

## RETROSPECTIVE ANALYSIS WHETHER DONOR AND RECIPIENT CHARACTERISTICS AND DEMOGRAPHY AFFECT THE KIDNEY TRANSPLANT OUTCOME. FIVE YEAR STUDY

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### Abstract

**Background:** Kidney transplant has always been a blessing to end stage renal disease patients. Our study aims how the demographic data pertaining to the donors and recipient with respect to gender affect the longterm outcome of kidney transplant. **Materials and Methods:** We did retrospective analysis of patients who underwent renal transplantation from 2016-2021. Data were collected from the records of the institution. The data were analysed and correlated to the outcome of renal transplantation. Chi square test was applied to elicit any statistical significance between gender and outcome of transplantation. **Result:** 168 cases of renal transplant were analysed. 86.9% transplants were live donor renal transplantation. Male recipients (76.7%), females donors (77.3%), mother to son (34.9%), ABO compatible (94%). Out of all 82.7% of patients are doing well with graft kidney. **Conclusion:** Females were the predominant donors males received majority of the kidneys. Outcomes were calculated with various variables, male donors donating to female recipient (p value: 0.012962) as well as the DDRT (p value: 0.010987) has significantly more failure rate. These discrepancies have socioeconomic as well as medical basis, which must be looked into and further studied.

## INTRODUCTION

Kidney transplant has been always a blessing to patients with end stage renal disease. Two types of management are done for end stage renal disease patients, dialysis and kidney transplantation.<sup>[1,2]</sup> Kidney transplantation is having good long term survival than with dialysis.<sup>[3-5]</sup> Every year about 750,000 deaths are due to chronic kidney disease worldwide.<sup>[6]</sup> In 2021 kidney transplant was done to 9,105 people in India compared to 92,000 in the worldwide. Among those patients 8275 were Live Related renal Transplantation (LRRT) and 830 were Deceased Donor Renal Transplantation (DDRT).<sup>[7,8]</sup> The prevalence of End stage renal disease who require transplantation in India is estimated to be between 151 and 232 per million population.<sup>[9]</sup> There is huge gap in the management of ESRD due to non-availability of kidneys for kidney transplantation. Waiting list is long for the procurement of deceased donor kidney transplantation. So majority of the kidney transplant done is live related kidney transplantation.<sup>[10]</sup> Anti-HLA antibodies (Abs) have been identified as the most important aspect which has been the predominant cause of early graft failure

from hyperacute rejection and acute humoral rejection.<sup>[11,12]</sup> Once the consequences of performing a transplant in the face of a circulating donor-specific allo antibody were fully appreciated and routine pretransplant cross-matching became the standard.<sup>[13]</sup> Other aspects like gender and age of the kidney donor and the recipients are in the same gender or not, is usually not taken into consideration as it does not have a significant effect on outcome of kidney transplantation.<sup>[14]</sup> This study aim to ascertain, how skewed is the demographic data pertaining to the donors and recipient with respect to gender and age. What are all the outcomes of the kidney transplant with respect to live and deceased donor renal transplantation and between ABO compatible and non-compatible kidney transplantation, between the age and degree of relation of donor.

## MATERIALS AND METHODS

Retrospective analysis was done of all the patients who underwent kidney transplantation during the period of 2016 to August, 2021 in our institution comprising of two hospitals, Kilpauk medical college and Government Royapettah Hospital. Chennai. Data

was compiled from institutional records. The data were analysed based on variables like age of donor and recipient, gender of donor and recipient, relationship between donor and recipient, ABO compatibility, live and deceased donor. All these statistical data was correlated to the outcome of kidney transplantation. Chi square test was applied to elicit any statistically significance between gender and outcome of transplantation.

## RESULTS

Total of 168 cases of kidney transplant were analysed. Out of them 139 are alive and 29 have either succumbed or underwent graft nephrectomy. [Table 1, Figure 1]

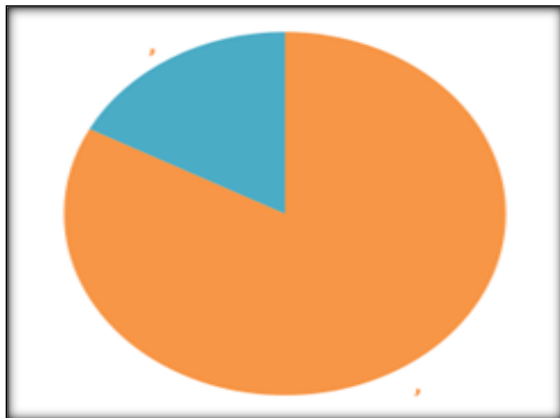


Figure 1:

Total of 146 cases underwent live donor Renal Transplantation and 22 underwent Deceased Donor Renal Transplantation. [Table 2, Figure 2]

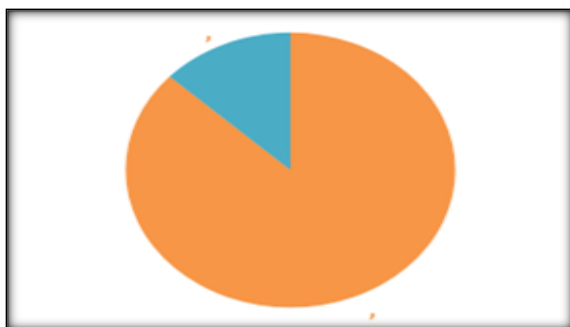


Figure 2:

In LRRT, males were the predominant recipients with 112 cases. Female recipients comprised 34 cases. [Table 3, Figure 3]

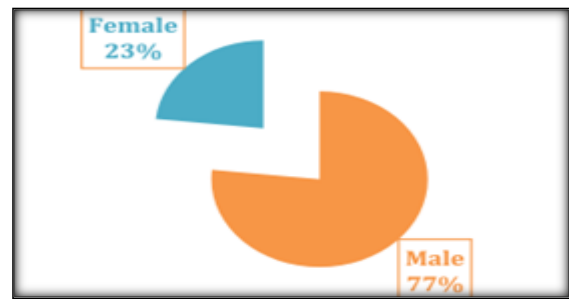


Figure 3:

In DDRT, males and females recipients both had 11 cases each. [Table 4, Figure 4]

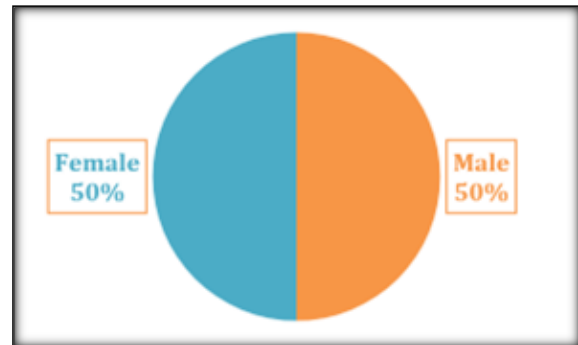


Figure 4:

In LRRT Majority of the donors were females with 113 cases. There were 33 male donors. [Table 5, Figure 5]

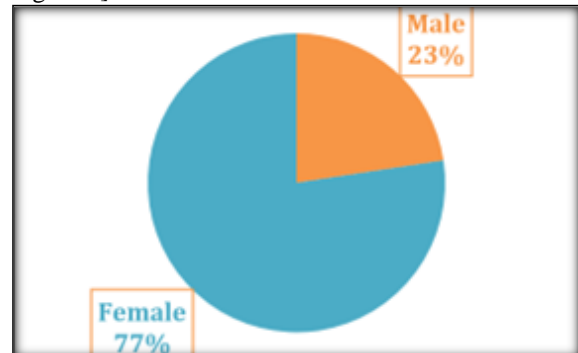


Figure 5:

Total of 9 cases were ABO incompatible, remaining 137 cases were ABO compatible renal transplantation. [Table 6, Figure 6]

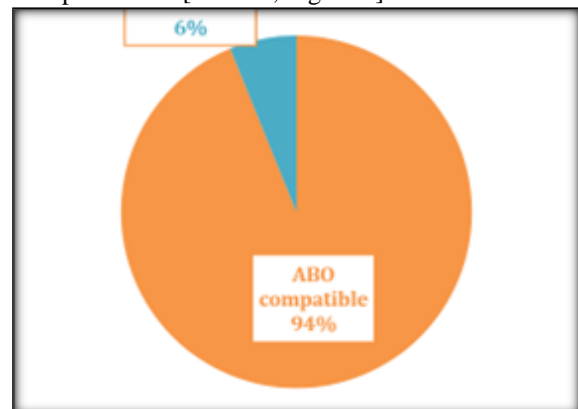


Figure 6:

51 cases of mother to son transplantation was reported. It was followed by 30 cases of wife to husband, 22 cases of mother to daughter, 16 cases of father to son, 8 cases of father to daughter, 5 cases of husband to wife and sister to brother each, 3 cases of sister to sister and brother to brother each. Brother to sister, grandmother to grandson, grandmother to granddaughter were the least common with 1 case each. [Table 7]

Female donor to male recipient comprised of 87 cases, Female to female in 26 cases, Male to male in 19 cases, male to female in 14 cases [Table 8, Figure 7]

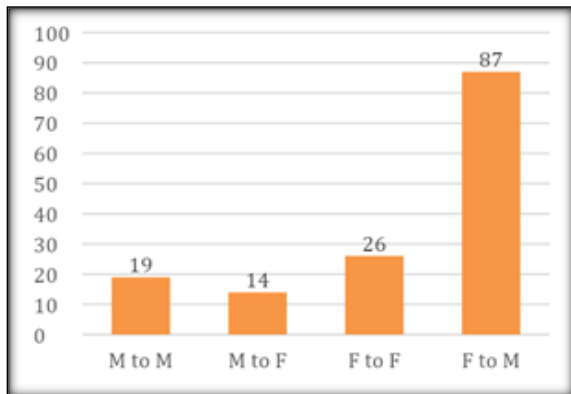


Figure 7:

Among LRRT recipients, 64 cases of 21-30 age, followed by 34 cases of 31-40 years, 28 cases of 41-50 years. 51-60 years age group was the least common with 5 cases. [Table 9, Figure 8]

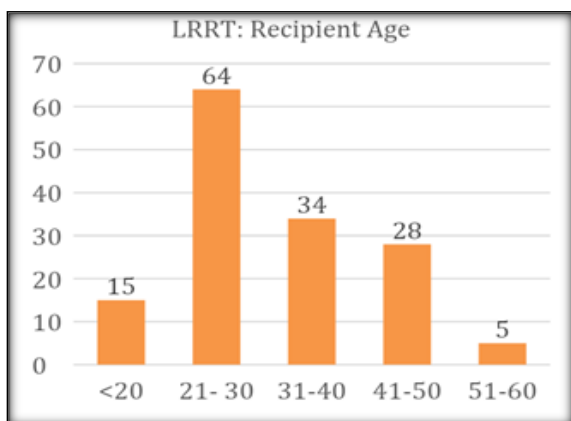


Figure 8:

Among DDRT recipients, 31-40 and 41-50 age group were the majority with 7 cases each, followed by 6 cases of 21-30 years, 28 cases of 41-50 years. 51-60 years age group was the least common with 2 cases. [Table 10, Figure 9]

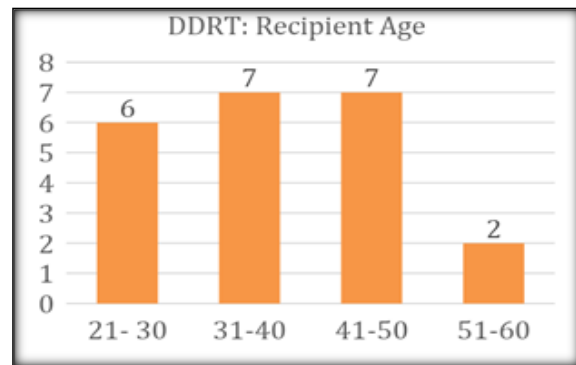


Figure 9:

All the above variables of donor and recipient characteristics were correlated with the outcome of kidney transplantation. Chi square test was applied to elicit any statistically significance between those variables and outcome of transplantation.

Among LRRT, 125 of the 146 cases are alive and doing well with the transplant kidney. Failure rate is 14.3% among LRRT. In DDRT, 14 out of 22 cases are doing well, with failure rate of 36.3%. The chi-square statistic is 6.4674. The p-value is 0.010987. Significant at  $p < .05$ . [Table 11, Figure 10]

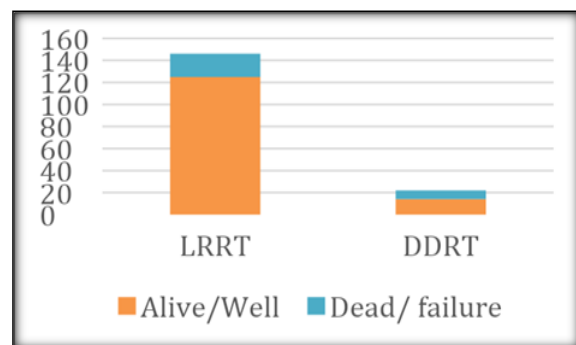


Figure 10:

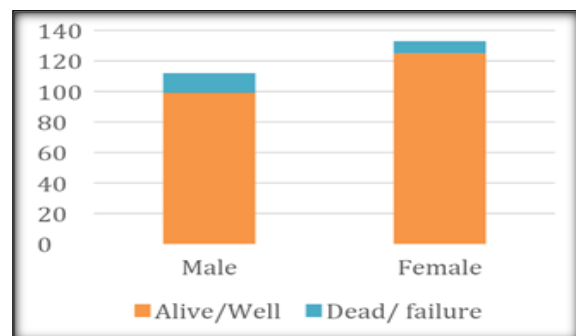
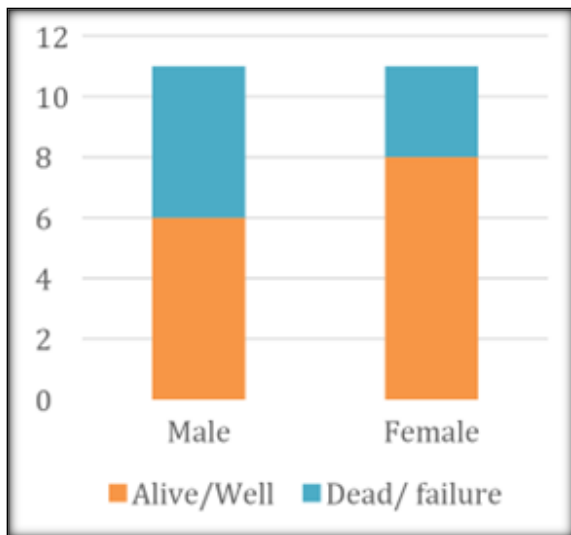


Figure 11:

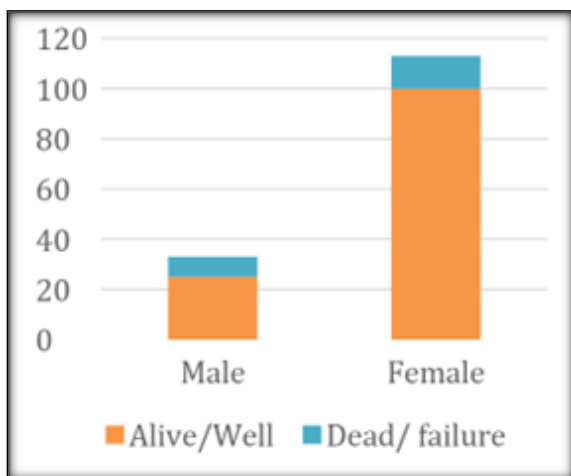


**Figure 12:**

In cases of LRRT, out of 112 male recipients, 99 cases are alive and doing well with the transplant kidney. Failure rate is 11.6%. Among female recipients, 26 out of 34 cases are doing well, with failure rate of 23.5%. The chi-square statistic is 3.0105. The p-value is 0.082727. Not significant at  $p < .05$ . [Table 12, Figure 11]

In cases of DDRT, out of 11 male recipients, 6 cases are alive and doing well with the transplant kidney. Failure rate is 45.4%. Among female recipients, 8 out of 11 cases are doing well, with failure rate of 27.27%. The chi-square statistic is 0.7857. The p-value is .375399. Not significant at  $p < .05$ . [Table 13, Figure 12]

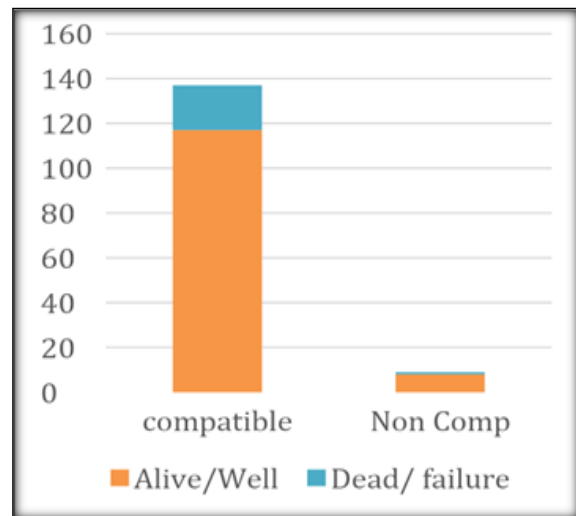
Among LRRT donors, 25 of the 33 male donated kidney transplantation cases are alive and doing well. Failure rate is 24.2%. In female donation, 100 out of 113 cases are doing well, with failure rate of 11.5%. The chi-square statistic is 3.3653. The p-value is 0.066585. Not significant at  $p < .05$ . [Table 14, Figure 13]



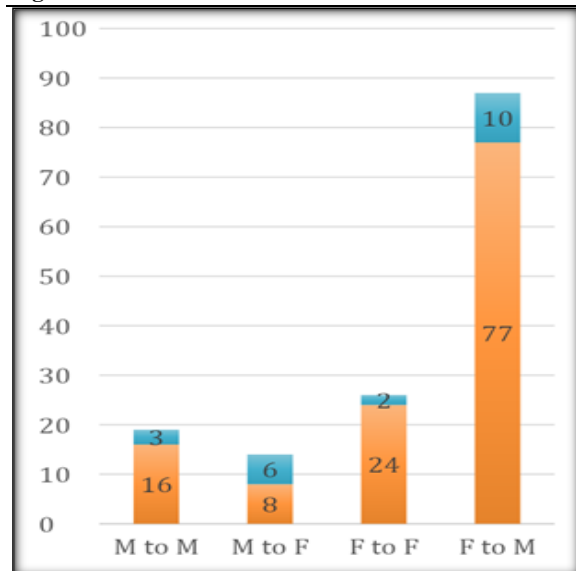
**Figure 13:**

Among LRRT, 117 of the 137 cases of ABO compatible kidney transplantation are alive and doing

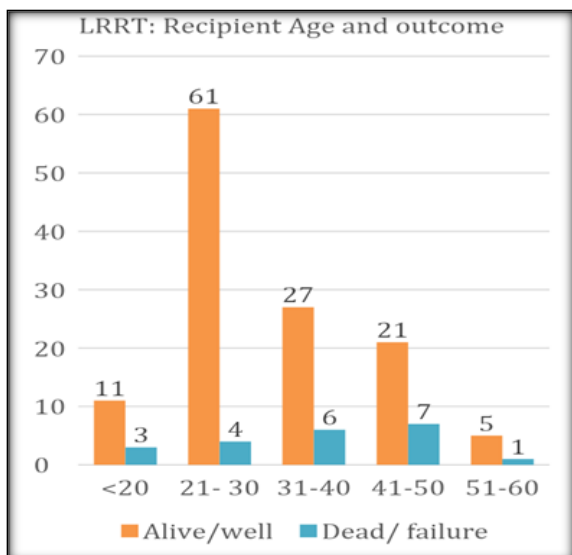
well with the transplant kidney. Failure rate is 14.6%. In ABO incompatible LRRT, 8 out of 9 cases are doing well, with failure rate of 11.1%. The chi-square statistic is 0.0834. The p-value is .772734. Not significant at  $p < .05$ . [Table 15, Figure 14]



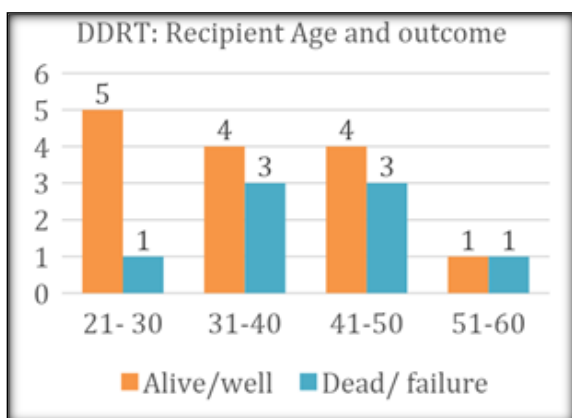
**Figure 14:**



**Figure 15:**



**Figure 16:**



**Figure 17:**

In cases of LRRT, out of 87 female donors to male recipients, 77 cases are alive and doing well with the transplant kidney. Failure rate is 11.5% among female donors to male recipients of LRRT. Among male donors to female recipients, 8 out of 14 cases are doing well, with highest failure rate of 42.9%. The chi-square statistic is 10.7825. The p-value is .012962. The result is significant at  $p < .05$ . [Table 16, Figure 15]

Among LRRT, 61 of the 64 cases in the age group of 21-30 years are alive and doing well with the transplant kidney with a failure rate of 6.25%. In 41-50 years age group, 21 out of 28 cases are doing well, with failure rate of 25%. The chi-square statistic is 7.1138. The p-value is .129997. The result is not significant at  $p < .05$ . [Table 17, Figure 16]

Among DDRT, 4 of the 7 cases each in the age group of 31-40 years and 41-50 years are alive and doing well with the transplant kidney with a failure rate of 42.9%. In 51-60 years age group, 1 out of 2 cases is doing well, with failure rate of 50%. The chi-square statistic is 1.4218. The p-value is .70044. The result is not significant at  $p < .05$ .

**Table 1:**

	Cases
Alive/well	139
Death/ failure	29
Total	168

**Table 2:**

	Cases
LRRT	146
DDRT	22
Total	168

**Table 3**

Recipient: LLRT	Cases
Male	112
Female	34
Total	146

**Table 4:**

Recipient: DDRT	Cases
Male	11
Female	11
Total	22

**Table 5:**

DONOR	Cases
Male	33
Female	113
Total	146

**Table 6:**

ABO	Cases
Comp	137
Incomp	9
Total	146

**Table 7:**

Relationship	Cases
Mother to son	51
Mother to Daughter	22
Father to son	16
Father to daughter	8
Wife to husband	30
Husband to wife	5
Sister to Sister	3
Sister to Brother	5
Brother to Brother	3
Brother to Sister	1
Grandmother to Grandson	1
Grandmother to Granddaughter	1
Total	146

**Table 8:**

Gender: LLRT	Cases
Male to Male	19
Male to Female	14
Female to Female	26
Female to Male	87
Total	146

**Table 9:**

Recipient age- LRRT	Cases
<20	15
21-30	64
31-40	34
41-50	28
51-60	5
Total	146

**Table 10:**

Recipient age- DDRT	Cases
21-30	6
31-40	7
41-50	7
51-60	2
Total	22

**Table 11:**

	Alive/well	Dead/Failur	Total
LRRT	125	21	146
DDRT	14	8	22
Total	139	29	168

The chi-square statistic is 6.4674. The p-value is .010987. Significant at  $p < .05$ .

**Table 12:**

Recipient: LLRT	Alive/well	Dead/Failur	Cases
Male	99	13	112
Female	26	8	34
Total	125	21	146

The chi-square statistic is 3.0105. The p-value is .082727. Not significant at  $p < .05$ .

**Table 13:**

Recipient: DDRT	Alive/well	Dead/Failur	Cases
Male	6	5	11
Female	8	3	11
Total	14	8	22

The chi-square statistic is 0.7857. The p-value is .375399. Not significant at  $p < .05$ .

**Table 14:**

DONOR	Alive/well	Dead/Failur	Cases
Male	25	8	33
Female	100	13	113
Total	125	21	146

The chi-square statistic is 3.3653. The p-value is 0.066585. Not significant at  $p < .05$ .

**Table 15:**

ABO	Alive/well	Dead/Failur	Cases
Comp	117	20	137
Incomp	8	1	9
Total	125	21	146

The chi-square statistic is 0.0834. The p-value is .772734. Not significant at  $p < .05$ .

**Table 16:**

Gender: LRRT	Alive/well	Dead/Failur	Cases
Male to Male	16	3	19
Male to Female	8	6	14
Female to Female	24	2	26
Female to Male	77	10	87
Total	125	21	146

The chi-square statistic is 10.7825. The p-value is .012962. The result is significant at  $p < .05$ .

**Table 17:**

Recipient age- LLRT	Alive/well	Dead/Failur	Cases
<20	11	3	14
21-30	61	4	64
31-40	27	6	34
41-50	21	7	28
51-60	5	1	6
Total	125	21	146

The chi-square statistic is 7.1138. The p-value is .129997. The result is not significant at  $p < .05$ .

**Table 18:**

Recipient age- DDRT	Alive/well	Dead/Failur	Cases
21-30	5	1	6
31-40	4	3	7
41-50	4	3	7
51-60	1	1	2
Total	14	8	22

The chi-square statistic is 1.4218. The p-value is .70044. The result is not significant at  $p < .05$ .

**Table 19:**

Variables	Most common	Failure rate	P Value	Significance
Type	LRRT (86.9%)	DDRT (36.3%)	0.010987	Yes
Recipient Gender: L	Male (76.7%)	Female(23.5%)	0.082727	No
Recipient Gender: D	M=F	Female(45.4%)	0.375399	No
Donor Gender	Female(77.3%)	Male(24.2%)	0.066585	No
ABO	Comp(93.8%)	Compa (14.6%)	0.772734	No
Relation	F to M (59.6%)	M to F (42.9%)	0.012962	Yes
Recipient age:LRRT	21-30 (44.5%)	41-50(25%)	0.129997	No
Recipient age:DDRT	21-30, 51-60 (27%)	31-40, 41-50 (57%)	0	

## DISCUSSION

The following finding are noted after our analysis of kidney transplantation in our institution. Females are majority of donors for kidney (77.3%), whereas the males receive majority of the kidneys (76.7%). Male to female donation is the least common mode with just 9.5% of total transplants, the majority being female to male, constituting 59.6% of the transplants. This disparity in gender of donors can be attributed to the societal factors. As males still constitute the sole earning member in majority of Indian households and this may be a major factor for this pattern.<sup>[15]</sup> In a study conducted by Kayler et al,<sup>[16]</sup>

conducted in USA, Females comprised 68% of spousal and 56% of related and unrelated nonspousal donors, correlating the findings of this study. In another study conducted by Øien et al,<sup>[17]</sup> in Norway also had similar findings with female donors constituting 52.8%. In a study conducted by Avula et al,<sup>[18]</sup> in india also revealed that females were the predominant donors (55%). Statistically, there was no significant effect on transplant outcome with Recipient gender, ABO compatibility, Recipient age. There was statistically significant effect on outcome in type of donation, with DDRT having more failure rate, the chi-square statistic is 6.4674. The p-value is



.010987. Significant at  $p < .05$ . There are multiple studies which have provided evidence that the outcome of living-donor transplant is superior to receiving kidneys from deceased donors.<sup>[19,20]</sup> In a study conducted by Nemathi et al,<sup>[21]</sup> patient and graft survivals were also significantly shorter in deceased kidney transplantation than those who received kidney from a living donor. Superior results after LRRT are partly due to the result of the shorter cold ischemia periods in this population. An increased sharing of unknown immunologic variables (e.g., minor antigens) in the LRRT population that beneficially influences graft survival cannot be excluded. In the LRRT, often there will be , lower donor serum creatinine, shorter period of renal replacement therapy before the present transplantation, lower number of previous transplants, lower peak and current panel reactive antibody, shorter cold ischemia period normal anatomy of the kidney graft, and more HLA identical combinations. These have all been associated with a better prognosis.<sup>[22,23]</sup>

It was statistically significance when relationship between donor and recipient pertaining to gender was taken into account with male donors to female recipients having more failure rate. The chi-square statistic is 10.7825. The p-value is .012962. The result is significant at  $p < .05$ . This finding is not consistent with the available literature. Each study has got different findings and no apparent factor involved in either improving outcome or as an adverse factor have been discovered. According to a study by Naderi et al,<sup>[24]</sup> female recipients, even from male donors, showed higher transplant outcomes in comparison to male recipients (from female donors). Correlating to it, our study also had the highest success rate among female-to-female transplants. Naderi et al hypothesized that as inflamed female's patients have a better outcome compared to inflamed males, because sex hormones may have important cardioprotective effects that limit the effect of inflammation on vascular injury in female patients with end-stage renal disease (ESRD). But this still does not correlate the highest failure rates among male to female transplant in our study. In a study conducted by Kayler et al, higher graft survival rates were found among male-to-male transplantations. They attribute this finding to sufficient functional donor nephron adequacy. In our study the failure rate was highest in male to female transplants, specifically among husbands to wife. This can be due to wives being specifically sensitized to their husbands immune system as a result of exposure to parental antigens during pregnancy.<sup>[25]</sup> The impact of gender on kidney transplantation outcomes has been extensively studied but no conclusive evidence has been obtained. Various factors like differential effects of sex hormones on immunologic responsiveness,<sup>[26,27]</sup> drug metabolism,<sup>[28]</sup> and hemodynamic responses has been attributed to the differential outcome of transplantation.<sup>[29]</sup>

## CONCLUSION

According to this study, females were the predominant donors but did not receive the kidney proportionally. Males even though donated less, received majority of the kidneys. When outcomes were calculated with various variables, more failure rate seen in male donors donating to female recipient as well as in the DDRT. These discrepancies have both socioeconomic and medical basis, which must be looked into and further studied.

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