Obesity and Quality of Life in Kidney Transplant Recipients

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ABSTRACT

Objective: The objective of this research was to analyse the effects of overweight and obesity in relation to markers of chronic graft dysfunction (*ie* dyslipidemia, high blood pressure, and proteinuria), and study their impact on the quality of life of kidney graft recipients in the first-year after transplantation.

Material and methods: This study monitored 1500 kidney transplant recipients of both sexes. One-year after receiving the graft, all patients had blood tests to measure their biochemical parameters. They were also weighed and their height measured. In addition, data regarding graft loss and delayed renal function were also evaluated.

Results: The results showed an increased prevalence of overweight and high body mass index (BMI) among the graft recipients participating in the study. Furthermore, there was a direct relation between these parameters and those of health status perception, graft rejection and reduced renal function.

Conclusion: A high BMI as well as proteinuria and high blood pressure in the first-year after transplantation can lead to chronic graft dysfunction and significantly reduce the quality of life of the patient. Renal dysfunction markers along with obesity and a high BMI contributed to a decrease in the glomerular filtration rate (GFR) and ensuing complications in the first-year after transplantation. This affected the quality of life of these patients who, as a result, suffered from chronic kidney disease. Consequently, their physical condition was negatively affected, which increased rates of morbidity and mortality.

Keywords: Kidney transplantation, lipid alterations, obesity anthropometry, quality of life

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INTRODUCTION

Within the context of public health and medicine in general, quality of life is an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns (1). Health professionals often use health-related quality of life to measure the effects of chronic illness in patients in order to gain a better understanding of how illness can affect daily life (2, 3). Currently, there is a growing interest in studying quality of life in renal transplant recipients. More specifically, research findings indicate that these patients tend to experience a significant reduction in quality of life in comparison to the general population (4).

The advantages of kidney transplantation are well known, but life in the post-transplant phase also has negative aspects, such as harsh treatments with immunosuppressive drugs and their related side effects. In addition, patients must also endure frequent medical visits, infections, rejection episodes, uncertainty, anxiety, and risk of graft loss (5,6). Therefore, an important task for the future of kidney transplantation is a more detailed specification of the wide range of clinical, environmental, and personal factors that can have a negative impact on the patient's health-related quality of life (7). Clearly, a more in-depth understanding of these factors is crucial in order to develop interventions that can improve the quality of life of renal transplant recipients (8). In line with this, one of the priorities of the World Health Organization (WHO) is also to enhance the quality of life of people who live with those suffering from chronic illness (9).

Obesity is a factor that significantly worsens quality of life for patients suffering from chronic illness. It has an evident impact on their physical condition (10). More specifically, overweight and obesity in the post-transplantation phase can lead to arterial hypertension,

proteinuria, and dyslipidemia, all of which can cause kidney damage and delayed renal function. The main objective of this research study was to analyse overweight and obesity in relation to these graft dysfunction factors and evaluate their effect on quality of life in the first year after kidney transplantation.

SUBJECTS AND METHODS

Subjects

The sample population was composed of 1500 kidney transplant recipients, 897 men and 603 women, 16-80 years of age. All of the subjects periodically visited the post-transplant clinic at the University Hospital Virgen de las Nieves in Granada (Spain). The base disease is shown in Figure. All patients met the following inclusion criteria: absence of diabetes mellitus before transplantation; stable renal function before transplantation and one-year monitoring period.

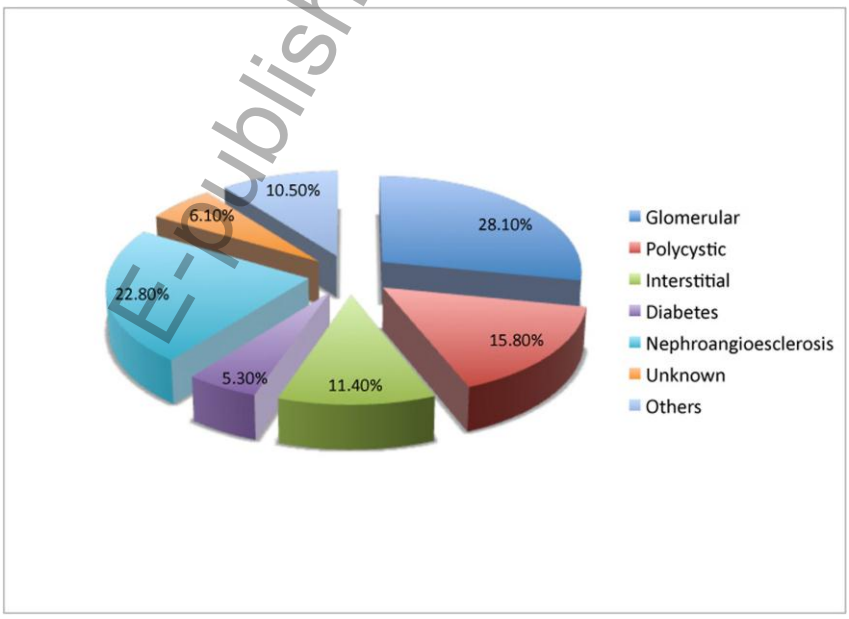

Figure: Causes of chronic kidney disease.

Methods

All of the patients were given blood tests to measure levels of the following: total cholesterol, low-density lipoproteins (LDL), high-density lipoproteins (HDL), and triglycerides. Peripheral blood samples (6 ml) were collected between 8:00 and 9:00 AM by venipuncture into a Venoject II® plastic whole blood tube (TERUMO, autosep®). Blood extraction was performed under fasting conditions. Renal function was measured with the Cockcroft-Gault (CG) formula:

$$\textbf{Creatinine Clearanca} = \frac{(\textbf{140} - \textbf{Age})\ \textbf{X Mas}\ (\textbf{in kilograms})}{\textbf{72 X Serum Creatinine}\ (\textbf{in mg/dl})}\ \textbf{X}\ (\textbf{0,85 is female})$$

Renal function deterioration was regarded as an increase in serum creatinine and the presence of high levels of proteinuria. A year after transplantation, the patients were also weighed in kilograms with a Perperson 113481 scale/stadiometer and their height measured in centimeters. Their body mass index (BMI) was then calculated using the formula: weight (kg)/height (m2). The subjects' BMI was evaluated based on the following ranges in the WHO Classification: (i) underweight (< 18.50); (ii) normal weight (18.50-25); (iii) overweight (25-30); (iv) obese (>30). The hypotensive agents used were beta-blockers, diuretics, angiotensin converting enzyme inhibitors [ACE inhibitors], and calcium channel blockers. The immunosuppressive protocol was a triple therapy based on prednisone, consisting of Cyclosporine (CsA) or Tacrolimus and Microphenolate Mofetil (MMF) or Azathioprine (AZA).

The dosage of immunosuppressive drugs followed the standard protocol used in the University Hospital Virgen de las Nieves in Granada (Spain). Of the sample, 80% of the graft recipients had taken lipid-lowering agents, such as rosuvastatin, atorvastatin, and simvastatin, and

were still being treated with them. Dyslipidemia was defined as follows: (i) total cholesterol values of >200 mg/dl (5.17 mmol/l); (ii) triglycerides >200 mg/dl (2.26 mmol/l); (iii) diabetes, if fasting blood glucose levels were > 126 mg / dl.

High blood pressure was defined in terms of the criteria established in 2010 by the American Heart Association (NHBPEP), namely, blood pressure values exceeding 140/90mmHg. Proteinuria was regarded as the presence of proteins in the urine, greater than 150 mg in a 24-hour urine collection. Before being discharged from the hospital, patients were advised to consume 1.4-1.5 g/kg of proteins (30-35 kcal) kg/day during the first three months after the kidney transplant. Moreover, it was recommended that they avoid sugar and decrease their intake of lipids to less than 30%. After the first three months, patients were advised to reduce their protein intake to 1g/kg per day. After one year, patients were surveyed and asked about their perception of their health status, specifically in regard to their position as a graft recipient. Accordingly, they had to classify their health status in one of the following categories: 1. Worse than before transplantation; 2. The same as before transplantation; 3. Better than before transplantation.

Statistical analysis

All statistical analyses were performed using the statistical software package SPSS Statistics 20. The results were expressed as frequencies, percentages, and mean values ± standard deviation. The differences between groups were evaluated with the analysis of variance (ANOVA). Category variables were compared with the chi square test. All data were expressed as mean value ± standard deviation (X ± SD). *P*-values lower than .05 were regarded as statistically significant.

RESULTS

As reflected in Table 1, age played a major role in the perception of health status. More specifically, an average of 53.71 patients said that they felt worse than before transplantation whereas 46.82 patients stated that they felt the same. Differences for parameters such as gender and height were not statistically significant.

Our results showed that weight was an important variable. Table 1 shows that the patients' mean weight tended to increase in the pre-transplant phase up to six months to a year after transplantation as patients perceived a deterioration in their health status. In contrast, this was not the case for those who stated that their health had improved after transplantation. In this regard, the parameter of high blood pressure was similar to that of weight. The majority of graft recipients with high blood pressure stated that their health was worse or the same as before transplantation. Only a small percentage said that they felt much better (Table 1).

Table 1: Comparison of quality of life to anthropometric and biochemical parameters

Variables	***Worse than before transplantation***	***Same as before transplantation***	***Better than before transplantation***	***Results***
Age	53.71 ± 12.65	56.82 ± 8.63	45.32 ± 13.81	0.000
Gender: Male/Female %	76.55 / 23.5	58.8 / 41.2	62.5 / 37.5	NS
Height (cm)	165.79± 9.11	164.04 ± 8.20	163.84 ± 9.26	NS
Pre-transplant weight	70.46 ± 15.07	67.41 ± 12.93	68.33 ± 13,29	NS
Weight [6 months afterward]	74.72 ± 11.61	70.10 ± 13.80	72.48 ± 12.80	NS
Weight [1 year afterward]	76.82 ± 11.24	70.44 ± 13.30	74.42 ± 13.55	NS
Proteinuria (1 year) (mg/dl)	0.35	0.31	0.07	0.012
Hypertension %	35.7	35.3	21.3	NS
Hyperlipidemia %	23.5	5.9	23.3	NS

Proteinuria was also an important variable. Table 1 shows that as levels of protein increased in urine, patients tended to have a worse perception of their health. As reflected in the value ranges in Table 2, the patients with lower percentages of proteins in their urine said that their health was

much better than those with higher percentages (proteinuria). In regard to the highest range of values, the results were very significant in comparison to the other intervals.

Table 2: Comparison between quality of life and proteinuria levels

	Proteinuria range [1 year afterward]				
Quality of life [1 year afterward]	< 0.125 g	0.125-0.250g	0.250-1g	1-3g	>3g
Worse than before transplantation %	66.7		16.7	16.7	
The same as before transplantation%	73.3	6.7	6.7	13.3	
Better than before transplantation %	89.8	2.9	5.6	1.4	0.3

$p < 0.000$

When the patients' body mass index (BMI) was categorized with the WHO classification, obese graft recipients with high BMIs were those that stated that their quality of life was worse than before transplantation. In contrast, there were no differences between overweight and normal-weight patients whose quality of life was the same as before transplantation. In regard to patients whose quality of life improved after transplantation, there was a higher percentage of overweight patients. Another striking result is the extremely high percentage of overweight and obese patients with renal graft loss within the first year after transplantation (Table 4).

Table 4: Comparison between percentage of patients with graft loss and BMI, according to WHO N=1336

	BMI according to the WHO classification			
Graft loss within one year	Underweight	Normal weight	Overweight	Obesity
No % (N: 1228)	0.4	32.9	39	27.7
Yes % (N: 108)			66.7	33.3

P: NS

Exactly the same occurred in the case of kidney function (Table 5).

Table 5: Comparison between delayed renal function (Cockcroft-Gault Formula) and BMI, according to the WHO classification

	BMI according to the WHO classification			
Delayed graft function	Underweight	Normal weight	Overweight	Obesity
No %	25	49.1	45.8	33.9
Yes %	75	50.9	54.2	66.1

$p < 0.01$.

When BMI was evaluated based on the WHO classification, our results showed that the percentages of patients with underweight, normal weight, overweight, and obesity were all greater in those suffering from delayed graft function. The difference had a high level of statistical significance. The patients' quality of life was perceived as poor when renal function was deficient (Table 6). In contrast, percentages were similar in those patients who stated that their quality of life was better than before transplantation. This difference was also statistically significant.

Table 6: Comparison between quality of life and delayed renal function (Cockcroft-Gault Formula)

	Delayed graft function	
Quality of life [1 year afterward]	**NO**	**YES**
Worse than before transplantation %	13.6	86.4
Same as before transplantation %	26.6	73.7
Better than before transplantation %	46.1	53.9

$p < 0.01$.

DISCUSSION

The majority of patients in this study were adults, 40-50 years of age (50.8%) with a mean age of 45.04 years (SD = 14.4). This in itself is disturbing because it is a reflection of the early development of kidney disease and its rapid progression in active young people. In this regard, this research differs from previous studies of renal graft recipients, whose age was slightly older (51.1 years) (11).

Evidently, age plays an important role in the acceptance of infirmity. Our results indicate that kidney transplant patients of a younger age seem to have a greater awareness of the limitations of their illness (12-14). In this regard, various studies show that kidney graft survival is longer in younger patients (73% and 83%) than in older ones (15-17). According to our results, after the renal transplant, patients experienced a significant gain in weight and BMI (Table 3).

Table 3: Comparison between quality of life and BMI, according to the WHO Classification

	BMI according to the WHO classification			
Quality of life [1 year afterward]	Underweight	Normal weight	Overweight	Obesity
Worse than before transplantation %		18.2	36.4	45.5
Same as before transplantation %		41.2	41.2	17.6
Better than before transplantation %	0.5	31.1	40.8	27.7

P: NS

This is a serious problem since post-transplant obesity is an important risk factor for renal graft survival as well as for the development of cardiovascular disease, high blood pressure, diabetes, and dyslipidemias. In addition, it is an important cause of morbility and mortality (18, 19). This is a source of added stress for these graft recipients, who must try to maintain their weight at a level that will not further endanger their health. As reflected in our results, the patients who perceived their health status as the same as before transplantation or worse than before transplantation had the highest BMIs. One reason for this is that they were aware that weight is a factor that can lead to graft rejection. This is an important problem that must be addressed in clinical work and management because of the possible consequences of overweight and obesity and the difficulty in regaining and maintaining a normal weight (20, 21).

Generally speaking, kidney transplant patients have suffered from chronic kidney disease over a period of several years. For this reason, many of them experienced lipid disorders even before transplantation (22, 23). Unfortunately, the metabolism of lipids does not return to normal

when renal function is recovered after the transplant (24). This signifies that post-transplant renal dyslipidemia is a relatively frequent metabolic disorder, especially in the first year after transplantation. It is thus of great clinical interest not only because of the high incidence of post-transplant cardiovascular incidents but also because of its possible contribution to the development of chronic graft dysfunction (25). Even though it is not statistically significant, our results point to a possible relation between hyperlipidemia and quality of life. Again, the highest percentages pertained to those patients whose quality of life had not improved after transplantation.

Proteinuria was found to be another important factor in our study. When percentages were high, the patients' quality of life significantly worsened because of the ensuing mental, emotional, and physical limitations. Physical symptoms include fatigue, lack of energy, sleep disorders, pain, edemas, general feeling of illness, and anxiety. These symptoms reduce the patients' capacity to engage in other activities, especially since there is the need to continuously monitor renal function (26).

Consequently, obesity is frequent in renal graft recipients, and is associated with a deterioration in cardiovascular parameters and the progression of proteinuria (27-30). As reflected in this study, patients with a high BMI experienced a reduction in quality of life. Moreover, a high percentage of these patients also suffered from renal graft loss and/or delayed renal function. All of these factors had a negative impact on their health-related quality of life as can be observed in Table 6.

In conclusion, markers of chronic graft dysfunction such as obesity and a high BMI contributed to a reduction in the glomerular filtration rate and ensuing complications in the first year after transplantation. This affected the health-related quality of life of patients with chronic

kidney disease by significantly reducing their physical condition and increasing their morbility and mortality.

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AUTHORS' NOTE

Mc Jose Martía conceived paper, oversaw data collection, conducted data analysis, wrote manuscript and approved final version. Artacho R participated in study design, data analysis and interpretation, critically revised manuscript and approved final version. Aguilar Cordero MJ and Bravo Soto J participated in study design, data analysis, and interpretation of data and revision of manuscript and approved final version. Castillo RF participated in study design, interpretation of data and revision of manuscript and approved final version.

The authors declare that there is no conflict of interests.

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