

Post-transplant weight gain and obesity: an opportunity for renal dietary management

Abstract

Weight gain and obesity are common after kidney transplantation. Several known risk factors for obesity in non-transplant population remain to be the important determining factors for obesity in kidney transplant recipients. In addition, some factors related to kidney transplantation contribute to post-transplant weight gain and obesity. These factors can occur during pre-, peri-, and/or post-transplant periods. During pre-transplant period, underlying conditions such as metabolic syndrome place the patients at risk for obesity after kidney transplantation. Positive fluid balance during peri-transplant period transiently causes post-transplant weight gain. Post-operative pain from surgical wounds limits physical activities and prevents weight loss especially in patients with pre-transplant obesity. Immunologic and non-immunologic factors during post-transplant period can become barriers to lose weight or even perpetuate obesity. Among of these factors, inappropriate dietary and nutrition management plays an important role in post-transplant weight gain and obesity. Apart from the dietary aspect, there are other factors contributing to post-transplant weight gain and obesity and these include the individual patient and their family, kidney transplant team through education and social aspects. Therefore, a multidisciplinary approach is required to prevent post-transplant weight gain and obesity.

Keywords: diet, kidney transplantation, nutrition, obesity, weight gain

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Abbreviations: BMI, body mass index; CKD, chronic kidney disease; CNI, calcineurin inhibitors; ESRD, end stage renal disease

Introduction

Kidney transplantation is a treatment of choice for an appropriate advanced chronic kidney disease (CKD) or end-stage renal disease (ESRD) patients.¹ It restores fluid and electrolyte imbalances due to renal dysfunction. During pre-transplant period, dietary restriction is required for ESRD patients to control these imbalances in conjunction with dialysis; however, well-functioning renal allograft function after successful kidney transplantation almost eliminates the need for dietary restriction. Oftentimes, unrestricted diet can become over liberal and even leads to “over nutrition”, and subsequently weight gain and obesity after kidney transplantation. Kidney transplant recipients may perceive an idea that “no dietary restriction is required for their new kidneys”. This misconception is partly due to inadequate patient education by kidney transplant team. Like in non-transplant population, obesity still conveys cardiovascular risk factors in kidney transplant recipients. Therefore, appropriate dietary management for kidney transplant recipients is one of the strategies to prevent post-transplant weight gain and obesity, minimize cardiovascular complications, and maximize transplant outcomes. In this article, an overview of risk factors for post-transplant weight gain and obesity from pre- through post-transplant periods are summarized. Dietary management during post-transplant is emphasized and some challenging aspects in the management are discussed.

Discussion

Two main questions will be discussed in this article. These explore key determinants of weight gain and obesity after kidney transplantation and potential preventive strategies particularly dietary intervention.

Why do kidney transplant recipients gain weight or become obese?

Several factors contributing to post-transplant weight gain and obesity may occur during pre-, peri-, and/or post-transplant periods. The main factors are summarized in Figure 1.

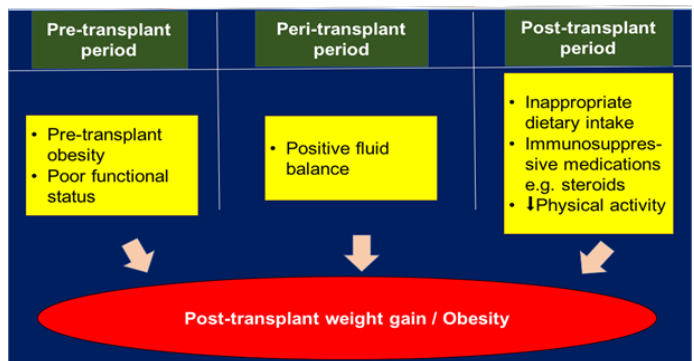


Figure 1 Potential contributing factors for post-transplant weight gain and obesity description of figures/image.

Pre-transplant period

During the pre-transplant period, there are several factors related to advanced CKD and ESRD that potentially increase the risk for post-transplant weight gain and obesity. These main risk factors include:

Pre-transplant obesity: Data from a single kidney transplant center revealed that around one-third of ESRD patients were obese at the time of kidney transplantation and obese patients who were on a kidney transplant waiting list lost more weight during the pre-transplant period than non-obese patients.² However, rapid post-transplant weight gain occurred in patients with pre-transplant weight loss.³

Poor functional status: Advanced CKD and ESRD patients generally have multiple comorbidities including cardiovascular diseases such as coronary artery disease, cerebrovascular accident, or peripheral arterial disease. These comorbidities make these patients become marginal candidates for kidney transplantation⁴ and lower the patients’ functional status. In addition, some ESRD patients may have some degrees of uremia from inadequate dialysis or even dialysis fatigue.⁵ In addition to the effects on patients during the pre-transplant period, the poor functional status likely predicts prolonged recovery and physical inactivity during the post-transplant period, and subsequently increases the risk for post-transplant weight gain and obesity.

Peri-transplant period

Many patients transiently gain weight during the peri-transplant period and the main component of weight is a large amount of intravenous fluid given to the patients during this period.

Intravenous fluid administered during kidney transplantation and the immediate post-transplant period is generally required to replace increased urine output from a functioning renal allograft. Rapid weight gain from a positive fluid balance is very common, but most patients with a functioning renal allograft can mobilize extra fluid by urinary excretion and subsequently lose weight.

Post-transplant period

Unlike per-transplant period, weight gain during the post-transplant period is generally persist unless factors contributing to weight gain are intervened. These factors including immunologic and non-immunologic factors involve in weight gain and obesity during this period.

Immunologic factors

a. Inappropriate dietary intake

Dialysis can correct fluid and electrolyte disturbances; however, fluid and diet restrictions are also mandatory for ESRD patients whose kidneys are not well functioning to adequately maintain acceptable fluid and electrolyte balances. ESRD patients tend to get used to dietary restriction mainly low potassium and phosphate intake. However, after successful kidney transplantation, fluid and electrolyte imbalances are generally corrected and dietary restriction is not required. Instead, many kidney transplant recipients develop post-transplant hypophosphatemia from the remaining elevated fibroblast growth factor (FGF) 23,⁶ which is a hormone responding to hyperphosphatemia in CKD and ESRD patients during pre-transplant period.

Apart from unrestricted phosphate diet, “renal diet” should be replaced with normal diet⁷ because inadequate phosphate intake in

the setting of functioning renal allograft can further worsen post-transplant Hypophosphatemia.⁸ In addition, kidney transplant recipients are usually told to consume high phosphate-containing diet such as a dark-colored fluid. Some patients may even drink dark-colored fluid containing high sugar and calories as well as increase high dairy product intake such as cheese, etc. Although these types of liberal diet can increase serum phosphorus level, they add more calories and make the patients to be at risk for “over nutrition”, which increases a chance for the patients to have weight gain and obesity.

b. Decreased physical activity

During the immediate post-operative period, kidney transplant recipients tend to have limited physical activity due to a slow recovery from kidney transplantation, the effect of anesthesia, and pain from the surgical wound. Moreover, an intense exercise is not advised for these patients during the early post-transplant period given potential mechanical complications to a renal allograft from stretching anterior abdominal wall. These restricted activities could prevent weight loss.

Immunologic factors

a. Immunosuppressive medications

Steroid is one of the most commonly used immunosuppressive medications in kidney transplantation. Its known side effects include increased salt and water retention, and subsequent weight gain and obesity. Moreover, in the setting of renal allograft rejection, escalation of immunosuppressive medications particularly high dose steroids can potentiate the side effects of steroids and further increases the risk for weight gain and obesity. However, risk for obesity in kidney transplant recipients is not decreased by only avoiding steroid use.⁹

What are potential strategies to prevent post-transplant weight gain and obesity?

Incidence and prevalence of obesity in ESRD patients are more than those in general population.¹⁰ In addition, obesity is a strong risk factor for CKD.¹¹ Different from non-kidney disease population, over nutrition such as high body mass index (BMI) in ESRD patient is associated with more favorable mortality outcomes than patients with under nutrition. This paradoxical result, which is opposite to non-kidney disease population, is called reverse epidemiology.¹² However, after successful kidney transplantation, traditional risk factors for cardiovascular diseases become risk factors for cardiovascular morbidities and mortalities in kidney transplant recipients. Therefore, prevention of post-transplant weight gain and obesity is one of the strategies to avoid cardiovascular complications and improve renal allograft and patient outcomes after kidney transplantation (Table 1). These interventions can be implemented during the pre-, peri-, and/or post-transplant periods.

Table 1 Potential interventions to prevent post-transplant weight gain and obesity during different transplant periods

	Interventions	Examples
Pre-transplant period	Lifestyle modification and improved function status	Diet Exercise
Peri-transplant period	Vigilant fluid monitoring	Diuretics Dialysis (for slow or delayed renal allograft function)
Post-transplant period	Education Individualize maintenance immunosuppressive medications	Related to diet and exercise Minimize CNI and steroids plus other strategies

CNI, calcineurin inhibitors

Intervention during pre-transplant period

Lifestyle modification and improved function status: Diet and exercise remain one of the most important non-pharmacological interventions for weight loss and weight maintenance in CKD or ESRD patients who are on the kidney transplant waiting list. Functional status is one of the critical criteria for selecting candidates for kidney transplantation since poor functional status or frailty in ESRD patients are associated with unfavorable transplant outcomes including re-hospitalization, poor renal allograft outcomes, and decreased patient survivals.^{13–15} From observation, ESRD patients with a good functional status tend to do well and have a short recovery period after kidney transplantation. They also have opportunities to engage in more physical activities during the post-transplant period. Therefore, pre-transplant preparation to improve functional status by exercise and lifestyle modification should be encouraged in all ESRD patients.

Intervention during peri-transplant period

Fluid control: Fluid intake and output during the peri-operative period needs to be closely monitored. Diuretics may be used if indicated such as volume overload or hyperkalemia. In the setting of a delayed renal allograft function, dialysis may be required to correct fluid and electrolyte imbalances. Weight gain during the peri-transplant period can transiently occur, but may not reflex an actual weight during the post-transplant period. However, it can be used to guide for fluid management during immediate post-transplant period.

Intervention during post-transplant period

Education about diet and exercise: As discussed above, kidney transplant recipients may not be fully aware of an appropriate “unrestricted” diet, which should still be a healthy diet. Therefore, education is very important to avoid misconception and the patients should be educated since pre-transplant period. Moreover, since kidney transplant recipients need assistance from their dedicated caregivers especially during the early post-transplant period, apart from patient education, family should also be educated. Dietary consultation and referral for weight loss or weight control should be considered if there are resources available.¹⁶ In addition, patients should be encouraged to perform exercise if there is no contraindication.

Selecting maintenance immunosuppressive medications: Post-transplant hyperglycemia and diabetes commonly occur due to several factors and can increase risk for post-transplant weight gain and obesity. In addition to non-immunologic causes such as inappropriate dietary intake or lack of exercise, immunologic causes especially immunosuppressive medications such as CNIs and steroids are the main causes of post-transplant hyperglycemia and diabetes. Therefore, minimizing immunosuppressive medications should be considered in an appropriate clinical setting.

Conclusion

Kidney transplantation improves quality of life and survival of advanced CKD and ESRD patients. Several conditions can worsen transplant outcomes. Obesity, one of the risk factors for cardiovascular disease, is common after kidney transplantation. Risk factors for post-transplant weight gain and obesity can occur during pre-, peri-, and/or post-transplant periods and most of these factors can be modified or prevented. Since immunologic and non-immunologic factors such as diet contribute to post-transplant weight gain and obesity, these should provide opportunities to intervene and prevent post-transplant weight

gain and obesity. Although the management of post-transplant weight gain and obesity is challenging since it involves several factors, patient and family education as well as collaboration among patients, their family, and transplant team should facilitate the preventive strategies to achieve weight control after kidney transplantation.

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Conflict of interest

The author declares no conflict of interest.

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