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MALE INFERTILITY IN RENAL FAILURE AND TRANSPLANTATION: A COMPARATIVE STUDY

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Abstract

Background

Male infertility is a significant but often underrecognized problem in patients with chronic kidney disease and end-stage renal failure. Uremia, hormonal imbalance, erectile dysfunction, impaired spermatogenesis, and the effects of long-term systemic illness can adversely affect reproductive potential. Kidney transplantation may improve endocrine and sexual function; however, fertility impairment may persist in some patients.

Objectives

To compare fertility-related clinical, hormonal, and semen parameters in men with renal failure and post-renal transplantation patients and to determine the impact of transplantation on reproductive outcomes.

Methodology

This retrospective comparative study was conducted at department of andrology & nephrology Institute of kidney disease Peshawar from jan 2023 to jan 2024. A total of 100 patients were included, comprising 50 men with end-stage renal failure on dialysis and 50 male renal transplant recipients. Demographic characteristics, duration of renal disease, duration of dialysis or transplantation, erectile dysfunction, serum testosterone, luteinizing hormone, follicle-stimulating hormone, prolactin, semen parameters, and fertility outcomes were recorded using a structured data collection form. Data were analyzed using SPSS version 24. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Statistical significance was set at $p < 0.05$.

Results

A total of 100 patients were included in the study. The mean age of the patients was 36.8 ± 7.4 years. Erectile dysfunction was more common in the renal failure group than in the transplant group (54% vs 28%). Mean serum testosterone was significantly lower in patients with renal failure compared with transplant recipients (2.9 ± 1.1 ng/mL vs 4.6 ± 1.3 ng/mL, $p = 0.01$), while prolactin levels were higher in the renal failure group. Abnormal semen analysis was observed in 72% of patients with renal failure and 46% of post-transplant patients. Oligospermia and reduced motility were the most frequent abnormalities. Spontaneous conception or documented paternity was more common after transplantation than during renal failure follow-up. Overall, renal transplant recipients demonstrated better hormonal and fertility profiles than men with ongoing renal failure.

Conclusion

Male infertility is common in patients with renal failure and is associated with hormonal imbalance, erectile dysfunction, and abnormal semen parameters. Renal transplantation appears to improve reproductive hormonal status and semen quality in many patients, although fertility impairment may persist in a subset. Early fertility counseling and multidisciplinary management are important in these patients.

Keywords: Male infertility; Renal failure; Kidney transplantation; Semen analysis; Hypogonadism; Erectile dysfunction

Introduction

Male reproductive dysfunction is increasingly recognized as an important consequence of chronic kidney disease and end-stage renal failure. In addition to reduced quality of life, infertility and sexual dysfunction may significantly affect psychosocial well-being in men of reproductive age with renal disease (1). Disturbances in the hypothalamic-pituitary-gonadal axis, chronic inflammation, metabolic derangements, and comorbid illness all contribute to impaired reproductive function in this population (2).Men with renal failure commonly exhibit reduced testosterone levels, elevated prolactin, altered gonadotropin secretion, erectile dysfunction, and impaired spermatogenesis (3). Semen abnormalities such as oligospermia, asthenospermia, teratospermia, and azoospermia have been reported more frequently in advanced stages of chronic kidney disease and dialysis-dependent patients (4). These changes may result from uremia, oxidative stress, nutritional impairment, and direct gonadal dysfunction (5).Sexual dysfunction is also highly prevalent in men with chronic kidney disease. Erectile dysfunction, reduced libido, ejaculatory problems, and impaired fertility may coexist and further complicate reproductive outcomes (6). In addition, several medications used in renal disease and transplantation may adversely affect male reproductive function (7).Kidney transplantation has been shown to improve several endocrine and reproductive abnormalities associated with renal failure. Restoration of renal function may lead to partial normalization of testosterone, reduction in prolactin levels, improved erectile function, and better semen quality in some patients (8). However, improvement is not universal, and persistent subfertility may occur because of residual gonadal damage, immunosuppressive therapy, or chronic systemic disease (9).The reproductive effects of immunosuppressive medications remain clinically relevant after transplantation. Calcineurin inhibitors and other post-transplant drugs may influence hormonal and semen parameters, while assisted reproductive techniques may still be needed in selected couples (10). Therefore, the fertility profile of male renal transplant recipients requires continued clinical attention (11).

Research Objective

To compare fertility-related clinical, hormonal, and semen parameters in men with renal failure and male renal transplant recipients and to assess the impact of transplantation on reproductive outcomes.

Materials and Methods

Study Design and Setting

This retrospective comparative study was conducted at department of andrology & nephrology Institute of kidney disease Peshawar from jan 2023 to jan 2024

Participants

The study included 100 male patients, divided into two groups:

- **Group A:** 50 men with end-stage renal failure on maintenance dialysis
- **Group B:** 50 male renal transplant recipients

Inclusion Criteria

Men aged 20 to 50 years with chronic renal failure on dialysis or with functioning renal transplantation and available fertility-related clinical and laboratory data were included.

Exclusion Criteria

Patients with known primary testicular disease, previous infertility unrelated to renal disease, obstructive azoospermia, malignancy, incomplete medical records, or prior bilateral orchidectomy were excluded.

Data Collection

Data were collected using a structured proforma. Recorded variables included age, duration of renal disease, dialysis duration or post-transplant duration, erectile dysfunction, serum testosterone, luteinizing hormone, follicle-stimulating hormone, prolactin, semen volume, sperm concentration, motility, morphology, and documented paternity or conception history.

Statistical Analysis

Data were analyzed using SPSS version 24. Quantitative variables were presented as mean ± SD, while categorical variables were expressed as frequency and percentage. The independent t-test and chi-square test were used for group comparisons. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 100 patients were included in the study, with 50 patients in the renal failure group and 50 in the post-transplant group. The mean age of the overall study population was 36.8 ± 7.4 years.Erectile dysfunction was reported in 27 patients (54%) in the renal failure group compared with 14 patients (28%) in the transplant group. Mean serum testosterone was significantly lower in the renal failure group (2.9 ± 1.1 ng/mL) than in the transplant group (4.6 ± 1.3 ng/mL). Mean prolactin level was higher in the renal failure group, whereas gonadotropin levels showed partial improvement after transplantation.Abnormal semen analysis was observed in 36 patients (72%) with renal failure and 23 patients (46%) after renal transplantation. Oligospermia, reduced progressive motility, and abnormal morphology were the most frequent abnormalities in both groups, but were more severe in the renal failure group. Azoospermia was observed more often in men on dialysis than in transplant recipients.Documented spontaneous conception or paternity during follow-up was more frequent among post-transplant patients. Overall, renal transplant recipients showed significantly better endocrine and semen profiles compared with men with ongoing renal failure.

Table 1. Baseline Characteristics of the Study Population

Variable	Renal Failure Group (n=50)	Transplant Group (n=50)	Total (n=100)
Age (years), mean ± SD	37.1 ± 7.8	36.5 ± 7.0	36.8 ± 7.4
Duration of renal disease (years)	5.8 ± 2.1	6.1 ± 2.4	5.9 ± 2.2
Erectile dysfunction	27	14	41
Hypertension	31	24	55
Diabetes mellitus	12	10	22

Table 2. Hormonal and Semen Parameters in Study Groups

Variable	Renal Failure Group	Transplant Group	p-value
Testosterone (ng/mL)	2.9 ± 1.1	4.6 ± 1.3	0.01
Prolactin (ng/mL)	28.4 ± 8.6	16.9 ± 6.2	0.01
Abnormal semen analysis	36 (72%)	23 (46%)	0.01
Oligospermia	18 (36%)	11 (22%)	0.12
Azoospermia	9 (18%)	4 (8%)	0.13
Reduced motility	22 (44%)	14 (28%)	0.09

Table 3. Fertility-Related Outcomes

Outcome Variable	Renal Failure Group	Transplant Group	p-value
Erectile dysfunction	27 (54%)	14 (28%)	0.01
Documented paternity/conception	6 (12%)	17 (34%)	0.01
Assisted reproduction referral	14 (28%)	9 (18%)	0.23
Persistent infertility at follow-up	32 (64%)	19 (38%)	0.01

Discussion

The present study showed that male infertility-related abnormalities were considerably more common in men with ongoing renal failure than in post-transplant patients. Men on dialysis had lower testosterone levels, higher prolactin levels, more erectile dysfunction, and a greater frequency of abnormal semen parameters. These findings are consistent with previous literature showing that chronic kidney disease and end-stage renal failure adversely affect the hypothalamic-pituitary-gonadal axis and impair male reproductive function (12,13).In our study, abnormal semen analysis was common in both groups but was significantly more frequent in patients with renal failure. Oligospermia, reduced motility, and azoospermia were more prominent before transplantation. Similar findings have been reported in earlier studies demonstrating that advancing kidney disease is associated with progressive deterioration in semen quality and accessory gland function (14,15).Renal transplantation was associated with better hormonal and fertility-related parameters in the present series. Post-transplant patients had higher testosterone levels, lower prolactin levels, less erectile dysfunction, and a higher rate of documented conception or paternity. This supports previous reports suggesting that restoration of renal function can partially reverse endocrine disturbances and improve sexual and reproductive health in male patients (16,17).

However, improvement after transplantation was not complete in all cases. A substantial proportion of transplant recipients still had abnormal semen parameters or persistent infertility. This finding is in agreement with published studies indicating that although kidney transplantation improves many reproductive abnormalities, residual subfertility may persist because of chronic illness, pre-existing gonadal damage, or exposure to immunosuppressive drugs (18,19).The role of post-transplant medications is clinically important. Immunosuppressive agents may influence fertility through direct or indirect effects on spermatogenesis, hormonal balance, or sexual function. This may explain why some patients continue to have reproductive impairment despite successful transplantation (20). In selected cases, fertility treatment and assisted reproductive techniques may still be required after renal transplant (21). Overall, the present findings highlight the need for early reproductive counseling in men with chronic kidney disease and post-transplant follow-up. Fertility assessment should not be overlooked, particularly in younger patients who desire paternity. Multidisciplinary management involving nephrologists, urologists, and fertility specialists may improve reproductive outcomes and quality of life in this population (22).

Limitations

This study has several limitations. It was conducted at a single center and used a retrospective design, which may limit the generalizability of the findings. The sample size was modest, and long-term reproductive outcomes were not available in all patients. In addition, fertility is multifactorial, and some confounding factors may not have been fully captured.

Conclusion

Male infertility is common in renal failure and is associated with hormonal disturbance, erectile dysfunction, and impaired semen quality. Renal transplantation improves reproductive hormonal status and semen parameters in many patients, although persistent infertility may remain in a subset. Early counseling, fertility evaluation, and multidisciplinary follow-up are essential for optimal reproductive care in these patients.

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Authors Contribution

Concept & Design of Study: Haseeb[1]
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Drafting:Misbah[3]
Data Analysis:Wajahat[4]
Critical Review: Fazle Manan[2]
Final Approval of version: All Authors Approved the Final Version.

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