white and a higher educational level, are consistent predictors of employment.[8,18–21] Clinical and health-related characteristics related to employment include type of primary kidney disease,[11,22] comorbidity,[4] a shorter time on dialysis,[20,21] peritoneal dialysis,[23] time since transplantation,[11,24] living versus deceased donor transplantation,[19,20] and physical and mental health.[4,25,26] Recent studies have shown that work-related factors like working conditions (physical and psychosocial) and type of work (e.g., being a factory or an office worker) have an influence on sustained employment after a kidney transplantation.[26,27,28]

Not much is known about the effects of a preemptive kidney transplantation (PKT) on employment. A few studies found a higher employment rate among PKT versus non-preemptive kidney transplantation (nPKT) recipients,[19,20] while another study found no effect.[29] PKT is the preferred treatment compared to transplantation after a period of chronic maintenance dialysis, as PKT, especially with a living donor, has been associated with improved recipient and allograft survival and better quality of life.[30,31,32] Avoidance of dialysis may reduce dialysis-associated comorbidities, the need to create an arteriovenous fistula or perform peritoneal dialysis catheter surgery,[33] and work interruptions. As far as we know, no studies explicitly examined the influence of preemptive versus non-preemptive transplantation on being employed by distinguishing between living and deceased donors and taking biopsychosocial co-variables into account.

Furthermore, recent observations show that many people with a chronic disease keep working despite physical or mental health problems.[34] Attending work when feeling ill without adequate support or adequate work adjustments may lead to a lower ability to work, more sick leave (absenteeism) and reduced work performance.[35] Very little is known about the work ability, absenteeism and the work performance of recipients with various types of transplantations, whereas these factors can be important predictors of sustainable employability.

The aim of the current study is twofold. First, it attempts to provide insight into the association between type of transplantation and employment, in addition to other socio-demographic, clinical and work-related factors that may influence employment. Second, it aims to explore the differences between employed recipients with different types of transplantations in terms of work ability, absenteeism and work performance.

2 | METHODS

2.1 | Data source

This study is part of the larger multiphase and mixed-methods study CKD@work, which aims at gaining insight into factors associated with

employment in people with CKD stage G3b-5, including those treated by dialysis or living with a kidney transplant. A cross-sectional quantitative study was conducted and data was obtained from questionnaires. For the current study we used a subsample of working-age (≤67 years) KTR.

2.2 | Study population

Respondents for the CKD@work study were recruited between 2018 and 2019 at nine nephrology departments (four university medical centers and five non-academic hospitals) throughout the Netherlands. In each hospital, one or two nephrologists and/or (research) nurses were involved. Patients were invited when they visited the outpatient clinic or were sent a letter, depending on the preferences of the nephrologists. For this study, patients with CKD stage G3b-G5 of working age (18–67 years) who had received their transplantation 6 months to 5 five years prior to the start of the study were included. Patients were excluded if they were unable to understand Dutch, had a life expectancy of less than 1 year, or had advanced cancer or heart failure. Respondents consented to participate by completing an online or, if preferred, a print questionnaire. Most hospitals sent non-respondents a reminder letter within 3 weeks. The study was judged exempt from review by the Medical Ethics Review Committee of University Medical Center Groningen, as the research does not fall under the Medical Research Involving Human Subjects Act (WMO) (M17.207323). All respondents were informed about voluntariness, anonymity, confidentiality, and the right to withdraw from the study at any time and gave written informed consent.

2.3 | Data collection

A questionnaire was developed on literature and input from the study advisory board. The main outcome for the first research question (part I) was employment and the main independent variable was type of transplantation. The other independent variables were divided into four groups: sociodemographic, clinical, health-related and work-related. The second research question (part II) focused on differences in work ability and absenteeism and reduced work performance among KTR who currently have paid work.

2.4 | Part I

2.4.1 | Main measures

Work outcomes

Employment was defined as working at least 1 hour per week in a paid position. Being non-employed means not being active in the labor force because of total or partial disability or due to unemployment. Disability benefit was defined as receiving a full or partial social security benefit administered under the Work Incapacity Act (WAO) or the Work and Income according to Work Capacity (WIA) Act. Young people aged 18–29 years who have a long-term illness or handicap and cannot work may be entitled to cash benefits (Wajong). Employment and work disability are not mutually exclusive, as employed people may receive additional partial disability benefits.

Types of transplantation

Kidney transplantation recipients were classified by type of organ (living vs. deceased donor transplant) and by whether the transplantation was preemptive (PKT) – taking place before dialysis became necessary – or non-preemptive (nPKT). Duration of dialysis prior to transplantation was recorded for nPKT recipients (< 1 year vs. ≥ 1 year). We defined three groups for the analyses: living PKT (L-PKT), living nPKT (L-nPKT) and deceased donor nPKT recipients (D-nPKT). Recipients who preemptively received a deceased donor transplant (D-PKT) were excluded because of the very low number of respondents.

2.4.2 | Independent variables (predictor variables)

Sociodemographic characteristics

Information of KTR was obtained on age, sex, educational level (primary, secondary or higher), ethnicity (Dutch vs. migration background) and household composition (living with others or alone).

Clinical characteristics

Time since transplantation, primary renal disease, allograft kidney function (estimated glomerular filtration rate, eGFR) and other comorbidities were assessed with self-reported data. Comorbidity was assessed using a self-administered list of eleven physical (such as cardiovascular disease and diabetes) and one mental disorder as selected by nephrology experts. The number of self-reported comorbidities was categorized into no comorbidities, one comorbidity and ≥ 2 comorbidities.

Work-related characteristics

Type of contract (permanent vs. other, i.e., temporary/flex or self-employed), number of contract-based working hours per week and work tasks (mentally demanding, physically demanding or both) were assessed. KTR who did not have a paid job were asked what the working conditions were during their last paid job. Only in employed recipients, adjustment to work was measured, that is, working fewer hours, other work tasks (yes/no).

Health-related characteristics

Data considering factors of health status were assessed by the Kidney Disease Quality of Life questionnaire (KDQoL-36),[36] which measures physical functioning (two items), mental functioning (three items) and CKD-related symptoms (12 items). Raw scale scores were transformed into a score ranging from 0 to 100, with a higher score indicating better health. Fatigue was assessed by the fatigue severity scale of the Checklist Individual Strength (CIS) questionnaire, which consists of 20 statements and yields a total fatigue score.[37,38] Respondents answered

on a 7-point Likert scale, with a higher score indicating a higher degree of fatigue (range 20–140).

2.5 | Part II (only employed KTR)

2.5.1 | Work ability

Work ability was defined as the capability of the worker to do the work in terms of work demands, and health and mental resources. We used a single item of the Work Ability Index (WAI), which asks KTR to estimate their current work ability compared to lifetime best (0 = unable to work to 10 = lifetime best).[39,40] This single-item question can be used as a simple indicator to assess self-reported work ability.[41]

2.5.2 | Absenteeism

Absenteeism has been defined as productivity loss due to health-related absence from work.[42] Absenteeism was measured using self-formulated questions by asking about working hours per week, sick leave from work in the last year (no sick leave, 1–24 days sick leave, 25–365 days sick leave), and whether KTR were work-disabled due to the kidney disease (having disability benefits, yes/no).

2.5.3 | Work performance

Work performance was measured by asking respondents to assess the quantity (one item) and quality of work (one item) performed on the last regular workday as compared to normal.[43] Both items were scored on a 10-point numerical rating scale, with 1 representing not being able to work (quantity) or poor work quality, and 10 representing quantity and quality of work compared to when the person was not yet bothered by the kidney disease. A score below 10 is considered as reduced work performance. In addition, CKD-related limitations in work performance were assessed using a self-constructed question with six response options (1 = 'no limitations', 6 = 'not able to work at all') and by assessing the type of limitation.

2.6 | Analyses

Descriptive analyses were conducted to provide overall information on the study variables. Logistic regression analyses were performed to determine the association between type of transplantation and employment (employed, unemployed), taking into account other potentially relevant factors. Odds ratios (OR) and their 95% confidence intervals (95% CI) were estimated.

Univariable logistic regression was performed first to identify the unique associations between each independent factor and employment, followed by a backward stepwise multiple regression analysis to select the best explanatory variable in addition to the type of transplantation. In the first step we included type of transplantation (living vs. deceased donor transplant) and preemptive versus non-preemptive transplantation. The second step included variables that had a *P*-value < .20 in the univariable logistic regression.[44] We examined the robustness of our primary findings in stepwise backwards regression by means of forward stepwise logistic regression analyses. A forward selection analysis approach yielded similar results.

Goodness-of-fit of the chosen model was evaluated by the Hosmer and Lemeshow goodness-of-fit statistic. Presence of multicollinearity was tested by calculating variance-inflated factors (VIF). A p-value of .05 was considered statistically significant. Statistical analyses were performed using SPSS statistics (v 26, IBM).

The second aim of this study was to examine differences between the three transplantation groups in work ability and absenteeism and reduced work performance. Omnibus tests were used for overall differences across the L-PKT, L-nPKT and D-nPKT groups. When the null hypothesis was rejected, we proceeded with a post-hoc pairwise group comparison. Chi-square tests were used in case of categorical variables. For analysis of continuous variables one-way analysis of variance (ANOVA) followed by least significant digit (LSD) tests were used when the homogeneity of variance was equal, or otherwise the Kruskal-Wallis test.

3 | RESULTS

Of the 809 KTR (age ≤ 65) invited by medical providers from the participating hospitals, 280 agreed to participate (response rate 35%). Full-time students ($n = 3$), full-time housekeepers ($n = 5$) and retirees ($n = 18$) were excluded from the analysis, as were 10 other KTR due to missing data. The remaining 244 KTR had a mean age of 51.9 years (SD: 10.4), 57.4% were male, and 92.6% had the Dutch nationality. Of the respondents, almost half (45.5%) underwent a preemptive transplantation with a living donor kidney (L-PKT). For 89.2% of respondents it was their first transplant. Of the non-preemptive respondents, 49.4% of L-nPKT and 11.4% of D-nPKT recipients were treated with dialysis for less than a year.

The study sample was stratified by employment, with 173 of the 244 respondents (71%) reporting having paid work for at least 1 h per week (82% for L-PKT, 65% for L-nPKT and 55% for D-nPKT). Of the employed respondents, 71% reported to be able to work, twenty-nine percent were partial disabled or on sick leave. Of those who were unemployed, 66% reported being fully disabled, the other 34% was (partial) able to work (Table 1).

3.1 | Factors associated with employment (univariable logistic regression analysis)

Being employed was associated with socio-demographic (younger age, male sex, higher educational status) and illness-related variables (higher kidney function and absence of other comorbidities). Employment was also positively associated with work-related (having mentally

TABLE 1 Descriptives of the work situation

Variable	Total $N = 244$	Unemployed $n = 71$	Employed $n = 173$
Work situation, *N* (%)			
Employed, able to work	123 (50.4)		123 (71.1)
Employed, partial disability*	39 (16.0)		39 (22.5)
Employed, sickness absence	11 (4.5)		11 (6.4)
No paid work, able to work	13 (5.3)	13 (18.3)	
No paid work, fully disabled**	47 (19.3)	47 (66.2)	
No paid work, partial disability**	11 (4.5)	11 (15.5)	

Percentages were calculated per column.

demanding work tasks) and health-related variables (fewer symptoms, better physical and mental health, and less fatigue). No significant associations were found for household composition, time since transplantation or duration of dialysis before transplantation (only L-nPKT and D-nPKT recipients), employment and working hours per week (Table 2).

3.2 | Association between type of transplantation and employment (multiple logistic regression)

All factors with $P < .20$ in the univariable logistic regression analyses were considered potential predictors for employment and analyzed further in a multivariable model, using backward logistic regression analysis (Table 3). Two factors (ethnicity and primary kidney disease) were not included in the model due to the low numbers of cases per category.

L-PKT patients were significantly more often employed in comparison with L-nPKT (OR .399, 95%CI .205–.775) and D-nPKT patients (OR .258, 95%CI .118–.566) and this remained statistically significant when sociodemographic, clinical, work and health-related characteristics were added to the final model (respectively, OR .426, 95%CI .197–.921 and OR .343, 95%CI .141–.832). Lower age (OR .950, 95%CI .913–.989), absence of comorbidities (1 comorbidity: OR .397, 95%CI .167–.942; 2 comorbidities: OR .347, 95%CI .142–.844), mentally demanding work tasks (only in comparison with physically demanding tasks, OR .342, 95%CI .145–.806) and less fatigue (OR .974, 95%CI .962–.987) were independently associated with employment in the multivariable logistic regression model. The associations of sex, educational level, kidney function, symptoms, physical functioning and mental functioning with employment did not remain independently associated in the final model.

Multicollinearity was tested for quality of life, fatigue and comorbidity, but this was not an issue as all variance inflation factors (VIF) in the multivariable regression models had values < 3.4.[45] Forward stepwise linear regression analyses identified the same determinants of employment as were found in the backward linear regression analyses.

3.3 | Work characteristics, work ability, absenteeism and reduced work performance of employed respondents ($n = 173$)

Statistically significant differences between the three transplant groups were found for working hours per week, the number of respondents that received disability benefits and for the limitations respondents experienced in functioning at work (Table 4). More specifically, post-hoc pairwise group comparisons showed that D-nPKT recipients worked fewer hours (mean 24.6±11.3 vs. PKT 31.1±9.6, L-nPKT 30.1±9.5) and that L-nPKT and D-nPKT received more often supplemental disability benefits (respectively, 32 and 33.3%) compared to PKT (9.9%). A higher percentage of L-PKT (53.4%) experienced limitations in functioning at work in comparison to PKT recipients (33%). No differences between groups were found for working tasks and for whether adjustments had been made to the work process (reduction of work hours), work practice (other tasks) or workplace (e.g., furniture and equipment). Respondent groups did not differ in work ability, days of absence in the last year or experienced loss of performance (quantity or quality) either. Groups did not differ significantly in sociodemographic variables, except for age, that is, D-nPKT recipients were significantly older than L-nPKT recipients (Table 4).

4 | DISCUSSION

Understanding the factors that influence sustainable employment of KTR positively or negatively is important to improve the structure of work-related care as well as outcomes in terms of health and financial conditions of this patient group.

First of all, the results of the current study show that PKT recipients with a kidney from a living donor are more often employed than nPKT recipients (with either a living or a deceased donor). Although a variety of personal, clinical and work-related factors influence employment, the strongest effect was found for age, comorbidity, type of work (mental or physical load) and fatigue. Of the employed KTR, D-nPKT recipients work the least number of hours and nPKT recipients (with either a living or a deceased donor) receive supplementary disability benefits more often. No differences were found between transplantation groups for absenteeism (sick leave), workability or loss in work performance (presenteeism).

The higher employment rate among PKT recipients corresponds with some recent studies.[19,20] Other studies found higher chances of employment primarily among nPKT recipients who had been on dialysis for less than a year,[18,20,31] which could not be confirmed in the current study. The beneficial effect of a preemptive transplantation was especially large when compared with D-nPKT recipients. A living donation offers better survival chances for both recipient

TABLE 2 Univariable logistic analyses for the association between transplant characteristics, sociodemographic, clinical, health-related and work characteristics and employment status

Main variable	*Total*	*Not employed N = 71 (29%)*	*Employed N = 173 (71%)*	Univariable logistic regression		
				OR	*95% CI*	*P-value*
Transplantation						
L-PKT	111 (45.5)	20 (28.2)	91 (52.6)	1.0		
L-nPKT	89 (36.5)	31 (43.7)	58 (33.5)	.399	.205–.775	**.007**
D-nPKT	44 (18.0)	20 (28.2)	24 (13.9)	.258	.118–.566	**.001**
INDEPENDENT VARIABLES						
SOCIODEMOGRAPHIC						
Age in years, mean (SD)	51.9 (10.4)	55.9 (7.6)	50.2 (11.0)	.937	.905–.969	**.001**
Sex						
Male	140 (57.4)	33 (46.5)	107 (61.8)	1.0		
Female	104 (42.6)	38 (53.5)	66 (38.2)	.486	.280–.842	**.010**
Educational level, *N* (%)						
Primary	68 (27.9)	28 (39.4)	40 (23.1)	.282	.135–.588	**.001**
Secondary	85 (34.8)	28 (39.4)	57 (32.9)	.402	.197–.821	**.012**
Higher	91 (37.3)	15 (21.1)	76 (43.9)	1.0		
Ethnicity, *N* (%)						
Dutch	226 (92.6)	66 (93.0)	160 (92.5)	NI*		
Migration background[a]	16 (5.6)	4 (5.6)	12 (6.9)			
Missing	2 (.8)	1 (1.4)	1 (.6)			
Household composition, *N* (%)						
Alone	53 (21.7)	17 (23.9)	36 (20.8)	1.0		
Others[b]	191 (78.3)	54 (76.1)	137 (79.2)	.835	.433–1.610	.590
CLINICAL						
Time since Tx, years (SD)	3.6 (3.5)	3.4 (3.3)	3.6 (3.6)	1.019	.938–1.107	.656
Kidney function, *N* (%)						
eGFR < 45 ml/min/1.73m^2	50 (20.5)	22 (31.0)	28 (16.2)	1.0		
eGFR ≥ 45 ml/min/1.73m^2	163 (66.8)	40 (56.3)	123 (71.1)	2.416	1.245–4.687	**.009**
Unknown	31 (12.7)	9 (12.7)	22 (12.7)	1.921	.739–4.994	.181
Duration of dialysis, *N* (%)[c]						
< 1 year	49 (36.8)	17 (33.3)	32 (39.0)	1.0		
≥ 1 year	84 (63.2)	34 (66.7)	50 (61.0)	1.280	.616–2.661	.509
Primary kidney disease, *N* (%)						
Renal vascular disease & diabetes	23 (9.4)	9 (12.7)	14 (8.1)	NI*		
Glomerulonephritis	11 (4.5)	1 (1.4)	10 (5.8)			
Polycystic kidney disease	61 (25.0)	14 (19.7)	47 (27.2)			
Other/unknown	149 (61.1)	47 (66.2)	102 (59.0)			
Comorbidities, *N* (%)[d]						
No comorbidities	113 (46.3)	14 (19.7)	99 (57.2)	1.0		
1 comorbidity	69 (28.3)	28 (39.4)	41 (23.7)	.207	.099–.433	< **.001**
≥ 2 comorbidities	62 (25.4)	29 (40.8)	33 (19.1)	.161	.076–.341	< **.001**

(Continues)

TABLE 2 (Continued)

INDEPENDENT VARIABLES						
WORK CHARACTERISTICS (current of last job)						
Employment, *N* (%)						
Permanent (1)	168 (68.9)	51 (71.8)	117 (67.6)	1.221	.665–2.240	.520
Other (2)[e]	76 (31.1)	20 (28.2)	56 (32.4)			
Working hours per week, hours (SD)	29.99 (9.9)	30.2 (9.8)	29.9 (9.7)	.997	.968–1.026	.815
Work tasks, *N* (%)						
Mentally demanding tasks	104 (42.6)	19 (26.8)	85 (49.1)	1.0		
Physically demanding tasks	54 (22.1)	23 (32.4)	31 (17.9)	.301	.145–.627	**.001**
Both	78 (32.0)	26 (36.6)	52 (30.1)	.447	.225–.887	**.021**
Missing	8 (3.3)	3 (4.2)	5 (2.9)			
HEALTH-RELATED						
Quality of life, mean (SD)						
KDQoL symptoms KT[f]	83.6 (14.6)	76.1 (18.1)	86.7 (12.1)	1.048	1.027–1.070	<**.001**
KDQoL physical[f]	73.4 (30.9)	55.3 (34.8)	80.8 (25.8)	1.027	1.017–1.037	<**.001**
KDQoL mental[f]	67.1 (19.8)	58.5 (19.8)	70.7 (18.7)	1.032	1.017–1.048	<**.001**
Fatigue, mean (SD)						
CIS total[g]	62.6 (28.0)	77.6 (27.9)	56.4 (25.7)	.972	.961–.983	<**.001**

[a]Either they themselves were born abroad, one parent was born abroad, or both parents were born abroad.
[b]Living with others, only with the partner, (partly) with children, or with children and partner (because of small *N*).
[c]Nonpreemptive recipients only, $n = 133$.
[d]Including diabetes and cardiovascular disease.
[e]Such as temporary, flex or self-employed workers.
[f]Higher scores, better functioning.
[g]Higher scores, more fatigue.
*Two factors (ethnicity and primary kidney disease) were not included in the model due to the low numbers of cases per category.
OR odds ratio, CI confidence interval, NI not included in the analyses because of low number of respondents.
Bold values indicate significance at $P < .05$.
Abbreviations: KT, kidney transplantation; L-PKT, living preemptive transplantation; L-nPKT, living nonpreemptive transplantation, D-nPKT, deceased nonpreeemptive transplantation; KDQoL, Kidney Disease Quality of Life; CIS, Checklist Individual Strength.

and donor kidney,[46] a better quality of life[47] and higher chances of employment.[18,19,20] The current study adds that the impact on employment is further increased when the transplantation is performed preemptively, as the risk of catheter-associated infections, the need for vascular access and the detrimental effects of dialysis (such as cardiovascular morbidities) are avoided and patients can undergo the transplantation in relatively good condition.[33,48] Previous studies show that the type of dialysis prior to dialysis may also play a role. Peritoneal dialysis is intrinsically more work-friendly than HD,[8,49] and is therefore the preferred dialysis modality before transplantation.[8,23] The group of patients who had undergone PD prior to transplantation was too small in this study to determine the impact of dialyses modality on employment.

The association between medical and socio-demographic variables and quality of life on the one hand and employment on the other has been demonstrated in previous research.[17,18,27] Less attention has been paid to the association between fatigue and employment, even when considering that fatigue is a pervasive complaint among PKT recipients. Fatigue, as measured in the current study, comprises a subjectively experienced feeling of tiredness, loss of concentration, loss of motivation to take action and diminished physical activity, and was associated with employment. Lastly, physically demanding jobs reduce the chances of employment which is in concordance with a previous study.[27] However, we could not confirm the association with a self-employed position (type of contract) which was described in that same study. In the Netherlands, most self-employed are not insured against illness and disability and therefore do not receive the corresponding benefit. This group of recipients possibly continues to work despite health problems.

The second aim of the study was to explore whether there are differences in self-rated work ability, absenteeism and reduced work performance among employed recipients with different types of transplantations. These results show that L-PKT recipients work more often and more hours per week and receive partial disability benefits less often, suggesting a higher work capacity among this group. Regardless of type of transplantation, all recipients nonetheless seem to experience a relatively high work ability and no or limited loss in work performance.

Apparently, most employed recipients were able to create a situation that may largely fit with their individual capabilities. D-nPKT

TABLE 3 Overall final multivariable model (backward selection procedure) of factors associated with employment of kidney transplant recipients ($n = 244$)

	Model B (Backward)		
Variable	**OR**	**95%CI**	***P*-value**
Transplantation			
L-PKT	1.0		
L-nPKT	.426	.197–.921	**.030**
D-nPKT	.343	.141–.832	**.018**
SOCIODEMOGRAPHIC			
Age	.950	.913–.989	**.013**
CLINICAL			
Comorbidity			
No comorbidities	1.0		
1 comorbidity	.397	.167–.942	**.036**
≥ 2 comorbidities	.347	.142–.844	**.020**
OCCUPATIONAL			
Work tasks			
Mentally demanding tasks	1.0		
Physically demanding tasks	.342	.145–.806	**.014**
Both	.572	.260–1.259	.165
HEALTH-RELATED			
CIS Fatigue	.974	.962–.987	**<.001**

OR odds ratio, 95% CI 95% confidence interval.
Abbreviations: L-PKT, living preemptive transplantation; L-nPKT, living nonpreemptive transplantation; D-nPKT, deceased nonpreeemptive transplantation; CIS, Checklist Individual Strength.

recipients work fewer hours and therefore may have more time to recover from work. Adjustments in work may also increase recipients' work ability and work performance. However, we found a relatively low percentage of recipients (25%) having adjustments in work and, in addition, we found no differences between transplantation groups in adjustment in work. Because of this, we do not expect that adjustments to work play a role in this population. Another explanation is the "healthy worker effect", a special type of selection bias common to occupational studies, by which healthy workers are more likely to stay in the workforce.[50] Especially among n-PKT recipients, whose employment is lower than PKT recipients, there is a chance of overrepresentation of healthy recipients.

The strength of our study is the inclusion of a large number of respondents in a multicenter study. Another strength is the use of a biopsychosocial approach considering psychological, social and work-related factors in addition to clinical ones. This helped explore the association between having kidney disease and employment, which is rather complex and multifaceted.[7]

Some limitations should also be noted. First, respondent representativeness may be limited. The percentage of L-PKT recipients in our study is slightly higher (46%) than the general percentage of preemptive transplantation recipients in the Netherlands (about 33%).[14] Preemptive KTR are not necessarily representative of the overall kidney transplant population[30] – they tend, for example, to be higher educated, which is often associated with less physically demanding jobs, and they may enjoy the advantage of not having to interrupt work because of dialysis. The employment rate in the current study might therefore be higher than the overall kidney transplant population. Furthermore, the number of recipients with a migration background and comorbidities such as diabetes and cardiovascular conditions appear to be underrepresented in the current study group. Second, this study was performed in the Netherlands, which has a social security system that foster (re)employment and has a socialized health system that is regulated by the government. This might have impacted the results and may give a slightly better picture of the situation of KTP in the Netherlands in comparison with some other countries[51] However, the insights of this study would likely resonate in other countries. Third, this study is based on recipients self-reports. Although this is a suitable way to elucidate personal and work-related factors, it hinders obtaining reliable information about clinical factors such as primary kidney disease. In addition to this study, the project group is therefore working on a study on clinical factors obtained through patients' medical record.[52] Lastly, the results in this study were based on cross-sectional data, which limits the inferences of causality.

To conclude, apart from the fact that a preemptive transplantation has clinical benefits, we add the knowledge that recipients who underwent a preemptive transplantation from a living donor are employed more often, work more hours per week and have a partial disability benefit less often than recipients who were on dialysis prior to their transplantation. More research is needed to establish whether undergoing a preemptive transplantation is the most important explanatory factor, or whether a combination of other medical as well as personal factors play an important role. Gaining insight into the conditions that determine whether recipients are able to sustainably participate in the labor force can contribute to improve their employment conditions and thus their health and wellbeing. This may also have a large societal impact by saving on costs for sickness absenteeism and work disability as well as costs related to loss of productivity.

ACKNOWLEDGMENTS

The authors thank all the kidney transplantation recipients who participated in this study by completing an extensive questionnaire. They also thank the staff of the nephrology departments of the nine Dutch hospitals that contributed to this study by including kidney transplantation recipients. This study was supported by a grant from the Dutch Kidney Foundation (Social Kolff Grant, SWO14.01). The funding organization had no role in the study design, data collection, analysis, interpretation of data, writing of the report or the decision to submit the report for publication.

CONFLICT OF INTEREST

None declared.

TABLE 4 Background characteristics, working characteristics and functioning at work of employed participants

	Total	Preemptive PKT	Nonpreemptive n-PKT		Test characteristics[a]
		Living donation (L)	Living donation (L)	Deceased donation (D)	
	N = 173	*n* = 91	*n* = 58	*n* = 24	
BACKGROUND CHARACTERISTICS					
Age in years, mean (SD)	50.2 (11.0)	50.5 (10.8)	47.8 (11.9)	55.2 (7.0)	**.018**
Gender, *N* (%)					
Male	107 (61.8)	53 (58.2)	36 (62.1)	18 (75.0)	.323
Female	66 (38.2)	38 (41.8)	22 (37.9)	6 (25.0)	
Educational level, *N* (%)					
Primary	40 (23.1)	19 (20.9)	15 (25.9)	6 (25.0)	.165
Secondary	57 (32.9)	24 (26.4)	24 (41.4)	9 (37.5)	
Higher	76 (43.9)	48 (52.7)	19 (32.8)	9 (37.5)	
Kidney function, *N* (%)					
eGFR < 45 ml/min/1.73m^2	28 (16.2)	11 (12.1)	13 (22.4)	4 (16.7)	.340
eGFR ≥ 45 ml/min/1.73m^2	123 (71.1)	69 (75.8)	39 (67.2)	15 (62.5)	
Unknown	22 (12.7)	11 (12.1)	6 (10.3)	5 (20.8)	
Comorbidity, *N* (%)					
No comorbidities	99 (57.2)	53 (58.2)	36 (62.1)	10 (41.7)	.084
1 comorbidity	41 (23.7)	23 (25.3)	8 (13.8)	10 (41.7)	
≥ 2 comorbidities	33 (19.1)	15 (16.5)	14 (24.1)	4 (16.7)	
WORKING CHARACTERISTICS					
Working tasks, *N* (%)					
Mentally demanding tasks	85 (50.6)	50 (54.9)	24 (41.1)	11 (45.8)	.256
Physically demanding tasks	31 (17.9)	13 (14.3)	15 (25.9)	3 (12.5)	
Both	52 (30.1)	26 (28.6)	17 (29.3)	9 (37.5)	
Missing	5 (2.9)	2 (2.2)	2 (3.4)	1 (4.2)	
Working hours per week, mean (SD)	29.9 (10.0)	31.1 (9.6)	30.1 (9.5)	24.6 (11.3)	**.019**
Disability pension, yes *N* (%)	35 (20.3)	9 (9.9)	18 (32.0)	8 (33.3)	**.001**
Adjustments to work, yes *N* (%)	43 (24.9)	22 (24.2)	16 (27.6)	5 (20.8)	.794
WORK ABILITY AND WORK FUNCTIONING					
Work ability, mean (SD)					
Current	8.2 (1.9)	8.2 (1.8)	8.1 (1.9)	8.3 (2.3)	.842
Days of absence last year, *N* (%)					
0 days	56 (32.4)	28 (30.8)	19 (32.8)	9 (37.5)	.512
1–24 days	71 (41.1)	35 (38.5)	24 (41.1)	12 (50.0)	
25–365 days	43 (24.8)	27 (29.7)	13 (22.4)	3 (12.5)	
Missing	3 (1.7)	1 (1.1)	2 (3.4)	–	
Reduced work performance					
Quantity of work, mean (SD)	8.3 (1.5)	8.3 (1.9)	8.2 (1.8)	8.3 (1.7)	.889
Quality of work, mean (SD)	8.7 (1.5)	8.8 (1.5)	8.6 (1.5)	8.5 (1.5)	.648
Limitations in functioning at work, yes *N* (%)	71 (41.0)	30 (33.0)	31 (53.4)	10 (41.7)	**.046**

[a]Test-characteristic: Chi-square test, One-Way Anova F or Kruskall Wallis.
*Significant difference: $P < .05$.

AUTHOR CONTRIBUTION

Annemieke Visser, Sandra Brouwer and Ron T. Gansevoort participated in research design. Annemieke Visser, Manna A. Alma, Roy E. Stewart, Stephan J. L. Bakker, Stefan P. Berger, and Ron T. Gansevoort participated in data analysis and interpretation. Annemieke Visser, Manna A. Alma, Paul J. M. van der Boog, Luuk B. Hilbrands, Frederike J. Bemelman, Dorien S. M. Standaar participated in execution of the study. Annemieke Visser, Manna A. Alma and Roy E. Stewart drafted the article. Sandra Brouwer and Ron T. Gansevoort participated in supervision of the study. All authors participated in critical revision of the article and approved the final version.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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How to cite this article: Visser A, Alma MA, Bakker SJL, et al. Employment and ability to work after kidney transplantation in the Netherlands: The impact of preemptive versus non-preemptive kidney transplantation. *Clin Transplant*. 2022;36:e14757. https://doi.org/10.1111/ctr.14757