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St. Paul's Hospital Millennium Medical College

ST. PAUL'S HOSPITAL AND MILLENNIUM MEDICAL COLLEGE

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

ADDIS ABABA

REPRODUCTIVE OUTCOMES AND ASSOCIATED FACTORS AFTER KIDNEY
TRANSPLANTATION IN ST. PAUL'S MILLENNIUM MEDICAL COLLEGE

BY ZERIHUN GETANEH (MD, OBGYN RESIDENT)

A RESEARCH THESIS SUBMITTED TO ST. PAUL'S HOSPITAL
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SPECIALTY CERTIFICATE IN OBSTETRICS AND GYNECOLOGY

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ABSTRACT

Background:

Women with end-stage renal disease have impaired fertility due to disruption of the hypothalamic gonadal axis. Pregnancy is therefore rare in women on dialysis with a very low incidence of conception ranging from 0.9 to 7%. Kidney transplantation regulates the chance of pregnancy, and some studies report an infertility rate similar to the general population rate ($\approx 10\%$). No published and unpublished study has been found on the reproductive outcomes after kidney transplantation in Ethiopia. Therefore, a study on this topic is relevant, timely, and ultimately will provide suitable recommendations.

Objectives: -

To assess reproductive outcomes and associated factors in child bearing women who underwent kidney transplantation in SPHMMC and who underwent kidney transplantation abroad and have follow-up in SPHMMC.

Methods:

A facility-based 9-year retrospective descriptive study was conducted on women who underwent kidney transplantation in St Paul Hospital Millennium Medical College and who underwent kidney transplantation abroad that had follow-up in SPHMMC by reviewing their chart and interviewing with structured questionnaire. The inclusion criteria were Renal transplant recipients in the reproductive age group and the exclusion criteria were Renal transplant recipients who had pre-existing reproductive disorders, who had previous fertility treatments and whose transplantation was less than 1 year.

Results:

This study evaluated 87 renal transplant recipients, of whom 52 (59.8%) experienced irregular menstruation prior to transplantation, with amenorrhea reported in 27 cases (51.9%) as the most common pattern. Post-transplant, 60 respondents (67.8%) resumed a regular menstrual cycle. Among the 87 participants, 58 (66.7%) had a history of infertility during ESRD, while others were unsure due to marital status or lack of sexual activity.

The study documented 22 pregnancies in 15 renal transplant recipients, with an average age of 30.3 ± 6.2 years at first pregnancy and a mean interval of 3.6 years post-transplant. Of these pregnancies, 19 resulted in live births (10 term, 7 preterm), and 3 ended in spontaneous abortions. Additionally, 2 cases were classified as early neonatal death. Ten mothers experienced adverse obstetric outcomes,

including 7 (41.2%) preterm deliveries, 6 (35.2%) cases of chronic hypertension with superimposed preeclampsia, 2 (11.8%) cases of preeclampsia, and 2 (11.8%) cases of fetal growth restriction.

Conclusion:

Renal transplantation restores fertility in women but requires careful reproductive planning.

Obstetricians and nephrologists should prioritize discussing menstrual and reproductive health with transplant recipients. Pregnancy after renal transplantation carries significant risks, including higher rates of maternal complications such as chronic hypertension, superimposed preeclampsia, and preeclampsia, as well as fetal complications like preterm delivery and growth restriction.

Multidisciplinary care is essential to optimize outcomes for both mother and baby.

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LIST OF ABBREVIATIONS AND ACRONYMS

AKI - Acute Kidney Injury

ANC- Antenatal Care

ANZDATA- Australia and New Zealand Dialysis and Transplant Registry

CKD -chronic kidney disease

CD- Cesarean delivery

ESRD - End-Stage Renal Disease

ETB-Ethiopian Birr

eGFR -Estimated glomerular filtration rate

G.C- Gregorian calendar

IRB -Institutional Review Board

IVF-in vitro fertilization.

MD- Medical Doctor

NKF - National Kidney Foundation

OBGYN- Obstetrics and Gynecology

SPHMMC -Saint Paul's Hospital Millennium Medical College

TB- Tuberculosis

WHO - World Health Organization

1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Kidney transplantation is an established treatment for end-stage renal disease, and a large number of recipients are women of fertile age. Renal dysfunction affects the pituitary–gonadal axis and leads to reduced fertility in most women. Hormonal status is often restored following kidney transplantation, resulting in markedly increased fertility. Consequently, pregnancy is an expected benefit following successful kidney transplantation(4).

Based on the latest international glossary on infertility and fertility care, infertility is defined as a disease characterized by the failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce, either as an individual or with his/her partner. Regular sexual intercourse is an important determinant for the occurrence of pregnancy. According to the latest definition by the WHO, infertility is a disease that generates disability as an impairment of function(1).

Sexual disorders along with infertility are complications frequently observed in under-favored individuals affected with chronic kidney disease. It affects both genders and impacts their quality of life. As the staging of chronic kidney disease progresses, the extent of infertility increases(2).

The history of pregnancy after kidney transplantation starts with young twin sisters: “In May 1956, one of a pair of 21-year-old identical twin females from Oklahoma was being studied as a potential recipient for a kidney transplant from her twin sister”. It is interesting to note that in this paper the family status was reported in the opening sentences: “Both were childless, having been married for less than a year.” The state of the recipient was defined as “dire” “with hypertension (blood pressure of 190 systolic, 120 diastolic), congestive heart failure”(3).

Women with end-stage renal disease have impaired fertility due to disruption of the hypothalamic gonadal axis. Pregnancy is therefore rare in women on dialysis with a very low incidence of conception ranging from 0.9 to 7% (5). Kidney transplantation regulates the chance of pregnancy, and some studies report an infertility rate similar to the general population rate ($\approx 10\%$)(6). With gradual improvement in graft and patient survival and quality of life, pregnancy incidence has increased in Kidney Transplant patients in recent decades. So, reported live birth rates are 73%–80% in Kidney Transplant recipients(7). Since there is rapid fertility restoration, in some cases, within 6 months following transplantation, kidney transplantation offers the best hope to women with end-stage renal disease who wish to become pregnant(8). Pregnancy in a kidney transplant recipient continues to remain challenging due to the risk of adverse maternal complications of preeclampsia and hypertension, and the risk of adverse fetal outcomes of premature birth, low birth weight, and small for gestational age infants(5). Additionally,

there is a risk of side effects from immunosuppressive medication and a risk of deterioration of allograft function(9). In Ethiopia, the first national kidney transplantation center was opened at Saint Paul's Hospital Millennium Medical College (SPHMMC) in September 2015 in collaboration between the Ministry of Health and the medical faculty at the University of Michigan(10).

1.2 PROBLEM STATEMENT

Despite significant advancements in kidney transplantation procedures and post-operative care, there remains a lack of comprehensive understanding regarding the impact of transplantation on reproductive health outcomes. Limited research exists on pregnancy outcomes, and long-term reproductive health in female transplant recipients. This knowledge gap creates uncertainties for transplant candidates and recipients regarding family planning decisions and their overall reproductive health post-transplantation. Therefore, there is an urgent need to investigate the various factors influencing reproductive outcomes following kidney transplantation, identify potential risks and challenges, and develop strategies to optimize fertility and pregnancy outcomes for transplant recipients. Understanding the potential risks and benefits of pregnancy post-transplantation is crucial for providing comprehensive care to female transplant recipients. To the best of our knowledge, there is no research done on post-kidney transplant reproductive outcomes and associated factors in Ethiopia. The goal of this study will be to perform a chart review and telephone interview in kidney transplant reproductive women from St. Paul's Hospital Millennium Medical College to estimate incidences of reproductive outcomes, maternal complications, and fetal complications.

2. LITERATURE REVIEW

2.1 Pregnancy outcome and associated factors after renal transplantation

A Metaanalysis and systematic review done on Pregnancy outcomes in women with kidney transplants showed 6712 pregnancies in 4174 kidney transplant recipients. The mean maternal age was 29.6 ± 2.4 years. The live-birth rate was 72.9% (95% CI, 70.0–75.6). The rate of other pregnancy outcomes was as follows: induced abortions (12.4%; 95% CI, 10.4–14.7), miscarriages (15.4%; 95% CI, 13.8–17.2), stillbirths (5.1%; 95% CI, 4.0–6.5), ectopic pregnancies (2.4%; 95% CI, 1.5–3.7), preeclampsia (21.5%; 95% CI, 18.5–24.9), gestational diabetes (5.7%; 95% CI, 3.7–8.9), pregnancy induced hypertension (24.1%; 95% CI, 18.1–31.5), cesarean section (62.6, 95% CI 57.6–67.3), and preterm delivery was 43.1% (95% CI, 38.7–47.6). The mean gestational age was 34.9 weeks, and the mean birth weight was 2470 g. The 2–3-year interval following kidney transplant had higher neonatal mortality, and lower rates of live births as compared to > 3-year, and < 2-year intervals. The rate of spontaneous abortion was higher in women with mean maternal age < 25 years and > 35 years as compared to women aged 25–34 years(11).

The study used data from the Australia and New Zealand Dialysis and Transplant Registry and the Australian Institute of Health and Welfare National Perinatal Epidemiology and Statistics Unit annual reports showed that 692 pregnancies to 447 transplant recipients were reported in ANZDATA between 1971 and 2010. Of these, 258 women had a single pregnancy (58%), 141 had two pregnancies (32%), 40 had three pregnancies (9%) and 8 had four pregnancies (2%). The median age of transplanted women who gave birth was 31 years (interquartile range [IQR]: 27, 34). The median age of transplanted women who gave birth for the first time was 30 years (IQR: 26, 33). Of pregnancies in transplanted women, 16 (2%) were teenagers (<20 years) and 17 (2%) were women aged 40 years or more. The most common primary kidney disease of women who had at least one pregnancy was glomerulonephritis (45%), followed by reflux nephropathy (31%), diabetes mellitus (5%), cystic disease (4%) and other/unknown (15%). Two-thirds of transplanted organs were from deceased donors. Fourteen women had creatinine prior to pregnancy of ≥ 177 mmol/L (2.0 mg/dL). Of these, 2 ended in spontaneous abortion and 12 progressed to live birth. The mean gestational age for live births was 36.5 ± 4 weeks with a mean birth weight of 2392 ± 878 g. Of the 12 pregnancies, 5 (42%) were complicated by preeclampsia. Data on pregnancy complications were Preeclampsia occurred in 58 (29%) pregnancies, and gestational diabetes occurred in 6 (3%). There were two (1%) pregnancies in which both preeclampsia and gestational diabetes occurred. The mean gestational age of babies born to women who developed preeclampsia was 34 ± 4 weeks, equivalent to the 33 ± 9 weeks mean gestational age of babies born to women who did not develop preeclampsia ($p=0.5$). The mean birth weight of babies born to women who developed

preeclampsia was significantly less than the mean birth weight of babies born to women who did not develop preeclampsia (2171 ± 736 g vs. 2666 ± 734 g [$p=0.0001$])(4).

A 40-year analysis of data on pregnancy-related outcomes for transplant recipients from the Australian and New Zealand Dialysis and Transplant Registry showed 444 live births reported from 577 pregnancies; the absolute but not relative fertility rate fell during these four decades. Of pregnancies achieved, 97% were beyond the first year after transplantation. The mean age at the time of pregnancy was 29 ± 5 yr. The proportion of live births doubled during the last decade, whereas surgical terminations declined ($P < 0.001$). The fertility rate (or live birth rate) for this cohort of women was 0.19 (95% CI 0.17 to 0.21) relative to the Australian background population. Maternal complications included preeclampsia in 27% and gestational diabetes in 1%(12).

In the UK National Cohort Study, 105 pregnancies were identified in 101 recipients. Median prepregnancy creatinine was 118 mmol/ L. Preeclampsia developed in 24% compared with 4% of the comparison group. Median gestation at delivery was 36 weeks, with 52% of women delivering at, 37 weeks, significantly higher than the national rate of 8%. Twenty- four infants (24%) were small for gestational age (<10th centile). There were two (2%) cases of acute rejection. Potential predictive factors for poor pregnancy outcome included .1 previous kidney transplant ($P=0.03$), first-trimester serum creatinine .125 mmol/L ($P=0.001$), and diastolic BP .90 mmHg in the second ($P=0.002$) and third trimesters ($P=0.05$)(13).

A retrospective case-note review study investigating the outcome of 234 pregnancies in 140 renal transplant recipients from five different Middle Eastern countries showed that overall pregnancies of 74.4% were successful albeit with a high prevalence of preterm and Caesarean deliveries (40.8% and 53%, respectively). The mean serum creatinine did not rise significantly during pregnancy in the group as a whole but did so in patients who had serum creatinine of or above 150 micromole/L at the beginning of their pregnancies. The mean birth weight was (2,458 g) with 41.3% of the newborns being of low birth weight (<2,500 g). The prevalence of stillbirths was 7.3% and of spontaneous abortion was 19.3%. Preeclampsia and gestational diabetes were observed in 26.1% and 2% of pregnancies, respectively(14).

Retrospective study of pregnancies in kidney transplanted patients between 2004 and 2014, followed up 12 months after delivery and 53 pregnancies in 36 kidney transplanted patients. Mean age was 28 ± 5 years. Pregnancy occurred 4.4 ± 3.0 years post-transplant. There were 15% miscarriages in the 1st trimester and 8% in 2nd trimester. In 41% of the cases, it was necessary to induce labor. Of all births, 22% were premature and 17% were very premature. There were 5% stillbirths and 5% of neonatal deaths. De novo proteinuria occurred in 60%, urinary tract infection in 23%, preeclampsia in 11%, acute

rejection in 6%, and graft loss in 2% of the cases. It was observed a significant increase in creatinine at preconception comparing to 3rd trimester and follow-up (1.17 vs. 1.46 vs. 1.59 mg/dL, $p < 0.001$)(15).

A retrospective study conducted from 1992 to April 2011 about 17 pregnancies in 12 kidney transplanted patients followed in the Department of Obstetrics and Gynecology and Organ Transplant Unit of the Military Hospital of Tunis showed that the mean age at the time of renal transplantation was 30.11 years. The average age at the time of conception is 34.23 years. The average time between renal transplantation and the occurrence of pregnancy was 46.94 months. More than 40% of pregnancies were not planned. Of the 17 pregnancies, 12 have advanced beyond the first trimester with 91.6% resulting in the birth of a living child. Toxemia was found in 60% of cases, low birth weight in 50%, preterm in 30% and intrauterine growth retardation in 20% of cases. Cesarean section was indicated in all cases. Graft survival was 90% with a mean of 6 years after delivery(16).

A retrospective study of 67 pregnancies that occurred in 41 renal allograft recipients for 15 years performed in the Department of Obstetrics & Gynecology, and Nephrology & Urology Center at Mansoura University, Egypt showed that Gestational diabetes occurred in 5.7%, infection in 13.4% and proteinuric hypertension in 19.2% of pregnancies. Graft dysfunction and obstructive uropathy occurred in 30.7% and 9.6% of pregnancies, respectively, but no episodes of graft rejection were reported. Preterm labor was found in 40.9% and fetal growth retardation occurred in 19.2% of pregnancies. Perinatal mortality was in the order of 9.6%(17).

A study done at the Johannesburg Hospital on pregnancy after renal transplantation from 1971 to 1984 showed 38 pregnancies in 21 renal transplant patients. 22 ended with live births and included two sets of twins; there were 9 spontaneous abortions, 6 therapeutic abortions, and 1 stillbirth. Maternal complications were mild in the majority but 5 patients suffered deterioration in renal function, 2 undergoing transplant nephrectomy as a result of this. There were 7 neonatal deaths, including both sets of twins; death was due to prematurity in 6 and congenital malformation (diaphragmatic hernia) in 1. A further infant had congenital pyloric stenosis which was corrected surgically(18).

2.2 Fertility status after renal transplantation

A retrospective study conducted at tertiary health center in Ahmedabad, from 2004 to 2014 on Overview on Fertility Outcome in Renal Transplant Recipients showed that out of 19 patients, 16 patients conceived and 3 were infertile. The main cause of infertility in these patients was ovarian factor in 2 patients and tubal factor in 1 patient. Among 16 patients, 8 patients had missed abortion, 2 patients had preterm deliveries and 6 patients had term deliveries(19).

Fertility is one of the potential benefits for women undergoing kidney transplantation; however, population- based information about the likelihood of pregnancy and successful fetal outcome is not

available. In this observational study of 16 195 female kidney transplant recipients aged 15–45 years in the United States between 1990 and 2003, we determined the pregnancy rate and live birth rate using Medicare claims data from the first three posttransplant years. The pregnancy rate was 33 per thousand female transplant recipients between 1990 and 2003 and progressively declined from 59 in 1990 to 20 in 2000. The live birth rate between 1990 and 2003 was 19 per thousand female transplant recipients and declined in parallel with the pregnancy rate. Despite a decrease in therapeutic abortions over time, the proportion of pregnancies resulting in fetal loss (45.6%) remained constant during the study due to an increase in spontaneous abortions and other causes of fetal loss. The pregnancy rate in kidney transplant recipients was markedly lower and declined more rapidly than reported in the general American population during the same period. The live birth rate was substantially lower than reported in voluntary registries of transplant recipients, and the proportion of pregnancies resulting in unexpected fetal loss increased over time(20).

2.3 Menstrual pattern after renal transplantation

A 10-year retrospective case-control study that was carried out in Esfahan Teaching Hospitals, Esfahan, Iran for Menstrual characteristics and pregnancy in women after renal transplantation showed Menstrual characteristics were improved in the 50 women who had renal transplantation(21).

A study done on Fifty women of reproductive age who underwent renal transplantation at the University of Ankara Medical School between March 2008 and December 2008 showed no differences between bleeding between periods, heavy period, painful period, and period duration before and after transplantation(22).

A Cross-sectional study that was carried out in a public sector hospital of Karachi, Pakistan showed from a total 69 patients of reproductive age who underwent living kidney donor transplant for more than a year ago showed Only 2.9% cases had normal menstrual pattern. The remaining had irregular menstrual with menstrual pattern 26.1% patients had amenorrhea, 24.6% had oligomenorrhea and 31.9% had menorrhagia(23).

2.2 SIGNIFICANCE OF THE STUDY

The significance of studying reproductive outcomes after renal transplantation lies in the importance of understanding the potential impact of the transplant on fertility, menstrual pattern, pregnancy, and maternal and fetal health. Reproductive health is a crucial aspect of quality of life for individuals, and understanding how renal transplantation may affect fertility and pregnancy outcomes can help improve the overall well-being of transplant recipients. Knowledge about the potential risks and benefits of pregnancy post-transplantation is essential for providing comprehensive counseling to female transplant recipients. This information can help them make informed decisions about family planning.

Understanding the impact of renal transplantation on reproductive outcomes can help healthcare providers optimize care for transplant recipients during preconception, pregnancy, and postpartum periods. This includes managing immunosuppressive medications, monitoring for potential complications, and providing appropriate support. There is a lack of comprehensive research on this topic, and addressing this gap can help advance knowledge in the field of transplant medicine and reproductive health. This can lead to the development of evidence-based guidelines and recommendations for managing pregnancy in transplant recipients. Studying reproductive outcomes after renal transplantation can also provide insights into the long-term health implications for both mother and child. This information is valuable for improving the care and outcomes of transplant recipients and their families. In conclusion, studying reproductive outcomes after renal transplantation is significant for enhancing patient care, optimizing outcomes, and advancing knowledge in the field of transplant medicine and reproductive health. In fact, no published study has been found on the reproductive outcomes and associated factors after kidney transplantation in SPHMMC. Therefore, a study on this topic is relevant, timely, and ultimately will provide suitable recommendations. This study will also initiate other studies to be conducted in the area.

3. OBJECTIVES

3.1 GENERAL OBJECTIVE

- To assess reproductive outcomes and associated factors in child bearing women who underwent kidney transplantation in SPHMMC and who underwent kidney transplantation abroad and have follow-up in SPHMMC.

3.2 SPECIFIC OBJECTIVES

- To assess the pregnancy outcome of child bearing women who underwent kidney transplantation
- To assess associated obstetrics adverse outcomes factors after kidney transplantation
- To assess menstrual pattern after kidney transplantation

4. METHODS

4.1 Study area and Period (study setting)

A facility-based 9-year retrospective chart review and interviewing renal recipient women who were in child-bearing age with structured questionnaire and a descriptive analysis was performed. The data was collected from the only transplant center in the country, St Paul's Hospital Millennium Medical College, Addis Ababa Ethiopia. The research took place at SPHMMC from May 15, 2024, to August 15, 2024 G.C. The data-collecting procedure took around three months to complete. SPHMMC is located in Addis Ababa, Ethiopia's capital city. Many foreign partners/affiliates exist at the college.

Undergraduate, master's, specialty, and subspecialty programs are available at the college. These programs are available in a variety of subjects. The SPHMMC's Obstetrics and Gynecology department was one of the first in the college to start a residency program. It was founded in 2012-13 GC and the first seven residents were admitted. The program's capacity has gradually risen, and the average number of admissions each year is now 28. Maternal-Fetal Medicine, Family Planning, Gynecologic Oncology, Reproductive Endocrinology, and Infertility are among the subspecialties offered by the department. The obstetrics and gynecology department offers a wide variety of services. Pregnant women get antenatal care from health experts during their pregnancy. Our department offers a round-the-clock labor and delivery service, which is available seven days a week and 24 hours a day. This service is offered without charge, and no payment is required. Both females and males can receive private, preventative health care from Family Planning to aid with their reproductive health concerns. The facility is also dedicated to providing permanent contraceptive services, such as vasectomy and bilateral tubal ligation. Abortion care is also provided, including both safe abortion services and post-abortion care. The department is focused to providing comprehensive care to individuals who are experiencing infertility or other reproductive endocrinology issues. SPHMMC is the first public health institution to provide modern infertility treatment alternatives, such as in vitro fertilization (IVF).

In Ethiopia, the first national kidney transplantation center was opened at Saint Paul's Hospital Millennium Medical College in September 2015 in collaboration between the Ministry of Health and the medical faculty at the University of Michigan.

4.2 Study Design

A facility-based 9-year retrospective chart review and telephone interview descriptive study was conducted on mothers who underwent kidney transplantation at SPHMMC from 2015 till 2023 G.C and on mothers who underwent kidney transplantation abroad who had a follow-up in SPHMMC.

4.3 Population

4.3.1 Source Population

The Source population will be all women who underwent kidney transplantation.

4.3.2 Study Population

The study population was all reproductive age women who underwent kidney transplantation.

4.5 Inclusion and exclusion criteria

4.5.1 Inclusion criteria

Renal transplant recipients in the reproductive age group.

4.5.2 Exclusion Criteria

Renal transplant recipients who had pre-existing reproductive disorders, who had previous fertility treatments and whose transplantation was less than 1 year.

4.4 Sample size and Sampling technique /Sampling procedures

The charts of **all** reproductive mothers who underwent kidney transplantation were reviewed and clients were interviewed via structured questionnaire for their reproductive outcomes and possible associated factors.

4.5 Data Collection Procedures

Data was collected retrospectively on reproductive women who underwent Kidney Transplantation from September 2015 to 2023 in Saint Paul's Hospital Millennium Medical College Department of Nephrology and Transplantation. Data was obtained from the medical records of the patients and interviewing with prepared questionnaire.

4.6 Data Quality Management

Training was given to the data collectors on pre-tested questionnaires. The supervisor of the research was continuously followed the overall data collection process. All collected questionnaires were rechecked for completeness and coded. Then data entered and cleaned using SPSS for analysis.

4.7 Data Analysis Procedures

Statistical analysis was done using SPSS Version 27.0.1.0. The data were presented with texts, tables, and figures.

4.8 Study Variables

4.8.1 Dependent variable:

- 1 Pregnancy
- 2 Pregnancy outcome
- 3 Menstrual status

4.8.2 Independent variables:

- 1 Maternal age
- 2 Time since kidney transplantation

4.9 Operational Definitions

- **Reproductive outcomes** are defined as results of conception, ensuing pregnancy and menstrual status
- **Pregnancy outcomes** were live birth, miscarriage (<28 weeks gestation), termination, ectopic pregnancy, and stillbirth ($\geq$ 28 weeks gestation).
- **The adverse obstetric outcome** is defined as a composite negative obstetric outcome incorporating first or second-trimester losses, stillbirths, early neonatal death (death in first 7 days of life), pre-term births (< 37-weeks' gestation), and fetal congenital anomalies.
- **Unknow fertility status** women who were single, widowed, divorced or those who didn't have sexual activity.

4.10 Ethical Consideration

Ethical clearance obtained from the Institutional Review Board (IRB) of SPHMMC. Permission to conduct the study and to review charts was taken from the hospital administration. Confidentiality of the information collected from the charts and patients were ensured.

4.11 Dissemination Plan

The final result of this paper was submitted to the SPHMMC Department of Obstetrics and Gynecology and Public Health Department. There will be a presentation of the research outputs to the college community and other concerned stakeholders. Manuscripts will also be prepared and sent for publication in reliable journals.

5. RESULTS

5.1 Socio-demographic characteristics of study participants

Over the past nine years, SPHMMC managed 166 renal transplant recipients, including 45 women, of whom 34 were childbearing mothers and included in the study. Additionally, SPHMMC follows 460 transplant recipients treated abroad, with 76 of childbearing age. Of these, 23 were excluded due to exclusion criteria or incomplete information.

In total, 87 women were included in the study, with 34 (39.1%) having undergone transplantation at SPHMMC and 53 (60.9%) abroad. The mean age of the participants was 34.21 ± 8.6 years.

([Table 1](#)).

Table 1 Socio-demographic characteristics of reproductive-age women who underwent renal transplantation at SPHMMC and those who had follow-up at SPHMMC after renal transplantation outside Ethiopia, Addis Ababa, Ethiopia, 2024.

Variables	Categories	Frequencies	Percentage
Age group of the mothers at the time of data collection	15-19	3	3.4
	20-24	11	12.6
	25-29	19	21.8
	30-34	10	11.5
	35-39	14	16.1
	40-44	20	23.0
	45-49	10	11.5
Educational status	Read and write	3	3.4
	Primary	15	17.2
	Secondary	30	34.5
	College and above	39	44.8
Marital status	Single	28	32.2
	Married	47	54.0
	Divorced	9	10.3
	Widowed	3	3.4
Adress	Rural	3	3.4
	Urban	84	96.6
Occupational status	Daily laborer	2	2.3
	Employee	29	33.3
	Farmer	1	1.1

	House wife	32	36.8
	Merchant	11	12.6
	Student	9	10.3
	Unemployed	3	3.4
Religion	Orthodox	48	55.2
	Muslim	23	26.4
	Protestant	14	16.1
	Catholic	1	1.1
	Other (Atheist)	1	1.1
Place of transplantation	Abroad	53	60.9
	Ethiopia	34	39.1

5.2 Medical history of renal transplant mother

The mean age of mothers at the time of transplantation was 30.95 (± 9.064) years ([Table 2](#)).

Hypertension was the second most common cause of ESRD, accounting for 35.6% of cases ([Table 3](#)).

Out of 87 respondents, 78 had undergone dialysis prior to renal transplantation, with an average duration of 20.55 ± 16.22 months ([Table 4](#)).

Table 2 Age of the mother at the time of transplantation

Variables	Categories	Frequency	Percent
Age group of the mother at the time of transplantation	10-14	1	1.1
	15-19	10	11.5
	20-24	15	17.2
	25-29	14	16.1
	30-34	14	16.1
	35-39	12	13.8
	40-44	16	18.4
	45-49	5	5.7
	Total	87	100.0

Table 3 Etiology of ESRD

Causes of ESRD	Frequency	Percentage
Adult polycystic kidney disease	2	2.3
Chronic glomerulonephritis	11	12.6
Diabetes mellitus	4	4.6
Genitourinary TB	1	1.1
Hypertension	31	35.6
Unknown	38	43.7
Total	87	100.0

Table 4 Dialysis before transplantation with an average of

Variables	Categories	Frequency	Percent
Dialysis before transplantation	Yes	78	89.7
	No	9	10.3
	Total	87	100.0

5.3 Reproductive outcome after kidney transplantation

This study showed out of 87 renal recipient respondents 52 (59.8 %) had irregular menstruation prior to renal transplantation and amenorrhea 27 (51.9 %) of cases was the most common irregular menstrual pattern. Whereas after renal transplantation 60 (67.8%) mothers had regular menstrual cycle ([Table 5](#))

Out of 87 mothers, 58 (66.7%) had a history of infertility during the period of ESRD. The remaining mothers were unsure whether they had difficulty conceiving, as they were single, divorced, widowed, or had not engaged in sexual activity ([Table 6](#)).

This study reported 22 pregnancies in 15 renal transplant patients with the mean age of 30.33 ± 6.2 years at the time of first pregnancy. The average interval between renal transplantation and pregnancy was 3.6 years. Out of these 22 pregnancies, 19 ended in live births and 3 ended in spontaneous abortions. Of the 19 live births, 10 were term, 7 were preterm, and 2 were classified as early neonatal death (END).

Among the 15 mothers, 10 of them experienced adverse obstetric outcomes, which included 7 (41.2 %) preterm deliveries, 6 (35.2%) cases of chronic hypertension with superimposed preeclampsia, 2 (11.8%) cases of preeclampsia, and 2 (11.8%) cases of fetal growth restriction (FGR) ([Table 7](#)).

Table 5 Menstrual pattern before and after renal transplantation

Menstrual status before renal transplantation			
	Categories	Frequency	Percentage
Menstrual status before renal transplantation	Irregular	52	59.8
	Regular	35	40.2
	Total	87	100.0
Patterns of irregular menstrual cycle before renal transplantation	Amenorrhea	27	51.9
	Menorrhagia	6	11.6
	Metrorrhagia	1	1.9
	Oligomenorrhea	16	30.8
	Polymenorrhea	2	3.8
	Total	52	100.0
Menstrual status after renal transplantation			
Menstrual status before renal transplantation	Irregular	27	31.0
	Regular	60	67.8
	Total	87	100.0

Table 6 Fertility status during the period of ESRD and after renal transplantation

	Categories	Frequency	Percent
Status of conceiving pregnancy before renal transplantation	Unknown	29	33.3
	Yes	58	66.7
	Total	87	100.0
Status of conceiving pregnancy after renal transplantation	Yes	15	17.2
	No	45	51.7
	Unknown	27	31.1
	Total	87	100.0

Table 7 Pregnancy outcome after kidney transplantation

Variables	Category	Frequency	Percentage
Women who were Pregnant after kidney transplantation	Yes	15	17.2
	No	72	82.8
	Total	87	100.0
Pregnancy outcome after kidney transplantation	Term alive	10	45.5
	Preterm alive	7	31.8
	END	2	9.1
	Spontaneous abortion	3	13.6
	Total	22	100.0
Women who had adverse obstetric outcome	Yes	10	66.7
	No	5	33.3
	Total	15	100.0
Adverse obstetric outcomes	Preterm delivery	7	41.2
	Chronic hypertension superimposed Preeclampsia	6	35.2
	Preeclampsia	2	11.8
	FGR	2	11.8
	Total	17	100.0

5. DISCUSSION

This study showed that, prior to transplantation, 52 cases (59.8%) exhibited irregular menstrual patterns, whereas only 27 cases (31%) showed irregular menstrual patterns after renal transplantation; which is comparable with a 10-year retrospective case-control study in the case of improvement irregular menstrual pattern(24), but this study is different from the study done on Fifty women of reproductive age who underwent renal transplantation that showed no differences between bleeding between periods, heavy period, painful period, and period duration before and after transplantation(22).

According to this study the mean age of the mother was 30.33 ± 6.2 years at the time of first pregnancy after renal transplantation which is comparable with a study on A Metanalysis and systematic review done on Pregnancy outcomes in women with kidney transplants that showed 29.6 ± 2.4 years(5) and a study done the Department of Obstetrics and Gynecology and Organ Transplant Unit of the Military Hospital of Tunis 30.11 years (25), but higher than the study on Retrospective study of pregnancies in kidney transplanted patients between 2004 and 2014, followed up 12 months after delivery with Mean age was 28 ± 5 years(6). From this study the average interval between renal transplantation and pregnancy was 3.6 ± 1.5 years which is lower as compared to Retrospective study of pregnancies in kidney transplanted patients between 2004 and 2014, followed up 4.4 ± 3.0 years(6). From this study out of 22 pregnancies, 19 (86.4%) ended in live births and 3 (13.6%) ended in spontaneous abortions and of the 19 live births, 10 (52.6%) were term, 7 (36.8%) were preterm, and 2 (10.5%) were classified as early neonatal death (END) which showed better outcome as compared to the study done at the Johannesburg Hospital on pregnancy after renal transplantation from 1971 to 1984 out of 38 pregnancies in 21 renal transplant patients 22 ended with live births , 9 spontaneous abortions, 6 therapeutic abortions, 1 stillbirth and 7 END probably the study period with advanced renal transplantation recently(6).

This study shows from 15 mothers, 10 of them experienced adverse obstetric outcomes, which included 7 (41.2 %) preterm deliveries, 6 (35.2%) cases of chronic hypertension with superimposed preeclampsia, 2 (11.8%) cases of preeclampsia, and 2 (11.8%) cases of fetal growth restriction (FGR) which is higher than a metanalysis and systematic review done on Pregnancy outcomes in women with kidney transplants especially hypertensive related adverse outcome ; but this study showed comparable outcome with preterm deliveries which showed induced abortions (12.4%) miscarriages (15.4%), stillbirths (5.1%), ectopic pregnancies (2.4%), preeclampsia (21.5%), gestational diabetes (5.7%), pregnancy induced hypertension (24.1%), and preterm delivery was 43.1% (26).

6. LIMITATION OF THE STUDY

This study has some limitations that should be noted. First, other causes of irregular menstruation, both pre- and post-transplant, were not assessed. Second, similar to menstrual irregularities, there are limitations in including other causes or confounding factors that could correlate CKD/ESRD with infertility

7. CONCLUSION AND RECOMMENDATION

Renal transplant restores fertility and pregnancy requires careful planning. There should be an expansion of effort by Obstetrician and nephrologists to include the discussion of menstrual and reproductive issues in women with renal transplant recipient. Pregnancy after renal transplant confers significant risks for both maternal and fetal adverse events, including increased rates of chronic hypertension superimposed preeclampsia, Preeclampsia, Preterm delivery and Fetal growth restriction. The findings of this study could assist healthcare providers in offering appropriate counseling and individualized management for this high-risk population, particularly in terms of preconception care and close follow-up in the High-risk ANC. This research will serve as an important baseline for future studies and provide valuable data for mothers of reproductive age with a history of renal transplantation.

ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research proposal and for the provision of required progress reports as per terms and conditions of the St. Paul's Hospital and Millennium Medical College in effect at the time of the grant is forwarded as the result of this application.

Name of the resident: _____

Dat _____ Signature _____

APPROVAL OF THE FIRST ADVISOR

Name of the first advisors: _____

Date _____ Signature _____

APPROVAL OF THE SECOND ADVISOR

Name of the first advisors: _____

Date _____ Signature _____

Reviewers

Name: _____

Date _____ Signature _____

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ANNEXES

Research questionnaire

Identification and sociodemographic profile

1. Name
2. Phone number
3. MRN
4. Current age of the mother
5. Educational status
 - a. Illiterate
 - b. Read and write
 - c. Primary
 - d. Secondary
 - e. College and above
6. Marital status
 - a. Single
 - b. Married
 - c. Divorced
 - d. Widowed
7. Address
 - a. Urban
 - b. Rural
8. Occupation
 - a. Farmer
 - b. Merchant
 - c. Employee
 - d. Day laborer
 - e. House wife
 - f. Others specify_____
9. Religion
 - a. Orthodox
 - b. Muslim
 - c. Protestant
 - d. Catholic
 - e. Jehovah witness
 - f. Other Specify_____

Medical history of renal transplanted mother

1. Age of the mother at the time of transplantation? _____

2. Place of transplantation?
 - a. Ethiopia
 - b. Abroad
3. What was the cause of ESRD?
 - a. Unknown
 - b. Chronic glomerulonephritis
 - c. Diabetes mellitus
 - d. Hypertension
 - e. Adult polycystic kidney disease
 - f. Urinary stone disease
 - g. Vesicoureteral reflux
 - h. Interstitial nephritis
 - i. Genitourinary TB (chronic interstitial nephritis)
 - j. Nonsteroidal anti-inflammatory drugs
4. History of dialysis before transplantation
 - a. Yes
 - b. No
5. If yes for dialysis durations of dialysis (In months) ____

Reproductive outcomes

1. Did you have gynecologic illness?
2. If yes for gynecologic illness, was it before or after transplantation?
 - a. Before
 - b. After
3. Did you have gynecologic operation?
 - a. Yes
 - b. No
4. How was your menstrual cycle before transplantation?
 - a. Regular
 - b. Irregular
5. If menstrual cycle is **irregular** how was the pattern?
 - a. It comes before 21 days
 - b. It comes after 35 days
 - c. It stays more than 8 days
 - d. Bleeding between menses
 - e. Absent more than 3 months

- f. Others specify_____
6. How was your menstrual cycle after transplantation?
- a. Regular
 - b. Irregular
7. If menstrual cycle is **irregular** how was the pattern?
- a. It comes before 21 days
 - b. It comes after 35 days
 - c. It stays more than 8 days
 - d. Bleeding between menses
 - e. Absent more than 3 months
 - f. Others specify_____
8. Do you have infertility history before transplantation?
- a. Yes
 - b. No
9. If yes for **infertility history** before transplantation, was it resolved after transplantation?
- a. Yes
 - b. No
10. Are you sexually active after renal transplantation?
- a. Yes
 - b. No
11. If yes for sexual activity how many times per week? ____
12. Did you use contraceptive device after renal transplantation?
- a. Yes
 - b. No
13. If yes for contraceptives which type of contraceptives?
- a. DMPA
 - b. IUD
 - c. CHC
 - d. Implant
 - e. Condom
 - f. Others specify_____
14. Did you have pregnancy after renal transplantation?
- a. Yes
 - b. No
15. If you had pregnancy, age of the mother during 1st pregnancy? ____

16. If you had pregnancy, after how long you become pregnant since renal transplantation? ____
17. If you had pregnancy, how many times you were pregnant? ____
18. If you had pregnancy, how was the outcome?
- a. Term alive
 - b. Preterm
 - c. Abortion
 - d. Ectopic pregnancy
 - e. Stillbirth
 - f. Others____
19. If you had pregnancy, did you have adverse obstetrics outcomes?
20. If yes for **adverse outcome** what was the adverse obstetrics outcomes?
- a. Gestational hypertension
 - b. Gestational diabetes
 - c. Chronic hypertension with superimposed preeclampsia
 - d. Preeclampsia
 - e. Preterm Delivery
 - f. FGR
 - g. Others specify _____