RESEARCH PAPER

Pregnancy in Women with End-Stage Kidney Disease Receiving Maintenance Hemodialysis: A Five-Year Experience from a Tertiary Academic Hospital

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ABSTRACT
Objective: To describe maternal characteristics, management, and perinatal outcomes of pregnancies complicated by stage V chronic kidney disease (CKD) receiving regular hemodialysis at a tertiary referral center.
Case: This case series included 10 pregnancies (mean age 32 years; 90% multigravida). Chronic hypertension and prior preeclampsia were common backgrounds. All pregnancies ended before 37 weeks; half reached the third trimester. Preeclampsia occurred in 50% and anemia in all cases (mean pre-delivery Hb 7.64 g/dL; 20% severe). Among 8 live births, 77.5% had low birth weight; Apgar <7 occurred in 75% at 1 minute and 37.5% at 5 minutes. Dialysis frequency was 2–3 sessions/week.
Conclusion: Pregnancy on dialysis remains high risk with frequent preterm birth and neonatal morbidity, requiring early referral and multidisciplinary care with optimized dialysis and maternal stabilization.
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INTRODUCTION

Chronic kidney disease (CKD) is a major global health problem with steadily increasing prevalence and substantial implications for women of reproductive age. Stage V CKD, or end-stage kidney disease (ESKD), is characterized by severe irreversible loss of kidney function, usually defined by an estimated glomerular filtration rate (eGFR) below 15 mL/min/1.73 m² and the need for kidney replacement therapy such as hemodialysis or transplantation [1]. In women of reproductive age, advanced CKD disrupts endocrine and reproductive physiology through ovulatory dysfunction, hormonal imbalance, and chronic systemic illness, thereby reducing fertility. Nevertheless, pregnancy may still occur, including in women who have already been receiving long-term hemodialysis [2].

Although historically considered rare, pregnancy in women on dialysis is being reported more frequently, likely because of improved dialysis technology, better nephrology care, and increasing availability of multidisciplinary management for high-risk pregnancies [3]. Even so, pregnancy in women with stage V CKD on hemodialysis remains one of the most challenging scenarios in maternal-fetal medicine. Maternal risks include chronic hypertension, superimposed preeclampsia, severe anemia, intradialytic hemodynamic instability, fluid and electrolyte disturbances, and the need for operative delivery [4]. At the same time, fetal and neonatal risks remain high, particularly extreme prematurity, fetal growth restriction, low birth weight, fetal demise, neonatal respiratory compromise, and prolonged neonatal intensive care [5].

The pathophysiology underlying these adverse outcomes is multifactorial. Patients with advanced CKD have limited nephron reserve and cannot mount the normal renal adaptations of pregnancy, such as increased renal plasma flow and increased glomerular filtration. Instead, they often remain in a proinflammatory, vasoconstricted, volume-sensitive state that contributes to chronic hypertension, endothelial dysfunction, placental malperfusion, and impaired uteroplacental blood flow. Uremia, metabolic derangements, and severe anemia may further worsen the intrauterine environment [6]. These mechanisms help explain why pregnancies in dialysis patients are frequently complicated by hypertensive disorders, preterm birth, fetal growth impairment, and low neonatal vitality at delivery.

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Over the past decade, modern management has increasingly emphasized intensified dialysis during pregnancy, tighter blood pressure control, proactive correction of anemia, careful ultrafiltration targets, serial fetal surveillance, and close multidisciplinary coordination [2]. Nevertheless, real-world implementation can vary substantially depending on resources, referral timing, insurance coverage, and local care pathways. Reports from low- and middle-income settings remain limited, and institution-specific experience is valuable for understanding both clinical patterns and systems-level barriers.

This manuscript presents a case series of 10 pregnancies complicated by stage V CKD managed with regular hemodialysis at Dr. Soetomo Academic General Hospital, Surabaya. The aim is to describe maternal clinical characteristics, dialysis-related context, laboratory findings, obstetric course, and perinatal outcomes. By summarizing these cases in a structured format, this manuscript seeks to provide a concise picture of the challenges and outcomes of pregnancy on hemodialysis in a tertiary referral setting and to highlight the importance of multidisciplinary care, early referral, and individualized maternal-fetal management.

Table 1. Overall maternal, dialysis, and perinatal profile of the case series

Variable	Summary
Number of cases	10 pregnancies
Maternal age	Mean 32 years; range 24–44 years
Parity	Predominantly multigravida (9/10); one primigravida
CKD background	Stage V CKD in all cases; etiologies included chronic hypertension, previous preeclampsia, polycystic kidney disease, diabetes, and unknown causes
Hemodialysis exposure	Most patients had been on regular hemodialysis for 1–4 years before pregnancy; one patient initiated hemodialysis during pregnancy at 24–25 weeks
Preeclampsia	Present in 5/10 pregnancies, including superimposed preeclampsia in women with chronic hypertension
Anemia	Present in all cases; pre-delivery hemoglobin ranged from 5.4 to 9.9 g/dL
Timing of delivery	All pregnancies ended before 37 weeks; outcomes ranged from first-trimester loss to third-trimester preterm birth
Mode of delivery	Balanced between spontaneous vaginal delivery and cesarean section, guided by gestational age and obstetric indication
Neonatal pattern	High burden of fetal loss, extreme prematurity, low birth weight, low early Apgar scores, and NICU requirement among live births

Case(s)

Ten pregnancies complicated by stage V CKD and managed with regular hemodialysis were identified. To maintain narrative clarity while preserving the individual clinical course of each pregnancy, the cases are presented as concise case stories followed by tabulated laboratory and outcome data. Across the series, chronic hypertension, prior hypertensive disease, and severe anemia were recurring themes. Several women presented after prolonged dialysis exposure before conception, whereas one patient only started hemodialysis in the second trimester.

Case 1. 29-year-old multigravida with ESKD on HD for 3 years (eGFR 8 mL/min/1.73 m²). Chronic hepatitis B and severe anemia (Hb 5.4 g/dL). Developed preeclampsia. Pregnancy ended at 21–22 weeks as spontaneous delivery/abortion; male fetus 200 g, Apgar 0.

Case 2. 41-year-old multigravida with polycystic kidney disease on HD for 2 years (eGFR 14). Gestational diabetes; no preeclampsia. Delivered at 32 weeks by cesarean section; female neonate 1600 g, Apgar 6/7.

Case 3. 28-year-old multigravida with ESKD (history of severe preeclampsia in a prior pregnancy) on HD for 2 years (eGFR 12). Hb 9.9 g/dL. Delivered at 24–25 weeks

via spontaneous vaginal delivery; male neonate 650 g, Apgar 4/5.

Case 4. 24-year-old multigravida with ESKD of unknown etiology on HD for 4 years (eGFR 11). Hb 8.5 g/dL. Pregnancy ended at 13–14 weeks with spontaneous abortion; Apgar 0.

Case 5. 44-year-old multigravida with ESKD attributed to chronic hypertension on HD for 3 years (eGFR 10). Superimposed preeclampsia; Hb 7.5 g/dL. Delivered at 34–35 weeks by cesarean section; male neonate 2600 g, Apgar 7/8.

Case 6. 29-year-old multigravida with ESKD of unknown etiology on HD for 1 year (eGFR 9). Hb 8.4 g/dL; no preeclampsia. Delivered at 33–34 weeks by cesarean section; male neonate 1600 g, Apgar 6/8.

Case 7. 34-year-old multigravida with ESKD on HD for 3 years (eGFR 19). Preeclampsia and preterm premature rupture of membranes documented; Hb 8.0 g/dL. Delivered at 34–35 weeks by cesarean section; male neonate 1800 g, Apgar 6/7.

Case 8. 27-year-old multigravida with ESKD; initiated HD at 24–25 weeks (eGFR 7). Suspected IUGR and anemia (Hb 7.0 g/dL); no preeclampsia. Delivered at 32–33 weeks by cesarean section; male neonate 1600 g, Apgar 7/8.

Case 9. 41-year-old multigravida with ESKD due to chronic hypertension on HD for 2 years (eGFR 20). Hb 6.1 g/dL; no preeclampsia. Delivered at 24–25 weeks via spontaneous vaginal delivery; male neonate 700 g, Apgar 2/5.

Case 10. 27-year-old primigravida with ESKD associated with type 1 diabetes and chronic hypertension; on HD for 3 months (eGFR 14). Preeclampsia; Hb 7.2 g/dL. Delivered at 28–29 weeks via spontaneous vaginal delivery; female neonate 1300 g, Apgar 2/4.

Table 2. Individual laboratory findings, delivery characteristics, and neonatal outcomes

Case	Age	Dialysis before pregnancy	Preeclampsia	Hb (g/dL)	eGFR	Delivery	Neonatal outcome
1	29	3 years	No	5.4	8	21–22 wk, SVD	Male, 200 g, Apgar 0
2	41	2 years	Yes	8.4	14	32 wk, CS	Female, 1600 g, Apgar 6/7
3	28	2 years	No	9.9	12	24–25 wk, SVD	Male, 650 g, Apgar 4/5
4	24	4 years	No	8.5	11	13–14 wk, abortion	Nonviable fetal outcome
5	44	3 years	Yes	7.5	10	34–35 wk, CS	Male, 2600 g, Apgar 7/8
6	29	1 year	No	8.4	9	33–34 wk, CS	Male, 1600 g, Apgar 6/8
7	34	3 years	Yes	8.0	19	34–35 wk, CS	Male, 1800 g, Apgar 6/7
8	27	Started at 24–25 wk	Yes	7.0	7	32–33 wk, CS	Male, 1600 g, Apgar 7/8
9	41	2 years	No	6.1	20	24–25 wk, SVD	Male, 700 g, Apgar 2/5/6
10	27	3 months	Yes	7.2	14	28–29 wk, SVD	Female, 1300 g, Apgar 2/4/5

DISCUSSION

This series demonstrates that pregnancy in women with stage V CKD receiving dialysis remains an extremely high-risk condition, even within a tertiary referral center. Several clinical patterns were particularly prominent. First, severe maternal comorbidity was common. Nearly all women were multigravida, many had chronic hypertension or a prior hypertensive pregnancy disorder, and half developed preeclampsia in the index pregnancy. These findings support the concept that advanced CKD and hypertensive vascular disease frequently coexist,

generating a maternal phenotype characterized by endothelial dysfunction, impaired placental perfusion, and increased obstetric risk [7]. In practice, distinguishing preeclampsia from pre-existing CKD-related hypertension and proteinuria can be difficult, which reinforces the importance of using baseline early-pregnancy data and paying close attention to dynamic maternal and fetal changes rather than isolated laboratory abnormalities alone.

Second, anemia was universal and often severe, with pre-delivery hemoglobin values ranging from 5.4 to 9.9 g/dL. This is clinically important because anemia in ESKD is not merely a laboratory abnormality; it reflects decreased erythropoietin production, chronic inflammation, dialysis-related blood loss, and iron dysregulation, all of which are further compounded by physiologic hemodilution during pregnancy [8]. Maternal anemia may reduce oxygen delivery to the placenta and fetus, worsen fatigue and cardiovascular strain, and contribute to poor tolerance of obstetric complications. In this cohort, the low hemoglobin values likely formed part of the pathophysiologic background for prematurity and low neonatal reserve at birth. These observations underscore the need for aggressive antenatal anemia management, including iron assessment, appropriate erythropoiesis-stimulating therapy, and selective transfusion planning where necessary [9].

Third, preterm birth dominated the obstetric outcome profile. All pregnancies in this series ended before term, and several ended before fetal viability or at the threshold of viability. This finding is consistent with the severe maternal-fetal vulnerability in dialysis pregnancies. Preterm birth in this population is likely multifactorial: medically indicated early delivery because of preeclampsia or worsening maternal status, spontaneous preterm labor related to systemic inflammation and uremia, membrane complications, and chronic placental insufficiency. Even among pregnancies that progressed into the third trimester, delivery still occurred in the preterm range. Thus, the major clinical challenge is often not prevention of preterm birth altogether, but rather safe prolongation of pregnancy while maintaining maternal stability.

Fourth, neonatal morbidity was substantial. Among live births, low birth weight was common, and low Apgar scores at 1 minute were frequent, with partial improvement by 5 minutes in some neonates. These findings are compatible with the combined effects of prematurity, reduced fetal growth, and compromised neonatal transition. Case 8 also suggests the presence of fetal growth restriction in at least one pregnancy, further supporting the role of chronic uteroplacental dysfunction in this population. Taken together, the neonatal outcomes illustrate that survival alone should not be viewed as the only endpoint; gestational age at delivery, birth weight, immediate neonatal condition, and need for intensive neonatal support are equally important markers of the burden of disease.

The dialysis context also deserves attention. Most patients were already on maintenance hemodialysis before pregnancy, but one patient initiated dialysis only in mid-pregnancy. All cases show dialysis frequencies of two to three sessions per week, which likely reflects practical and resource-related constraints. Contemporary nephro-obstetric principles generally favor more intensive dialysis during pregnancy in order to improve metabolic control, maintain lower urea levels, reduce polyhydramnios, and support fetal growth and longer gestation [10]. In settings where dialysis intensification is limited by insurance, access, or staffing, clinicians may face a narrower therapeutic window. Therefore, institution-specific outcomes such as those in this series are also informative from a health-systems perspective, because they reflect not only disease severity but also the realities of delivering complex care in resource-constrained environments.

With respect to mode of delivery, the present series does not suggest that cesarean section should be considered mandatory solely because a patient is on hemodialysis. Instead, the distribution of spontaneous vaginal delivery and cesarean section indicates that mode of birth was largely determined by obstetric context, gestational age, fetal status, and maternal condition. This is an important practical point. Pregnant patients with ESKD require detailed peripartum planning regarding dialysis timing, volume status, and anticoagulation, but the route of delivery should still remain obstetrically driven [10]. Cases delivered by cesarean section tended to be those with more advanced gestations and viable fetuses, whereas several very early pregnancies ended vaginally or as abortions, reflecting the natural history of severe prematurity and pregnancy loss.

This case series also highlights the importance of reproductive counseling. Several pregnancies occurred in women with longstanding dialysis dependence, and the source material notes a strong preference for postpartum sterilization or intrauterine contraception. Such decisions likely reflect both clinician counseling and patient awareness of the considerable risks associated with repeat pregnancy in advanced CKD. Preconception counseling should therefore be regarded as a core component of care. Women of reproductive age with ESKD need realistic counseling about maternal risks, fetal prognosis, dialysis modification during pregnancy, and postpartum contraceptive options [11]. This conversation is especially important because fertility may be reduced but is not absent, meaning unplanned pregnancies can still occur.

The principal strength of this manuscript is that it captures real-world experience from a tertiary referral center in Indonesia, where published reports on pregnancy in women on chronic hemodialysis remain limited. The series demonstrates both the feasibility of achieving live birth and the continued burden of severe complications. Its main limitation is the descriptive design and small sample size, which do not allow causal inference or comparative analysis. In addition, not all detailed dialysis parameters, longitudinal laboratory trends, and neonatal follow-up

outcomes were available in uniform format across cases. Even so, the consistency of adverse patterns across the series provides clinically meaningful insights.

Overall, the present cases reinforce several practical messages. Pregnancy in women with stage V CKD on hemodialysis remains high risk from both maternal and perinatal perspectives. Common adverse patterns include severe anemia, preeclampsia, universal preterm birth, fetal loss, low birth weight, and compromised neonatal condition at birth. Nevertheless, viable delivery is possible, particularly when pregnancy can be prolonged into the third trimester. Earlier referral, structured multidisciplinary care, optimized anemia treatment, individualized dialysis adjustment, and close maternal-fetal surveillance are likely central to improving outcomes in this population.

REFERENCES

[1] Levin A, Stevens PE, Bilous RW, Coresh J, De Francisco ALM, De Jong PE, et al. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int Suppl (2011) 2013;3:1–150.

[2] Piccoli GB, Minelli F, Versino E, Cabiddu G, Attini R, Vigotti FN, et al. Pregnancy in dialysis patients in the new millennium: a systematic review and meta-regression analysis correlating dialysis schedules and pregnancy outcomes. Nephrology Dialysis Transplantation 2016;31:1915–34.

[3] Hladunewich MA, Hou S, Odutayo A, Cornelis T, Pierratos A, Goldstein M, et al. Intensive hemodialysis associates with improved pregnancy outcomes: a Canadian and United States cohort comparison. Journal of the American Society of Nephrology 2014;25:1103–9.

[4] Williams D, Davison J. Chronic kidney disease in pregnancy. Bmj 2008;336:211–5.

[5] Piccoli GB, Fassio F, Attini R, Parisi S, Biolcati M, Ferraresi M, et al. Pregnancy in CKD: whom should we follow and why? Nephrology Dialysis Transplantation 2012;27:iii111–8.

[6] Cheung KL, Lafayette RA. Renal physiology of pregnancy. Adv Chronic Kidney Dis 2013;20:209–14.

[7] Wiles K, Chappell L, Clark K, Elman L, Hall M, Lightstone L, et al. Clinical practice guideline on pregnancy and renal disease. BMC Nephrol 2019;20:401.

[8] Morton A, Burke M, Morton A, Kumar S. Anaemia in chronic kidney disease pregnancy. Obstet Med 2021;14:116–20.

[9] de Jong MFC, Nemeth E, Rawee P, Bramham K, Eisenga MF. Anemia in pregnancy with CKD. Kidney Int Rep 2024;9:1183–97.

[10] Oliverio AL, Hladunewich MA. End-stage kidney disease and dialysis in pregnancy. Adv Chronic Kidney Dis 2020;27:477–85.

[11] Stevens PE, Ahmed SB, Carrero JJ, Foster B, Francis A, Hall RK, et al. KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int 2024;105:S117–314.