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A RETROSPECTIVE STUDY ON ACUTE RENAL DAMAGE DURING PREGNANCY AND PUBERTY, JHARKHAND, INDIA.

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Abstract

Background

Acute kidney injury is uncommon in young women while pregnant and post-delivery care, but it is linked via higher deaths and morbidity. This research aims to examine the prevalence, outcomes, and characteristics of AKI while pregnant and the post-delivery period in an Indian populace.

Methods

The present research examined pregnant women who were discharged from the hospital between 2022 to 2023. In expectant mothers who don't have a history of chronic kidney disease (CKD), AKI is described as serum creatinine levels exceeding 70.72umol/l. Acute-on-CKD is defined as a fifty percent rise in creatinine levels in the serum over baseline for individuals with pre-existing CKD.

Results

AKI was common (0.81%) during pregnancy and postpartum. There were 172 AKI patients throughout pregnancy and postpartum, including 10 severe and 11 acute CKD cases. Haemorrhage and toxaemia caused most acute kidney injury during pregnancy and postpartum. Some 17% of women with toxaemia and 60% with HELLP syndrome develop AKI problems. Unless amniotic fluid was blocked, the pregnancy prognosis was good. Four of the seven fatalities got kidney replacement. Amniotic fluid obstruction or haemorrhage after birth killed most AKI pregnant women.

Conclusion

Acute renal damage a pregnant women and post-delivery care is more common than was previously thought. Toxemia is the most prevalent cause of severe kidney disease during pregnancy and post-delivery care. However, the outcome is favorable. Blockage of amniotic fluid and bleeding after delivery are the most prevalent causes of maternal death. Major Acute kidney injury may indicate an inadequate result.

Recommendations

To improve AKI management during pregnancy, increase regular monitoring, provide specialized training, enhance healthcare access, and promote collaborative care. Additionally, encourage further research, develop national guidelines, and ensure adequate postpartum follow-up and support.

Keywords: *Postpartum acute kidney injury, kidney damage, post-delivery hemorrhage*
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Introduction

The National Maternal and Child Mortality Surveillance System in India reported a rate of mortality among mothers of 113 per 100,000 live births [1]. Acute kidney injury (AKI) is uncommon in females while pregnant and post-delivery period, but it is linked to greater mortality and morbidity [2]. The prevalence of acute kidney damage during pregnancy has decreased in developed as well as developing nations [3, 4]. India has a higher maternal death rate than other developed countries [1].

AKI is now considered a rare pregnancy issue [4, 5]. Since the 1970s, the prevalence of septic abortion has significantly decreased in industrialized countries due to enhanced maternity care [5]. However, there is not much information on pregnancy-related AKI in Indian women.Exact statistics on the prevalence of kidney damage associated with childbirth in India might be challenging to find as it requires detailed epidemiological studies and data collection. However, pregnancy-related AKI remains a significant concern in India, especially in neglected and rural locations where access to medical treatment may be restricted. Pregnancy-related acute kidney injury (AKI) is more common in India than in developed countries [4]. A more precise criterion was employed in the study to determine kidney dysfunction, which could explain the results. In this populace, 28 cases of renal failure were classified as mild (serum creatinine 70-123 umol/L), while only 3 patients were classified as severe (serum creatinine >221 umol/L) [6,7].

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Despite India's large populace, the sample size of pregnant women was relatively small. Acute kidney damage during pregnancy and post-delivery period is a substantial contributing factor to maternal death [2]. Therefore, it is important to study its characteristics. This retrospective study examined the prevalence, etiology, clinical characteristics, and outcomes of AKI in the majority of Chinese populace around puberty and childbirth.

Methods

Study design

A retrospective cross-sectional study

Study setting

The study was conducted at MGM Medical College, Jharkhand, India, from 2022 to 2023.

Inclusion Criteria

- Pregnant women or women in the post-delivery period.

- Women without a history of chronic kidney disease (CKD).

- Diagnosis of acute kidney injury (AKI) or acute-on-CKD during pregnancy or post-delivery period, verified by medical documentation.

Exclusion Criteria

- Women with a history of chronic kidney disease (CKD) unless diagnosed with acute-on-CKD.

- Incomplete medical records or lack of sufficient data to confirm AKI diagnosis.

- Cases not related to pregnancy or the post-delivery period.

Bias

There was a chance that bias would arise when the study first started, but it was avoided by giving all participants the identical information and hiding the group allocation from the nurses who collected the data.

Study procedures

The study examined termed women for toxemia, cardiac arrest, shock, pyelonephritis, post-delivery fatty liver, hemorrhaging after delivery, and anaphylactic syndrome. The aforementioned diseases are linked with an increased risk of AKI throughout pregnancy and post-delivery period [8]. The cases with multiple organ dysfunction syndrome (MODS) were also observed. Documentation of cases with MODS revealed kidney damage, they were included in the current study.

Maternal and fetal result

The study evaluated the maternal outcomes of kidney damage and calculated mortality among mothers. A newborn born after the thirty-seventh week of gestation is referred to as term delivery [9, 10]. A fetus that passes away in the uterus after twenty weeks of gestation was referred to as a stillbirth [14]. A newborn baby weighing less than 2500 g and born after the thirty-seventh week of pregnancy was considered small-for-date [13].

Data analysis

The inpatient database listed patients' names, ages, genders, and diagnoses. The incidence and reasons for kidney damage throughout pregnancy and post-delivery period were observed. The frequency of kidney damage in patients with toxemia, a condition known as HELLP syndrome, post-delivery fatty liver disease, or bleeding after delivery were also determined. Pregnant women with kidney damage were grouped into four categories based on the time of onset: Groups 1 through 4 experienced AKI in the first to third trimester, respectively, and group 4 experienced AKI in the postpartum phase. The features of the four groups of patients were described. Additionally, the study looked into the attributes, treatments, and results for termed women who have severe AKI.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

Results

The present research comprised 172 termed women, with an average age of 29 years as mentioned in Table 1. The majority of patients (79.3%) got kidney damage throughout the last trimester of pregnancy. 146 patients experienced at

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least one pregnancy problem. Toxemia was the most prevalent cause of acute kidney injury throughout pregnancy and post-delivery period, then postpartum hemorrhage. Furthermore, 8 cases of AKI throughout the 3rd trimester of pregnancy were associated with bleeding after delivery, which could make renal damage worse. During the very first trimester of pregnancy, hemorrhage from an extrauterine pregnancy rupture was the primary factor causing severe kidney damage.

In this sample, 7 fatalities were recorded, yielding a maternal mortality rate of 4.08%. (Table 2). The fatalities among pregnant women with AKI were primarily caused by a blockage of amniotic fluid and bleeding after delivery. A ruptured extrauterine pregnancy caused hemorrhagic shock in two cases, resulting in their deaths.

Table 1: Characteristics of populace with Acute kidney disease

	Total	**Group 1**	**Group 3**	**Group 3**	**Group 4**
	***N* = 172**	***N* = 6**	***N* = 12**	***N* = 136**	***N* = 18**
Age (yrs.)	29.40 ± 5.94	30.5 ± 5.78	29.59 ± 6.07	29.48 ± 6.04	28.4 ± 5.13
Amniotic fluid blockage	3(1.75)	0	0	0	3(16.66)
Urea nitrogen in blood (µmol/L)	8.73 ± 7.02	7.38 ± 3.75	11.58 ± 6.16	7.84 ± 5.90	14.22 ± 11.98
Chronic kidney disease	11(6.39)	0	4(33.33)	6(4.40)	0
Eclampsia	7(4.08)	0	0	6(4.41)	0
Extrauterine pregnancy	5(2.92)	5(83.33)	0	0	0
pregnancy-related diabetes mellitus	8(4.66)	0	0	12(9.19)	0
Gestational weeks(admission)	33.43 ± 6.68	7.70 ± 1.29	23.28 ± 3.25	35.00 ± 3.18	38.33 ± 2.36
HELLP syndrome	16(9.33)	0	1(8.33)	29(10.66)	0
Obstructive nephropathy	2(1.17)	0	2(16.67)	0	0
Peripartum cardiomyopathy	2(1.17)	0	0	3(1.47)	0
Postpartum hemorrhage	20(11.66)	0	0	8(5.88)	12(68.57)
Urine retention after childbirth	1(0.58)	0	0	0	1(5.6)
Pre-eclampsia	113(65.89)	0	4(33.33)	106(77.94)	3(17.14)
Pregnancy fatty liver	6(3.49)	0	0	5(3.67)	0
Pregnant complication	145(84.30)	5(83.33)	5(41.67)	120(88.24)	16(88.88)
Primary heart diseases	3(1.74)	0	0	2(1.47)	0
Primipara (%)	90(52.32)	3(50)	7(58.33)	73(53.67)	6(33.3)
Serum creatinine(mmol/L)	148.57 ± 142.40	127.15 ± 72.90	243.74 ± 175.16	128.73 ± 123.21	243.77 ± 204.45

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Serum creatinine > 221 mmol/L	24(13.99)	0	4(33.33)	13(9.55)	6(33.3)
Triplet pregnancy	2(1.17)	0	0	2(1.47)	0
Twin pregnancy	26(15.16)	0	0	24(17.64)	2(11.11)
Pyelonephritis	3(1.75)	0	3(25.0)	0	0

Table 2: Data of fatalities cases

Case No	The reason of death	Renal replacement therapy	Prenatal result
1	Amniotic fluid blockage	No	Stillbirth
2	Primary pulmonary hypertension Heart failure, preeclampsia	No	Live birth
3	Amniotic fluid blockage	No	Neonatal death
4	Hemorrhage after delivery, MODS	Yes	Live birth
5	Amniotic fluid blockage Hemorrhage after delivery	Yes	Live birth
6	HELLP syndrome	No	Live birth
7	Amniotic fluid blockage After delivery hemorrhagic shock	Yes	Live birth
8	MODS, AFLP	Yes	Live birth
9	Hemorrhagic shock resulting from a preterm birth rupture	Yes	
10	Hemorrhage after delivery Amniotic fluid blockage	Yes	Live birth
11	Hemorrhage after delivery, hemorrhagic shock	No	Live birth
12	Acute cerebral vascular accident (Right cerebellar hemorrhage)	No	Still birth
13	Amniotic fluid blockage	Yes	Live birth
14	Hemorrhagic shock resulting from a preterm birth rupture	No	

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Table 3: Women with severe Pregnancy related kidney damage

	Total	Group 1	Group 2	Group 3	Group 4
Birth weight, g	2209 ± 1430	450	1072 ± 970	2236 ± 1460	2702 ± 605
Death (%)	32	0	9	21	2
Extrauterine pregnancy	5	5	0	0	0
Loss to follow-up	6	0	1	4	1
Number of pregnant women	172	6	12	136	18
Number of prenatal	190	0	11	160	19
Triplet pregnancy	2	0	0	2	0
Twin pregnancy	26	0	0	23	6
Birth weight > 2500 g (%)	48	0	2	41	5
Apgar scores					
5 min	10 (8–10)		0 (0–0)	10 (9–10)	10 (8–10)
10 min	10 (8–10)		0 (0–0)	10 (9–10)	10 (10–10)
1 min	9 (6–9)		0 (0–0)	9 (7–9)	9 (7–9)
Cesarean section	134	0	1	121	12
Term delivery (>37 weeks)	66	0	1	53	12

The current study included 26 patients with twin pregnancies and 2 patients with triplet pregnancies. Ten patients with extrauterine pregnancy had no fetal information, and the outcomes of 6 fetuses were unknown. Perinatal infant mortality was 17.11%. Pregnant women with AKI experienced worse perinatal outcomes in comparison to the 3rd trimester during the 2nd trimester ($P < 0.05$).

Discussion

The recent investigation found that 0.81% of pregnant and post-delivery period women had AKI. Renal replacement treatment was given to ten expectant mothers. Throughout pregnancy and post-delivery period, toxeima and bleeding after delivery were two of the most usual causes of severe kidney impairment. Among pregnant women with problems, the HELLP syndrome patients had the greatest rate of AKI (60%) among all other groups. Prenatal death was higher than maternal mortality (17.11%) in AKI throughout pregnancy and post-delivery period (4.08%). During pregnancy and the puerperium, the most common reasons for maternal death in AKI were blockages from amniotic fluid and bleeding following birth. In the first trimester of AKI, the most common cause of maternal death was hemorrhage from an extrauterine pregnancy rupture.

The study indicates that AKI during pregnancy and post-delivery is relatively rare but serious, with significant causes including toxemia, postpartum hemorrhage, and HELLP syndrome. Prenatal mortality was notably higher than maternal mortality, highlighting severe risks to the fetus. Maternal deaths were primarily due to amniotic fluid blockage and hemorrhage, particularly from extrauterine pregnancy ruptures in the first trimester. Renal replacement therapy was necessary for severe cases, emphasizing the need for early detection and management.

According to reports, Since the 1960s, the prevalence of pregnancy-related AKI has dropped to 1 in 18,000 in developed nations [4]. The current study revealed an unusually high rate of kidney damage during pregnancy and puerperium. A probable reason is that the study defined AKI using a low serum creatinine level (> 70.72 umol/L). Increased renal blood flow during early pregnancy causes a more than 50% increase in filtration rate [11]. Changes after birth could last for up to 12 weeks. The expected plasma creatinine level is 44 umol/L, and any value above 70.72 umol/L is considered abnormal [11, 12]. Low

acknowledgment and postponed diagnosis may result in an understate of the occurance of kidney damage during pregnancy and post-deliver period.

The current study found that complications associated with pregnancy are the primary reason for Kidney failure in gestation. Toxemia is the most common form of kidney damage during expectation. The majority of kidney damage cases occurred in the third trimester and after delivery. About 17% of women who had been given the diagnosis of toxemia with AKI. The results are comparable to the preceding one [15]. AKI complicates almost 60% of patients of HELLP syndrome. The highest prevalence of AKI was seen in women with HELLP syndrome among those experiencing pregnancy problems. According to Martínez de Ita AL et al [16], 20% of women with HELLP syndrome develop acute kidney failure. This study [16] found that acute renal failure was defined as serum level of creatinine 106.08 umol/l for at least 48 hours.

Generalizability

The study's results are most applicable to pregnant and postpartum women in similar tertiary care settings in India, particularly those without pre-existing chronic kidney disease. Generalizability of other populations may be limited due to regional healthcare differences, demographic variations, and specific local factors influencing AKI incidence and outcomes. Further studies across diverse regions and healthcare settings are needed to enhance external validity.

Conclusion

Acute kidney injuries during pregnancy and post-delivery period are more common than was previously thought. In this study, it was found that an average prevalence (0.81%) of AKI throughout pregnancy and post-delivery period. Toxemia is a major reason of acute kidney injury while pregnancy and post-delivery period. Individuals suffering from a condition called HELLP disorder have the most profound risk of kidney damage. A blockage of hemorrhagic shock and blockage of fetal fluid are the leading reason of death among expecting with kidney damage. Except in cases of Shock due to profuse bleeding and blockage of the amniotic fluid, the mother's recovery following treatment is favorable, while the perinatal result is unfavorable. Extensive AKI requiring renal replacement medication may be a reliable indicator of poor outcomes.

Limitation

First, the current study is vulnerable to some biases because it is a retrospective single center study. This represents the primary constraint of the current investigation. Second, since the study did not examine every case pregnant woman, it was unable to fully prevent missing diagnoses. As a result, the actual incidence may be understated. Third, electronic medical records did not contain laboratory data before 2022. The only other medical data were used to screen patients who were released from the hospital before were discharge reports, admission notes, service notes, and case notes. Even though case notes must include a description of a patient's laboratory results, incomplete records may nonetheless exist. Fourth, the only way the study can determine the number of pregnancy cases is to look up the number of instances that were released from the department of obstetrics throughout the study period. A few of the expectant mothers required more than one admission. This has minimal bearing on the incidence of AKI results given the size of the study cohort.

Recommendation

To improve AKI management during pregnancy, increase regular monitoring, provide specialized training, enhance healthcare access, and promote collaborative care. Additionally, encourage further research, develop national guidelines, and ensure adequate postpartum follow-up and support.

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List of abbreviations

AKI: Acute Kidney Injury
CKD: Chronic Kidney Disease
HELLP: Hemolysis, Elevated Liver enzymes, Low Platelet count
MODS: Multiple Organ Dysfunction Syndrome
AFLP: Acute Fatty Liver of Pregnancy

Source of funding

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Conflict of interest

The authors have no competing interests to declare.

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