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ORIGINAL ARTICLE

Prevalence and Predisposing Factors of Post Renal Transplant Erythrocytosis

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ABSTRACT

Objective: Aim of current study was to determine the factors and prevalence of post-transplant erythrocytosis after kidney transplantation.

Study Design: Retrospective study

Place and Duration: Institute of Kidney Diseases Hayatabad Peshawar during June 2021 to December 2021.

Methods: Total 118 patients of renal transplant were presented. Participants' full demographic information was recorded after getting written consent from each participant. Association of risk factors and prevalence of post-transplant erythrocytosis were recorded. Hematocrit (Ht) above 52% and haemoglobin (Hb) over 18 g/dl in males and Ht over 50% and Hb over 17 g /dl in females were considered to be indicative of true PTE. We used SPSS 18.0 to analyze all data.

Results: The mean age of the patients was 50.6±2.31 years with mean BMI 27.4±11.52 kg/m^2. There were majority 76 (64.4%) patients were males and 42 (35.6%) patients were females. Frequency of PTE was found in 23 (19.5%) cases and 95 (80.5%) cases were without PTE. Most common factors for PTE development were endogenous erythropoietin, local renal hypoxia, endogenous androgens, insulin-like growth factors and the renin-angiotensin- aldosterone system. Mean duration of dialysis in PTE group was 25.1±7.48 months and duration of patients without PTE was 51.9±6.75 months. Frequency of diabetes, hypertension, glomerulonephritis, polycystic kidney disease and graft failure were higher in PTE patients as compared to non-PTE. We found higher number of acute rejection in PTE patients as compared to non PTE cases with p value <0.009.

Conclusion: We concluded in this study that the shorter duration of dialysis and higher number of acute rejection before kidney transplant were the risk factors for post transplant erythrocytosis. Most common factor for PTE development was renin-angiotensin- aldosterone system.

Keywords: Erythrocytosis, Transplantation, Kidney, Dialysis

INTRODUCTION

Despite kidney transplantation's status as the gold standard treatment for patients with end-stage renal illness, many patients experience post-transplant problems that need to be monitored and managed carefully[1,2]. One of these complications, known as post-transplant erythrocytosis (PTE), is characterised by a persistently increased haemoglobin (Hgb) > 17 g/dL or hematocrit (Hct) > 51% after a kidney transplant[3, 4].

For the most part, there was no agreed-upon definition of PTE used in these investigations. Some studies utilised hematocrit (50-53.5%) or haemoglobin (16.5-18 g/dL) as cutoffs, whereas others employed real red cell mass [4,5]. The KDIGO 2009 recommendations, for example, employed the same threshold to identify PTE in both sexes despite the fact that men and women have different normal haemoglobin concentrations [6]. Some studies included all patients who were over the threshold number at any time after transplantation, whereas others needed persistent PTE beyond a certain time frame. Most of the previous research was conducted at a single institution, and it involved transplant recipients who had treatment before the widespread use of T-cell depleting induction immunosuppression and mycophenolate for maintenance. These novel drugs can produce substantial suppression of bone marrow and have the potential to lessen the occurrence of PTE. Moreover, some studies have revealed that PTE is more prevalent in KT recipients with well-preserved renal allograft function [7,8] and in recipients of simultaneous pancreas and KT [9], which might be explained by the good donor quality that these recipients enjoy.

Chronic and acute graft rejection, transplant artery stenosis,[10] smoking, and diabetes, and more recently the type and amount of immunosuppressive medication, the level of allograft function, and the length on dialysis have all been associated to PTE.[11,12]

Therefore, we compared numerous characteristics between the PTE patients and a control group in order to perform a retrospective research on the prevalence of genuine erythrocytosis following renal transplantation and to explore for predisposing factors.

MATERIAL AND METHODS

This retrospective study was conducted at Institute of Kidney Diseases, Hayatabad Peshawar during June 2021 to December 2021 and comprised of 118 cases of renal transplant. Participants' full demographic information was recorded after getting written consent from each participant.

In order for a patient to qualify, they needed to receive a kidney graft that had been working for more than three months. After the transplant, a course of anti-lymphocyte (ALG) and anti-thymocyte globuline (ATG) was administered to all patients as preventative care for a period of 10-12 days. Prednisone and cyclosporine were used alone or in combination with an additional medicine (either prednisone, cyclosporine, and azathioprine or prednisone, cyclosporine, and mycophenolate (mofetil)) to maintain immunosuppression. High doses of methylprednisolone or OKT3 were used to treat bouts of rejection (muromonab-CD3 Janssen Cilag). For males, an elevated hematocrit (Ht) and haemoglobin (Hb) of 18 g/dl constituted erythrocytosis; for females, an elevated Ht of 50% accompanied by an elevated Hb of 17 g/dl was considered pathological.

The following factors were compared between the polycythemic and control groups: pre-transplant Hb, pre-transplant rHuEPO treatment, degree of HLA matching, number of acute rejection episodes, immunosuppressive therapy, iron supplementation, post-transplant hypertension, and treatment with angiotensin-converting enzyme inhibitors. All patients underwent colour doppler ultrasonography to check for stenosis in their transplant arteries. A diagnosis of policythemia vera could not be made because none of the patients exhibited thrombocytosis, leukocytosis, or spleno-megaly (PV). All patients with policythemic conditions had normal arterial blood gases. Chi-square, Fischer, and Mann-Whitney tests are applied to the data after expressing it as mean SD. All data was analysed using SPSS 18.0.

RESULTS

The mean age of the patients was 50.6±2.31 years with mean BMI 27.4±11.52 kg/m^2. There were majority 76 (64.4%) patients were

males and 42 (35.6%) patients were females. 65 (55.1%) patients were smokers.(table 1)

Table-1: Patients demographics after written consent

Variables	Frequency	Percentage
Mean age (years)	50.6±2.31	
Mean BMI (kg/m^2)	27.4±11.52	
Gender		
Male	76	64.4
Female	42	35.6
Smokers		
Yes	65	55.1
No	53	44.9

Frequency of PTE was found in 23 (19.5%) cases and 95 (80.5%) cases were without PTE.(figure 1)

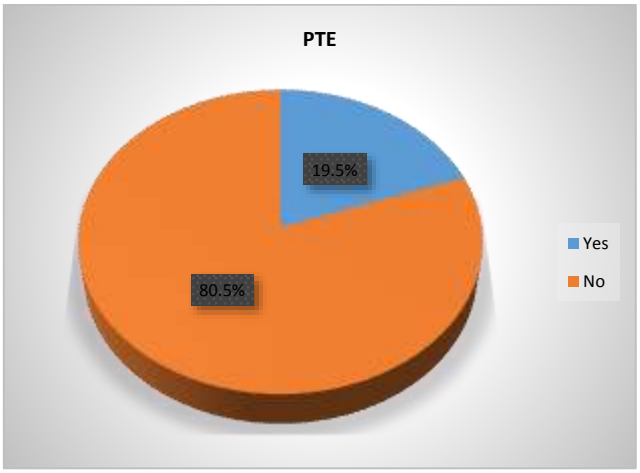

Figure-1: Association of PTE after renal transplant

Most common factors for PTE development were endogenous erythropoietin, local renal hypoxia, endogenous androgens, insulin-like growth factors and the renin-angiotensin-aldosterone system.(table 2)

Table-2: Risk factors for PTE development

Variables	Frequency (23)	Percentage
Risk Factors		
renin-angiotensin- aldosterone system	10	43.5
insulin-like growth factors	2	8.7
endogenous androgens	2	8.7
local renal hypoxia	3	13.04
endogenous erythropoietin	6	26.1

Table-3: Comparison of characteristics between PTE and non PTE cases

Variables	PTE (23)	Non-PTE (95)
Mean duration of dialysis (months)	25.1±7.48	51.9±6.75
Potential factors		
Diabetes	12 (52.2%)	23 (24.2%)
HTN	10 (43.5%)	13 (13.7%)
Glomerulonephritis	13 (56.5%)	15 (15.8%)
Polycystic	5 (21.7%)	7 (7.4%)
Polycystic kidney disease	6 (26.1%)	13 (13.7%)
Graft failure	4 (17.4%)	5 (5.3%)
Acute Rejection		
Yes	11 (47.8%)	5 (5.3%)
No	12 (52.2%)	90 (94.7%)
Mean hemoglobin g/dl	19.2±4.25	15.7±5.19
Mean hematocrit %	47.3±6.44	26.7±6.55
Pre-Transplant Transfusions		
Yes	15 (65.2%)	10 (10.5%)
No	8 (34.8%)	85 (89.5%)

Mean duration of dialysis in PTE group was 25.1±7.48 months and duration of patients without PTE was 51.9±6.75 months. Frequency of diabetes, hypertension, glomerulonephritis, polycystic kidney disease and graft failure were higher in PTE patients as compared to non-PTE. We found higher number of acute rejection in PTE patients as compared to non PTE cases with p value <0.009. Significantly difference was observed between hemoglobin and hematocrit levels between PTE and non PTE patients. Pre-transplant frequency of blood transfusion were higher in PTE patients.(table 3)

DISCUSSION

Recognized since 1965, erythrocytosis is a known complication of renal transplantation. [13] Recipients of kidney transplants have a reported frequency of PTE between 6.5% to 38.4%. [14] The main reason why there is a wide range in reported prevalence is because erythrocytosis is diagnosed using a wide range of different criteria. Most writers characterised PTE as having a Hb or Ht result over the normal range (often 16–18 g/dl or 50–55%). Few studies really measured the mass and volume of the plasma and RBCs using isotopes to rule out the possibility of false erythrocytosis. Among 431 transplant recipients, 21 percent had PTE, and Qunibi and coworkers detected 93 of them when they used a hematocrit of more above 51 as the cut off point for erythrocytosis. [15]

In current study 118 patients were included. The mean age of the patients was 50.6±2.31 years with mean BMI 27.4±11.52 kg/m^2. There were majority 76 (64.4%) patients were males and 42 (35.6%) patients were females. 65 (55.1%) patients were smokers. Results were comparable to the previous studies.[16,17] In our study, frequency of PTE was found in 23 (19.5%) cases and 95 (80.5%) cases were without PTE. Approximately 30% of individuals were found to have PTE in previous trials. They found that PTE was linked to rejection, transplant renal artery stenosis, hydronephrosis, and diuretic abuse . [18,19] PTE is a common early complication, occurring in 69.6% of patients during the first year after transplantation. Primitive erythrocytosis, such as in PV, or secondary erythrocytosis due to coexisting diseases are both types of true erythrocytosis. Our patients were all cleared of these potential illnesses.

Males with healthy kidneys were more likely to suffer from PTE. All patients kept their donated kidney throughout the follow-up period, even though the maximum blood creatinine at the outset of PTE was 1.8 mg/dl. Last but not least, we found that HLA matching was not particularly important.[20] Mean duration of dialysis in PTE group was 25.1±7.48 months and duration of patients without PTE was 51.9±6.75 months. Frequency of diabetes, hypertension, glomerulonephritis, polycystic kidney disease and graft failure were higher in PTE patients as compared to non-PTE. Different studies presented same findings.[21,22]

Our findings suggest that PTE may reduce the predicted benefits of obtaining a higher-quality kidney transplant by showing that patients with PTE did not have improved patient or allograft survival during a 5-year follow-up period despite having greater kidney quality. In this context, it's important to remember that a prior research by Kiberd et al. demonstrated that recipients with PTE had better overall survival but worse renal allograft survival [23].

We found higher number of acute rejection in PTE patients as compared to non PTE cases with p value <0.009. Significantly difference was observed between hemoglobin and hematocrit levels between PTE and non PTE patients. Pre-transplant frequency of blood transfusion were higher in PTE patients. Our results are comparable to the highest incidence reported by other writers who defined erythrocytosis more broadly than we did. [20,24]

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