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Pregnancy with chronic kidney disease: maternal and fetal outcome

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ABSTRACT

Objective: Pregnancy with chronic kidney disease (CKD) is considered to be high risk. The purpose of this study was to assess the effect of pregnancy on CKD and the fetomaternal outcome in these patients.
Study design: A retrospective observational study was conducted in the Department of Obstetrics and Gynaecology, All India Institute of medical sciences, New Delhi over a period of 11 years. A total number of 80 pregnant patients with CKD were reviewed. Staging of CKD was done according to glomerular filtration rate (GFR). Maternal demographic profile, stage of CKD, biochemical profile, antenatal and neonatal records were analyzed. The course of pregnancy was then reviewed and note was made of any maternal or fetal complication. At the time of analysis, patients were divided into early (Stage 1, 2) and late stage (Stage 3–5) disease. All the variables were compared between two groups. Data analysis was carried out using SPSS software version 20.0.
Results: There was significantly increased incidence of preeclampsia ($p = 0.001$) and moderate to severe anemia ($p = 0.001$) in late stage disease as compared to early stage. The renal parameters including mean GFR and serum creatinine deteriorated with pregnancy in both the groups. Among fetal complications, the patients in late stage had significantly increased incidence of small for gestational age, low 5 min Apgar score and increased NICU admissions. The overall preterm delivery rate was 57.5%. There was an overall increase in the incidence of caesarean section (CS) rate (64%).
Conclusions: Despite advances in antenatal care, incidence of adverse events in mother and fetus remain high in these women of CKD as compared to the rates expected in the general population. In all patients of CKD planning for pregnancy, the pre-existing disease should be optimized before conception.

Introduction

Pregnancy with chronic kidney disease (CKD) is considered to be high risk. The prevalence of CKD in pregnancy is 3.3% in a population based study [1]. Achieving successful pregnancy in these patients is challenging as adverse fetomaternal outcome is significantly increased with higher degrees of renal impairment [2,3]. In the past, any degree of renal impairment was considered incompatible with pregnancy and those women were advised to undergo termination of pregnancy [4]. But with advancements in medical science, pre conception counselling and intensive antenatal management, the fetomaternal outcome has improved. Recent evidence supports pregnancy in early stage kidney disease, although complications are increased [5].

Studies have shown varying results regarding perinatal outcome across different stages of renal disease. This variation in perinatal outcome may be due to the differences in availability of care and also the type of classification used for CKD. Majority of studies [6,7] in the past have used creatinine for grading the disease but the recently available literature addresses the CKD severity according to estimated glomerular filtration rate (eGFR). There is paucity of studies with respect to current nephrologic, obstetric and neonatal practices and more evidence needs to be generated to guide management and counselling of these women.

In present study, eGFR was used to classify chronic kidney disease. The objective of this study was to evaluate the maternal and fetal outcome in pregnancies with kidney disease and to compare the same between early and late stages of CKD. The effect of pregnancy on renal disease was also assessed. There are very few studies from India to analyze pregnancy outcome in CKD. This study was carried out to better elucidate the condition in Indian settings where patients are less aware of pre conception counselling and usually come to us in late pregnancy.

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Materials and methods

A retrospective observational study was conducted in the Department of Obstetrics and Gynaecology, All India Institute of medical sciences, New Delhi over a period of 11 years, from January 2005 to November 2015. Case records of all booked patients with CKD who delivered in the hospital were reviewed. All the patients diagnosed with CKD preconceptionally or in early pregnancy (≤12 weeks) were included in the study. Out of 94 patients, 14 were excluded from the study due to incomplete data records. A total 80 patients with CKD and singleton pregnancy were reviewed. CKD was defined according to National kidney foundation-Kidney disease outcome quality initiative (NKF-KDOQI) guidelines [8]. CKD is defined as either kidney damage or GFR <60 ml/min/1.73 m^2 for ≥3 months. In our study, staging of CKD was done according to GFR as per NKF-KDOQI guidelines calculated by Cockcroft-Gault formula (Table 1).

The baseline parameters at the time of first antenatal visit, including age, parity, number of previous pregnancy losses, period of gestation (POG), duration of CKD, GFR, blood urea, creatinine, proteinuria, hemoglobin and blood pressure were recorded. The patients with missing data were excluded from the study. The course of pregnancy was then reviewed and note was made of any maternal or fetal complication. Effect of kidney disease on various maternal and fetal parameters was studied. Adverse maternal outcome was defined as development of any of the complication like anemia, pre eclampsia, eclampsia, abruption, caesarean delivery or ICU admission. Anemia was defined as haemoglobin (Hb) less than 11 g/dl. According to Indian Council of Medical Research (ICMR) guidelines, anemia was classified as mild (Hb 10–10.9 g/dl), moderate (Hb 7–9.9) g/dl and severe (Hb <7 g/dl) [9]. Hypertensive disorders were defined according to National High Blood Pressure education programme working group on high blood pressure during pregnancy, 2000 [10]. Hypertension was defined as systolic blood pressure ≥140 and/or diastolic blood pressure ≥90, or patients taking anti-hypertensive therapy. Pre eclampsia was defined as new onset hypertension after 20 weeks of pregnancy associated with proteinuria. Superimposed pre eclampsia was defined as CKD with hypertension with new onset or sudden increase in proteinuria, sudden increase in blood pressure, thrombocytopenia or deranged liver or kidney function. In this study, patients with superimposed pre eclampsia were included in pre eclampsia group. Eclampsia was defined as development of seizures in a patient of pre eclampsia. Adverse fetal outcome was defined as presence of any of the factors like small for gestational age (SGA, infants <10th percentile of birth weight for given gestation), Oligoamnios (Amniotic Fluid index <5), preterm births (<37 weeks gestation), Umbilical artery Doppler abnormalities (Raised peak systolic/end diastolic ratio, absent or reversal of end diastolic flow), low Apgar score (<7 at 5 min), neonatal intensive care unit (NICU) admissions or stillbirth. Pre term births were divided in early preterm (<34 weeks) and late preterm (34–37 weeks). To evaluate the effect of pregnancy on renal disease, the biochemical parameters of the patients were repeated prior to delivery (within 2 weeks) and at 6 weeks postpartum. Patients were in regular follow-up in same maternal fetal unit with a multidisciplinary team involving obstetricians, nephrologists, anaesthesiologists and neonatologists.

The objective of the study was to compare various outcomes in early and late stages of kidney disease. We have considered only pre eclampsia for calculation of the sample size with desired power. From the earlier study [11] incidence of pre-eclampsia was observed to be in the range of 10–20%.Therefore to obtain statistical significant difference at 5% level of significance with 90% power, required sample size was found to be 74. Hence 80 patients were included in present study.

At the time of analysis, patients were divided into early (Stage 1, 2) and late stage (Stage 3–5) disease. All the variables were compared between two groups. Data analysis was carried out using SPSS software version 20.0. Descriptive statistics such as mean, median and standard deviation were calculated. The test of normality was done for continuous variables. Mean values of continuous variables that followed approximate to normal distribution were compared using Student's independent *t* test between the two groups. Frequency data across categories were compared using Chi square or Fisher exact test. Median values of data with non normal distribution were compared using non parametric Mann–Whitney *U* test. Changes in the biochemical parameters from preconceptional through ante partum and postpartum period were compared using students t paired test. Comparison of categorical variables between early and late stage disease were compared using Mc Nemar chi square test. For all statistical tests, the probability of $p < 0.05$ was taken as significant.

Results

The clinical profile of 80 patients included in study is shown in Table 2. Mean age of study population was 26.65 ± 3.6 years. Majority of patients were multigravida (65%) and 47% of them had one or more abortions. In the present study, glomerulonephritis type of kidney diseases was found to be more common during pregnancy. Median duration of CKD was 15 months. Out of 80 patients, 22(27.5%) were diagnosed in pregnancy. Baseline proteinuria was present in 38(47.5%) patients. Fifty five percent of the patients were hypertensive at the time of entry into the study. The stage wise distribution of the disease at the time of conception is shown in Table 1.

Mean period of gestation at which patients were admitted was 33.5 ± 4 weeks. The most common indication was uncontrolled blood pressure records (30%) followed by worsening renal parameters (17.5%). Other patients (53.7%) were admitted for various obstetrical indications. The various maternal and fetal complications are shown in Table 3. On comparison of the parameters between the early and late stage, there was significantly increased incidence of preeclampsia ($p = 0.001$) and moderate to severe anemia ($p = 0.002$) in late stage disease. Similarly six patients who developed impending eclampsia belonged to the late stage group. There was no case of eclampsia or abruption in either group. There was an overall increase in the incidence of caesarean section (CS) rate (64%), however there was no significant difference in CS rate in both the groups (70.6% vs 65.2%). The most common indication of caesarean section was non

Table 1
Staging of chronic kidney disease (NF-KDOQI guidelines) and stage wise distribution of patients.

Stage	*N* (%)	Description	GFR (ml/min/1.73 m^2)
1	36 (45)	Kidney damage with normal or increased GFR	≥90
2	10 (12.5)	Kidney damage with mild decrease in GFR	60–89
3	20 (25)	Moderate decrease in GFR	30–59
4	12 (15)	Severe decrease in GFR	15–29
5	2 (2.5)	Kidney failure	<15 or dialysis