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Determining the Relationship Between Perceived Social Support and Immunosuppressive Medication Adherence After Kidney Transplantation: A Descriptive Correlational Study

Ebru Karazeybek

Surgical Nursing Department, Faculty of Nursing, Akdeniz University, Antalya, Turkey

Correspondence: Ebru Karazeybek (ekarazeybek@gmail.com)

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ABSTRACT

Background: What is known about how the level of social support, which is among the factors affecting medication adherence, affects medication adherence is limited.

Objectives: This study investigated the relationship between perceived social support and immunosuppressive medication adherence among kidney recipients.

Design: This study was conducted using a descriptive correlational research method.

Participants: The study conducted research with 168 kidney transplant recipients who agreed to participate between April and June 2021. Participants completed the Immunosuppressive Medication Adherence Scale (IMAS) and the Multidimensional Scale of Perceived Social Support (MSPSS).

Measurements and Results: Participants had a mean IMAS and MSPSS score of 50.24 ± 3.71 and 57.21 ± 13.96, respectively. Participants' MSPSS total ($r = 0.209$, $p = 0.006$) and 'family' ($r = 0.248$, $p = 0.001$) and 'friends' ($r = 0.226$, $p = 0.003$) subscale scores were weakly and positively correlated with their IMAS total score.

Conclusion: Understanding the effect of perceived social support on immunosuppressive medication adherence is important for designing future interventions to increase immunosuppressive medication adherence.

1 | Introduction

Kidney recipients should use immunosuppressive medications throughout their lives to have a high quality of life, live longer, preserve graft functions and prevent complications (rejection, etc.) [1].

One of the reasons why kidney recipients are hospitalized frequently is complications due to immunosuppressive medication nonadherence, which adversely affects all health outcomes. Research shows that nonadherence can cause rejection and increase the risk of re-dialysis and retransplantation, resulting in a higher rate of readmissions and health expenditures [2–4]. Nonadherence is when a patient forgets to take medications at least once each month, takes the wrong medication or takes medications 2 or 3 h late at least once a month [5]. The prevalence of nonadherence in kidney transplantation varies according to the definition of nonadherence, measurement methods and transplant population. Therefore, the prevalence of nonadherence ranges from 2% to 65% [6]. Zhao and colleagues [7]

reported an alarmingly high nonadherence rate among Chinese kidney recipients (27.5%–72.3%) [7]. Ören and Sucu Dağ conducted a study in the Turkish Republic of Northern Cyprus and found a prevalence of nonadherence in almost two out of five kidney recipients (37%) [8].

Turkish researchers used the Immunosuppressant Therapy Adherence Scale (ITAS) and reported high averages [8–10]). In a different study conducted with liver transplant patients in Turkey using the Immunosuppressive Medication Adherence Scale (IMUAS), medication adherence scores were again found to be high [10].

During the first year after transplantation, kidney recipients have to use more than one immunosuppressive medication with adverse side effects and frequent dose changes. Therefore, they face various obstacles in terms of immunosuppressive medication adherence [3]. In their meta-analysis, Williams and colleagues reported two results. First, medication nonadherence appears in the first 6 months after transplantation. Second, 7 out of 10 patients skip doses, take their medication late or use multiple medications [11]. According to the World Health Organization, medication adherence is affected by low socioeconomic status, poverty, low education level, unemployment, changing living and environmental conditions, culture and inadequate social and family support [12]. Han and colleagues also determined that medication nonadherence among kidney recipients was affected by forgetfulness, the complexity of treatment plans, beliefs and inadequate social support [1].

2 | Literature Review

Healthcare professionals should address all factors affecting treatment adherence [12]. They should also focus regularly on the factors affecting immunosuppressive medication adherence to prevent medical and economic problems resulting from nonadherence in kidney recipients [13].

Family, community and patient associations are critical for improving medication adherence. Patients and their family members and the community play an active role in providing effective care for patients with chronic conditions. Informal or formal social support influences health outcomes and health-promoting behaviours. Healthcare professionals spend less time caring for patients with chronic conditions who receive support from their peers. Moreover, such patients are more likely to adhere to medication regimens [12]. No guidelines clearly define social support. However, services provided by spouses/partners, family members, friends or social network members are regarded as care or support [14].

Although clinicians often talk about the importance of social support to ensure adherence to medication after transplantation, the extent to which social support predicts adherence is unclear [14]. We know that social support promotes medication adherence. However, we know little about what type of social support affects it. Ladin and colleagues have drawn two conclusions in their meta-analysis. First, social support has a statistically significant effect on post-transplant outcomes, but this effect is not valid in high-quality studies. Second, more research is warranted to look into the impact of social support on post-transplant outcomes [14]. There are no studies investigating the relationship between social support and immunosuppressive drug adherence behaviours in Turkiye. Social support plays a significant role in recovery, albeit indirectly. If we better understand the impact of perceived social support on medication adherence, we can design future nursing interventions.

2.1 | Aims

This study investigated the relationship between perceived social support and immunosuppressive medication adherence among kidney recipients.

2.2 | Research Questions

1- Do participants' MSPSS scores differ by sociodemographic and transplant-related characteristics?

2- Do participants' IMUAS scores differ by sociodemographic and transplant-related characteristics?

3- Is there a correlation between MSPSS and IMUAS scores?

3 | Materials and Methods

3.1 | Study Design

This study adopted a descriptive and correlational design.

3.2 | Sampling

The research was conducted between April and June 2021 and 168 kidney transplant recipients were recruited as study participants when they visited transplant follow-up polyclinics in the hospital. In this study, sample selection was not made and the sample consisted of volunteers who met the inclusion criteria.

The inclusion criteria were patients who: (1) age older than 18 years, (2) primary kidney transplant, (3) completing the second month after transplantation, (4) using immunosuppressive medications, (5) be able to speak Turkish, and (6) volunteering to participate in the research. The exclusion criteria were as follows: (1) hospitalization during the research process.

3.3 | Data Collection Tools

3.3.1 | Sociodemographic and Transplant-Related Characteristics Questionnaire

The Sociodemographic and Transplant-related Characteristics Questionnaire was developed by the researchers [13, 15]. The questionnaire comprised 19 items on sociodemographic characteristics (age, income, employment status, health insurance and living arrangement) and transplant-related characteristics

(donor type, transplant time, immunosuppressive medications, post-transplant complications, post-transplant hospitalizations, person reminding to take medications, using a medication-reminder app and medication reminder method).

3.3.2 | Multidimensional Scale of Perceived Social Support

The Multidimensional Scale of Perceived Social Support was developed by Zimet and colleagues [16] and adapted into Turkish by Eker and colleagues [16, 17]. The Turkish version has a Cronbach's alpha (α) of 0.89 [17]. The scale comprises 12 items and three subscales: family (items 3, 4, 8 and 11; $\alpha = 0.85$), friends (items 6, 7, 9 and 12; $\alpha = 0.88$) and significant other (items 1, 2, 5 and 10; $\alpha = 0.92$). The items are rated on a 7-point Likert-type scale (1 = *strongly disagree*, 7 = *strongly agree*). The total score ranges from 12 to 84. In the present study, the total score was the sum of all subscale scores (4–28). Higher scores indicate higher social support. In the present study, the total scale had a Cronbach's α of 0.863, while the 'family', 'friends' and 'significant other' subscales had a Cronbach's α of 0.772, 0.922 and 0.906, respectively. Permission to use the scale was received from one of the authors, Prof. Dr. Haluk Arkar, via e-mail.

3.3.3 | Immunosuppressive Medication Use Adherence Scale

The Immunosuppressive Medication Use Adherence Scale was developed by Köken and colleagues [13]. The scale has 11 items. Eight items are scored on a 5-point Likert-type scale (1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*, 5 = *always*). Three items are responded with 'yes' (1 point) or 'no' (5 points). The scale has two positive statements (items 4 and 6) and nine negative statements (1, 2, 3, 5, 7, 8, 9, 10 and 11). The negative items are reverse-scored on a 5-point Likert-type scale (1 = *always*, 2 = *often*, 3 = *sometimes*, 4 = *rarely*, 5 = *never*). The total score ranges from 11 to 55, with higher scores indicating higher levels of immunosuppressive medication adherence. The Turkish version has a Cronbach's α score of 0.61 [13]. In the present study, the reliability coefficient for IMUAS was 0.403. Permission to use the scale was received from one of the authors, Assoc. Prof. Dr. Zeliha Özdemir Köken, via e-mail.

3.4 | Procedure

Kidney recipients who met the inclusion criteria were contacted during their consultations at the polyclinic. They were briefed on the research purpose and procedure. Informed consent was obtained from volunteers. The data were collected through face-to-face interviews. Data collection lasted about 15 min.

3.5 | Statistical Analysis

Mean ± standard deviation (SD) was used for continuous variables, while frequency (n) and percentage (%) were used for categorical variables. Normality was tested using the Shapiro–Wilk test. The data were analyzed using the independent t-test, one-way ANOVA, Kruskal–Wallis test and Pearson's correlation test. Multiple linear regression analysis was employed to ascertain factors related to IMUAS. Cronbach's α was used for reliability. The data were analyzed using the IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY) at a significance level of 0.05.

3.6 | Ethics

The research project was approved by the Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (Approval No. KAEK-92, January 2021) and institutional permission was obtained from Akdeniz University Hospital. Permissions for the scales used in the study were obtained from the authors via e-mail. Written consents of the participants were obtained with the informed consent forms. In terms of protecting the medical and personal data of individuals, the Helsinki Declaration Principles were complied with regarding respect for human dignity.

4 | Results

4.1 | Sociodemographic and Transplant-Related Characteristics

The sample comprised 168 participants (109 men and 59 women) with a mean age of 42.2 + 12.51. Most were married (76.8%). More than a quarter had no children (30.4%). More than half lived in cities (57.1%). Less than half had primary school degrees (47.6%). Half of them had a neutral income (income = expense) (50%). More than a quarter had full-time jobs (30.4%). Almost all participants were covered by health insurance (96.5%). More than half lived with their spouses and children (57.1%) (Table 1).

More than half the participants received kidneys from living donors (79.8%). Almost half the participants underwent kidney transplantation surgery 5 years ago or earlier (48.2%). More than half the participants were on two immunosuppressive medications (60.7%). More than half the participants had no complications (51.8%). Less than half the participants had no rehospitalization (47.6%). More than a quarter of the participants had someone to remind them to take their medications (31%). Almost half the participants stated that their spouses reminded them to take their medications (49.1%). More than a quarter of the participants used apps that reminded them to take their medications (38.1%). Most participants set alarms to take their medications (90.6%) (Table 1).

4.2 | The Distribution of MSPSS and IMUAS Scores by Sociodemographic and Transplant-Related Characteristics

Participants had a mean IMUAS and MSPSS score of 50.24 ± 3.71 (min–max: 11–55) and 57.21 ± 13.96 (min–max: 12–84), respectively.

Table 3 shows the distribution of participants' mean MSPSS scores by their sociodemographic and transplant-related

TABLE 1 | Participants' sociodemographic and transplant-related characteristics ($N = 168$).

Variables	*n*	%
Age (year), $\bar{X} \pm SS$	42.2 + 12.51	16–76
< 30	25	14.9
30–50	99	58.9
> 50	44	26.2
Gender		
Female	59	35.1
Male	109	64.9
Marital status		
Married	129	76.8
Single	39	23.2
Number of children		
No children	51	30.4
One children	37	22.0
Two children	44	26.2
Three children	22	13.1
Four children and above	14	8.3
Place of residence		
City	96	57.1
District	68	40.5
Village–Town	4	2.4
Education		
Literate	8	4.8
Primary school	80	47.6
High school	49	29.2
University and above	31	18.5
Income		
Income less than expenses	66	39.3
Income neutral expense	84	50.0
Income more than expenses	18	10.7
Employment status		
Unemployed	29	17.3
Housewife	41	24.4
Student	4	2.4
Full-time job	51	30.4
Part-time job	11	6.5
Retired	32	19.0
Health insurance		
No	6	3.5
Yes	162	96.5
Living arrangement		
Spouses	34	20.2
Spouses and children	96	57.1
Parents and siblings	31	18.5
Alone	7	4.2
Donor type		
Cadaver donor	34	20.2
Live donor	134	79.8
Transplant time		
2–6 months	17	10.1
7–12 months	8	4.8
13 months (1 year)–2 years	18	10.7
3–4 years	44	26.2
5 years and more	81	48.2
Immunosuppressive medications		
One immunosuppressive medication	42	25.0
Two immunosuppressive medications	102	60.7
Three or more immunosuppressive medications	24	14.3
Post-transplant complications		
No complication	87	51.8
Rejection	7	4.2
Infection	48	28.6
High creatinine	15	8.9
Other (anaemia, mouth sore)	11	6.5
Post-transplant hospitalizations		
No rehospitalization	80	47.6
1 week or less	39	23.2
2–3 weeks	27	16.1
1 month and more	22	13.1
Any reminders of medications?		
Yes	52	31.0
No	116	69.0
Person reminding to take medications ($n = 116$)		
Spouse	26	49.1
Children	4	7.5
Spouse and children	12	22.6
Mother or father	8	15.1
Friend–sibling–aunt	3	5.7
Medication reminder app use		
Yes	64	38.1
No	104	61.9

(Continues)

TABLE 1 | (Continued)

Variables	*n*	%
Medication reminder method		
Short message	1	1.6
Alarm	58	90.6
Taking notes in a permanent place	2	3.1
Counting pills	1	1.6
Medication diary	2	3.1

characteristics. Most participants were supported by their families (26.08 ± 3.88), followed by their friends (18.06 ± 7.51) and significant others (13.08 ± 7.27).

Participants who received kidneys from live donors had a higher mean MSPSS 'family' subscale score than those who received kidneys from cadavers. Participants who used apps had a higher mean MSPSS 'family' subscale score than those who did not. However, no factors affected participants' MSPSS 'family' subscale scores.

Participants aged 30–50 had significantly higher mean MSPSS total ($p = 0.003$) and 'friends' subscale scores ($p = 0.001$) than those over 50 years of age. Single participants had significantly higher mean MSPSS total ($p = 0.015$) and 'friends' ($p = 0.025$) and 'significant other' ($p = 0.009$) subscale scores than married ones ($p < 0.05$). Participants with full-time jobs had significantly higher mean MSPSS 'friends' subscale scores than the unemployed/students and housewife ($p < 0.05$). Participants with full-time jobs had significantly higher mean MSPSS 'significant other' subscale scores than housewife and the retired ($p < 0.05$). Participants with full-time jobs had a significantly higher mean MSPSS total score than the unemployed/students and housewife ($p < 0.05$). Participants living with their parents and siblings had significantly higher mean MSPSS total and 'friends' subscale scores than those living with their spouses ($p < 0.05$). Participants living alone had significantly higher mean MSPSS 'significant other' subscale scores than those living with their spouses and those living with their spouses and children ($p < 0.05$). Participants with post-transplant complications had a significantly higher mean MSPSS 'friends' subscale score than those without post-transplant complications ($p < 0.05$). The other factors did not affect participants' MSPSS scores ($p > 0.05$). Participants with bachelor's or higher degrees had higher MSPSS total and subscale scores. However, the difference was statistically insignificant ($p > 0.05$) (Table 2).

Participants living with their parents and siblings had a significantly higher mean IMUAS score than those living with their spouses ($p = 0.005$). The other factors did not affect participants' IMUAS scores (Table 3).

4.3 | The Correlation Between MSPSS and IMUAS Scores

Participants' MSPSS total ($r = 0.209$, $p = 0.006$) and 'family' ($r = 0.248$, $p = 0.001$) and 'friends' ($r = 0.226$, $p = 0.003$) subscale scores were weakly and positively correlated with their IMUAS total score (Table 3).

4.4 | Factors Associated With IMUAS Score

A multivariate linear regression analysis was conducted to determine the impact of the factors on participants' IMUAS scores. The findings showed that living with parents and siblings ($\beta = 0.262$, $p = 0.002$) and MSPSS score ($\beta = 0.160$, $p = 0.046$) positively affected participants' medication adherence (Table 4).

5 | Discussion

Nonadherence to chronic medications places a significant clinical and financial burden on the healthcare system. Medication nonadherence is a common source of hospitalization, morbidity, and mortality in various populations and diseases [12]. Besides, we know little about the most cost-effective interventions to promote medication adherence [18]. Therefore, we need different approaches to improving medication adherence to improve health outcomes and reduce care costs [19]. Perceived social support is a cost-free approach. Therefore, this study investigated how perceived social support affected immunosuppressive medication adherence.

This study employed the MSPSS to determine the social support perceived by kidney recipients ($n = 168$). Participants had an above-average MSPSS total score. The results showed that participants received more support from their families than their friends and significant others. This result indicates that the family is the most basic source of social support. Family members give patients strength and encouragement, making them feel safe and supported. Patients who receive support from family members feel a greater sense of self-worth, making them more optimistic about their treatment [20]. Du and colleagues reported that family is the most important social support mechanism for kidney recipients [21]. Lin and colleagues also found that kidney recipients received more support from their families than their friends and significant others. This may have two reasons. First, parents, children, and spouses are generally the primary caregivers of kidney recipients. Second, patients with chronic diseases spend less time with friends and significant others because chronic diseases require long-term treatment [22]. We should encourage kidney recipients to be more social so that they can get more support from friends and significant others. Although family members and relatives are the greatest sources of social support, patients need both family and friends for adequate social support [23].

In this study, it is thought that the reason why the total score of perceived social support and friend support of people between the ages of 30–50 was significantly higher is that people in this age range have a wider social network than most adolescents and the elderly. Lin et al. also found that kidney recipients aged 40–50 were more in touch with others than adolescents and older adults [22].

Single participants had significantly higher mean MSPSS total and 'friends' and 'significant other' subscale scores than

TABLE 2 | The distribution of MSPSS and IMUAS scores by sociodemographic and transplant-related characteristics ($N = 168$).

		Family		Friend		Significant others		MSPSS		IMUAS	
Variables	***n***	**$\bar{X} \pm SS$**	**Test/*p***	**$\bar{X} \pm SS$**	**Test/*p***	**$\bar{X} \pm SS$**	**Test/*p***	**$\bar{X} \pm SS$**	**Test/*p***	**$\bar{X} \pm SS$**	**Test/*p***
Age											
1. < 30	25	25.52 ± 4.07	$F = 0.813$	16.88 ± 8.5	$F = 7.841$	13.04 ± 8.47	$F = 2.048$	55.44 ± 16.74	$F = 6.113$	49.56 ± 4.83	$F = 1.002$
2. 30–50	99	26.39 ± 3.24	$p = 0.445$	19.82 ± 6.68	$p = 0.001$	13.09 ± 7.31	$p = 0.132$	60.11 ± 12.44	$p = 0.003$	50.57 ± 3.32	$p = 0.369$
3. > 50	44	25.68 ± 4.98		14.77 ± 7.61		11.25 ± 6.19		51.7 ± 13.98		49.89 ± 3.82	
Significant difference				2–3				2–3			
Gender											
Female	59	25.64 ± 4.33	$t = -1.009$	17.71 ± 8.37	$t = -0.441$	13.71 ± 7.84	$t = 0.832$	57.07 ± 15.84	$t = -0.094$	49.95 ± 4.35	$t = -0.742$
Male	109	26.31 ± 3.62	$p = 0.315$	18.25 ± 7.03	$p = 0.660$	12.73 ± 6.96	$p = 0.407$	57.29 ± 12.91	$p = 0.925$	50.39 ± 3.32	$p = 0.459$
Marital status											
Married	129	26.27 ± 3.72	$t = 1.179$	17.35 ± 7.24	$t = -2.260$	12.16 ± 6.68	$t = -2.722$	55.78 ± 12.92	$t = -2.467$	49.98 ± 3.54	$t = -1.620$
Single	39	25.44 ± 4.36	$p = 0.240$	20.41 ± 7.99	$p = 0.025$	16.13 ± 8.35	$p = 0.009$	61.97 ± 16.26	$p = 0.015$	51.08 ± 4.15	$p = 0.107$
Education											
Literate/primary school	80	26.11 ± 3.51	$F = 1.469$	16.89 ± 7.73	$F = 2.833$	12.18 ± 7.37	$F = 1.658$	55.18 ± 14.41	$F = 2.982$	50.48 ± 3.64	$F = 0.717$
High school	49	25.45 ± 5.03	$p = 0.233$	18.67 ± 7.34	$p = 0.062$	13.61 ± 6.45	$p = 0.194$	57.73 ± 12.91	$p = 0.053$	50.24 ± 3.44	$p = 0.490$
University and above	31	26.97 ± 2.5		20.42 ± 6.61		14.77 ± 8.01		62.16 ± 13.33		49.55 ± 4.3	
Income											
Income less than expenses	66	25.21 ± 4.82	$F = 2.856$	17.23 ± 7.93	$F = 1.399$	11.92 ± 7.65	$F = 1.537$	54.36 ± 14.81	$F = 2.654$	50.29 ± 3.26	$F = 0.017$
Income neutral expense	84	26.56 ± 3.08	$p = 0.060$	19.01 ± 7.47	$p = 0.250$	14.01 ± 7.03	$p = 0.218$	59.58 ± 13.68	$p = 0.073$	50.23 ± 4.12	$p = 0.983$
Income more than expenses	18	27 ± 2.79		16.67 ± 5.56		12.94 ± 6.65		56.61 ± 10.12		50.11 ± 3.41	
Employment status											
1. Unemployed or student	33	24.97 ± 5.08	$F = 1.661$	16 ± 6.44	$F = 3.868$	12.55 ± 6.67	$F = 2.630$	53.52 ± 13.12	$F = 4.603$	48.91 ± 4.66	$F = 1.968$
2. Housewife	41	26.02 ± 3.74	$p = 0.162$	16.17 ± 8.54	$p = 0.005$	11.41 ± 7.14	$p = 0.036$	53.61 ± 14.49	$p = 0.002$	50.22 ± 3.68	$p = 0.102$
3. Full-time job	51	26.88 ± 3		21.25 ± 6.69		15.67 ± 7.89		63.8 ± 13.42		50.84 ± 3.15	
4. Part-time job	11	24.73 ± 5.42		17.36 ± 5.84		13.18 ± 6.05		55.27 ± 11.09		49.27 ± 3.82	
5. Retired	32	26.47 ± 3.04		17.75 ± 7.54		11.59 ± 6.59		55.81 ± 12.83		51 ± 3.16	

(Continues)

TABLE 2 | (Continued)

Variables	*n*	Family		Friend		Significant others		MSPSS		IMUAS	
		$\bar{X} \pm SS$	Test/*p*	$\bar{X} \pm SS$	Test/*p*	$\bar{X} \pm SS$	Test/*p*	$\bar{X} \pm SS$	Test/*p*	$\bar{X} \pm SS$	Test/*p*
Significant difference				1–3. 2–3		2–3. 3–5		1–3. 2–3			
Living arrangement											
1. Spouse	34	26.21 ± 3.88	KW = 3.185	16.15 ± 6.71	KW = 8.024	12.24 ± 6.89	KW = 8.792	54.59 ± 11.94	KW = 8.885	48.88 ± 3.84	KW = 12.823
2. Spouse and children	96	26.19 ± 3.82	*p* = 0.364	17.74 ± 7.37	*p* = 0.046	12.12 ± 6.6	*p* = 0.032	56.05 ± 13.29	*p* = 0.031	50.19 ± 3.83	*p* = 0.005
3. Parents and siblings	31	26.23 ± 3.72		20.29 ± 8.68		15.55 ± 8.87		62.06 ± 17.03		51.97 ± 2.71	
4. Alone	7	23.29 ± 5.25		21.86 ± 4.22		19.29 ± 5.62		64.43 ± 12.25		49.86 ± 2.41	
Significant difference				1–3		1–4. 2–4		1–3		1–3	
Donor type											
Cadaver donor	34	24.68 ± 5.3	*t* = −1.840	16.82 ± 6.85	*t* = −1.076	13.18 ± 7.16	*t* = 0.089	54.68 ± 13.09	*t* = −1.188	50.15 ± 3.09	*t* = −0.160
Living donor	134	26.43 ± 3.37	*p* = 0.073	18.37 ± 7.65	*p* = 0.284	13.05 ± 7.32	*p* = 0.929	57.86 ± 14.15	*p* = 0.236	50.26 ± 3.86	*p* = 0.873
Transplant time											
2–6 months	17	25.06 ± 6.81	KW = 5.879	16.53 ± 6.99	KW = 1.471	11.71 ± 5.73	KW = 2.265	53.29 ± 12.81	KW = 2.077	50.53 ± 3.94	KW = 4.125
7–12 months	8	24 ± 5.15	*p* = 0.208	17.63 ± 9.09	*p* = 0.832	13.88 ± 8.74	*p* = 0.687	55.5 ± 18.75	*p* = 0.722	48.63 ± 6.95	*p* = 0.389
13 months (1 year)–2 years	18	26.39 ± 3.07		18.39 ± 7.45		12.72 ± 6.93		57.5 ± 13.91		51.72 ± 2.61	
3–4 years	44	25.43 ± 4.35		17.61 ± 7.45		14.55 ± 7.86		57.59 ± 14.98		50.39 ± 3.47	
5 years and more	81	26.78 ± 2.51		18.59 ± 7.61		12.57 ± 7.19		57.94 ± 13.31		49.93 ± 3.55	
Post-transplant complications											
No	87	25.86 ± 3.82	*t* = −0.744	16.67 ± 7.2	*t* = −2.533	12.98 ± 6.52	*t* = −0.184	55.51 ± 13.19	*t* = −1.652	50.34 ± 3.16	*t* = 0.386
Yes	81	26.31 ± 3.96	*p* = 0.458	19.56 ± 7.58	*p* = 0.012	13.19 ± 8.04	*p* = 0.855	59.05 ± 14.6	*p* = 0.100	50.12 ± 4.23	*p* = 0.700
Any reminders of medication?											
Yes	52	26.69 ± 2.85	*t* = 1.594	18.79 ± 8.4	*t* = 0.789	12.06 ± 8.06	*t* = −1.147	57.54 ± 15.39	*t* = 0.201	49.81 ± 4.55	*t* = −1.007
No	116	25.8 ± 4.25	*p* = 0.113	17.73 ± 7.08	*p* = 0.432	13.53 ± 6.87	*p* = 0.255	57.07 ± 13.34	*p* = 0.841	50.43 ± 3.27	*p* = 0.315
Medication reminder app use											
Yes	64	25.34 ± 4.38	*t* = −1.836	18.89 ± 7.83	*t* = 1.127	12.78 ± 7.39	*t* = −0.413	57.02 ± 14.12	*t* = −0.144	50.12 ± 4.55	*t* = −0.283
No	104	26.53 ± 3.49	*p* = 0.069	17.55 ± 7.29	*p* = 0.261	13.26 ± 7.22	*p* = 0.680	57.34 ± 13.93	*p* = 0.885	50.31 ± 3.1	*p* = 0.778

Note: F: One-way ANOVA, *t*: Independent *t*-test.
Abbreviations: IMUAS, Immunosuppressive Medication Use Adherence Scale; KW, Kruskal–Wallis test; MSPSS, Multidimensional Scale of Perceived Social Support.

TABLE 3 | The correlation between MSPSS and IMUAS scores.

		Family	Friend	Significant others	MSPSS	IMUAS
Family	*r*	1				
	p	—				
Friend	*r*	0.257	1			
	p	0.001	—			
Significant others	*r*	−0.005	0.513	1		
	p	0.946	< 0.001	—		
MSPSS	*r*	0.413	0.876	0.795	1	
	p	< 0.001	< 0.001	< 0.001	—	
IMUAS	*r*	0.248	0.226	0.037	0.209	1
	p	0.001	0.003	0.637	0.006	—

Note: Pearson's correlation test.
Abbreviations: IMUAS, Immunosuppressive Medication Use Adherence Scale; MSPSS, Multidimensional Scale of Perceived Social Support.

TABLE 4 | Factors associated with IMUAS score.

	IMUAS						95% confidence interval	
Model	***B***	**SE**	***β***	***t***	**Sig.**	**VIF**	**Lower**	**Upper**
Age	0.921	0.507	0.157	1.815	0.071	1.354	−0.081	1.922
Male gender	0.259	0.602	0.033	0.431	0.667	1.091	−0.929	1.448
Full-time job	0.691	0.682	0.086	1.014	0.312	1.3	−0.655	2.038
Living with parents and siblings	2.501	0.799	0.262	3.132	0.002	1.269	0.924	4.078
MSPSS	0.042	0.021	0.160	2.007	0.046	1.147	0.001	0.084

Note: $R = 0.362$, $R^2 = 0.131$, $p = 0.002$.
Abbreviation: IMUAS, Immunosuppressive Medication Use Adherence Scale.

married ones. Participants with full-time jobs had significantly higher mean MSPSS 'friends' subscale scores than the unemployed/students and housewives. Participants with full-time jobs had significantly higher mean MSPSS 'significant other' subscale scores than housewives and the retired. Working people spend most of their time in their workplaces, and therefore, they receive much more support from their friends and significant others.

Participants living alone had higher mean MSPSS total and 'friends' and 'significant other' subscale scores than others. People with many close friends feel less lonely. Unlike family, friends are there as long as you are there for them [23]. In other words, friendship is based on mutual support. Kidney recipients living alone are less likely to receive support from their family members. However, they are probably more likely to have different ways and strategies to seek support or have their significant others who are there for them. Friendship is an essential part of life. Friends prevent isolation and loneliness and make one feel a sense of belonging, resulting in happiness [24]. Participants with post-transplant complications had a significantly higher mean MSPSS 'friends' subscale score than those without post-transplant complications. People need their friends to be there for them when they have problems. They feel happier and more satisfied when they are with their friends [25]. Older adults are happier when interacting with their friends than their family members [24]. According to Chopik, family relationships are also generally fun, but sometimes they are overly serious, negative and monotonous. For example, people develop more chronic diseases when their friendships are sources of tension. However, they are happier when friends support them [24].

In this study, it was determined that the most important factors affecting medication adherence behaviour in kidney transplant recipients were living with a mother, father or sibling and perceived social support score. This is probably because kidney recipients living with their parents generally relegate their care responsibilities to their parents, such as reminding them to take medications. Involving friends and family in the care of kidney recipients is an effective approach to increasing medication adherence [19]. In addition, family members positively affect each other's behaviors and encourage each other to adopt more health-promoting behaviors and benefit from healthcare services more effectively [20]. Participants living with their parents and siblings had the highest mean IMUAS score, whereas those living with their spouses had the lowest mean IMUAS score. A kidney recipient and his/her spouse should be viewed as an interconnected whole, each affecting the other. A kidney transplant causes both the patient and his/her partner to experience high levels of stress [26]. Although social support from the spouse is critical for the kidney recipient, the spouse is also affected by the disease, which can cause various problems and worsen their relationship [27]. Therefore, kidney recipients living with their spouses may have to take responsibility for their own care. This may explain why our participants living

with their spouses had a lower mean IMUAS score than those living with their parents and siblings. However, more research is warranted to better understand the effect of living arrangements on immunosuppressive medication adherence.

A weak positive correlation was found between the family subscale, friend subscale and total score of the social support scale and the total score of the immunosuppressive drug adherence scale. The positive correlation indicates that an increase in social support increases immunosuppressive drug adherence and a decrease in social support decreases immunosuppressive drug adherence. In a meta-analysis study, it is generally stated that although there is a statistically significant effect between social support and adherence and post-transplant outcomes, the effect is not valid in high-quality studies. As few studies have examined the relationship between social support and adherence and post-transplant outcomes, it is emphasized that this is an area where more high-quality research is particularly needed [14].

Effective communication between healthcare professionals and patients contributes to medication adherence. Patients receiving social support from family members are more likely to receive positive health interventions and have a better quality of life [20]. Moreover, patients supported by family members are more likely to adhere to their medications [22]. Having conducted a systematic review on social support and medication adherence, Shahin and colleagues have concluded that support from family members and peers encourages patients to adhere to their medications [20]. In their meta-analysis, Yang and colleagues [28] recommend that healthcare professionals inform kidney recipients about the importance of social support for their physical and psychological health and encourage them to spend time with their families and friends. The higher the perceived support, the more confident the patients are in their fight against their illnesses. Moreover, perceived support makes them more likely to adopt health-promoting behaviors, such as medication adherence. On the contrary, the lower the perceived support, the more likely the patients are to be pessimistic about their illnesses [28]. This increases the risk of patients mismanaging the therapeutic regimen, including medication adherence. Lieber and Volk reported a correlation between low social support and immunosuppressive medication nonadherence in liver recipients ($n = 444$) [29]. Rodrigue and colleagues also reported a correlation between the lack of social support factors and immunosuppressive medication nonadherence in recipients [30]. Therefore, recipients should be provided with social support to encourage them to adhere to their medications and prevent nonadherence-related complications. Healthcare professionals should develop interventions to promote individual, family, and social support to ensure medication adherence.

6 | Study Limitations

This study had four limitations. First, the study was conducted only in one centre. Second, the sample was small. Third, the data were based on self-reports. Fourth, we could not support our findings with the international literature because we used a scale developed in Turkey to evaluate our participants' medication adherence levels. Therefore, more research is warranted to guide medical practice better. The results cannot be generalized to all kidney transplant recipients.

7 | Clinical Implications

Nurses should raise the public's awareness of social support. They should work closely with family members, hospitals and other social resources to provide a better support system and create favourable conditions for patients. In this way, they should provide support, care, and assistance to patients in various ways. In addition, authorities should exert more efforts to improve the existing social support system [28] Researchers should conduct larger prospective studies and adopt different methods to confirm the scales used to evaluate the impact of perceived social support on immunosuppressive medication adherence more accurately. Researchers should examine the timing, type, and consequences of social support associated with transplantation. More qualitative research is warranted to better understand what social support factors are most important for improving immunosuppressive medication adherence.

8 | Conclusion

Our participants had high immunosuppressive medication adherence and moderate perceived social support. Participants were mostly supported by their family members, followed by friends and significant others. A correlation was observed between perceived social support and immunosuppressive medication adherence. Living with parents and siblings and receiving social support were the most important factors affecting medication adherence in our participants. Healthcare professionals should focus on these findings and design interventions to optimize immunosuppressive medication adherence.

Author Contributions

Author has agreed on the final version and meets at least one of the following criteria:

Ebru Karazeybek: conceptualization, data curation, formal analysis, investigation, methodology, validation, visualization, supervision, writing–original draft, writing– review and editing.

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Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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