Aetiology and Outcome of Obstetric-Related Acute Kidney Injury in Benue State University Teaching Hospital, Makurdi, Nigeria. A Three-year Review

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ABSTRACT

Background: Obstetric (Pregnancy related) Acute Kidney Injury is a global health problem associated with significant fetal and maternal morbidity and mortality. Acute Kidney Injury in pregnancy is usually due to obstetric complications such as septic abortion, abruptio placental, uterine haemorrhage, intrauterine fetal death, puerperal sepsis and preeclampsia-eclampsia. Several studies conducted across the world revealed variations in the aetiology of pregnancy related Acute Kidney Injury. **Objectives**: This study aimed to determine the common aetiologies and outcome of patients with Obstetric Acute Kidney Injury treated in Benue State University Teaching Hospital Makurdi over a 3 year period. **Methods:** This was a three (3) year retrospective study of 21 patients with Obstetric Acute Kidney Injury. The socio-demographic information, aetiology, treatment and outcome of treatment were extracted from patients hospital records. **Results:** The mean age of the study population was 29.3±5.23. Common causes of obstetric Acute Kidney Injury were postpartum haemorrhage, puerperal sepsis, pre-eclampsia – eclampsia. and post-abortal sepsis. Twelve (12)(57.1%) were managed conservatively while nine 9(42.9%) had haemodialysis. Six (6) (28.57%) died while fifteen 15(71.4%) recovered. **Conclusion:** Obstetric-related Acute Kidney Injury is a common cause of maternal and fetal morbidity and mortality in our environment. Postpartum haemorrhage and sepsis were the commonest cause of obstetric Acute Kidney Injury. The mortality is high owing mainly to late presentation. Early presentation, early diagnosis and treatment as well as making haemodialysis affordable are key to improving outcomes of patients with Obstetric- related Acute kidney injury..

Keywords: Acute Kidney Injury, Obstetric related, Pregnancy, Outcome.

INTRODUCTION

Acute Kidney Injury (AKI) occurring during pregnancy, child birth and the postpartum period is termed Obstetric AKI. Acute kidney injury is a common cause of morbidity and mortality worldwide [1]. The incidence of AKI is increasing both in developing as well as developed countries of the world [2].

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In pregnancy, AKI occurs during antenatal or post-natal periods. Common causes of AKI in pregnancy include septic abortion, puerperal sepsis, ante-partum haemorrhage, post-partum haemorrhage, pre-eclampsia – eclampsia [3][4][5] While the incidence of Obstetric –related AKI has witnessed a downward trend in developed countries due to improvement in health care delivery [6], it is still high in developing countries [7][8].

Several studies across the world show variations in the aetiologies of Obstetric-related AKI. For instance, studies done in India revealed sepsis as the most common cause of Obstetric- related AKI [9] while in Pakistan antepartum haemorrhage is the commonest cause of pregnancy related AKI [10].Studies done in other regions of the world show that HELLP (haemolysis, elevated liver enzymes, low platelet) syndrome, pre-eclampsia – eclampsia and thrombotic microangiopathies are common causes of Obstetric related AKI [11].

The high incidence of Obstetric Acute Renal Failure in developing countries is mostly due to late presentation, limited access to prenatal care and to unsafe abortion services. The latter also account for the high incidence of septic abortion in developing countries [7][8].

Pregnancy leads to physiologic changes in renal and systemic haemodynamics that cause important alternations in acid-base, electrolyte, and kidney function [7][8]. This is partly responsible for the unique presentation and challenges associated in managing patients with Obstetric related AKI [7][8].

Causes of Obstetric-related AKI exhibit trimester related distribution. Obstetric AKI in the first trimester is associated with hyperemesis gravidarum and septic abortion whereas Obstetric AKI in the third trimester occurs mainly in the context of hypertensive disorders such as pre-eclampsia – eclampsia [9]. Postpartum AKI is mainly due to haemorrhage, puerperal sepsis and thrombotic microangiopathies.[9]. Iimproved access to prenatal care, early detection and appropriate management of patients with Obstetric-related AKI will help reduce the rising incidence as well as improve outcomes.

The aim of this study was to determine the aetiology and outcome of patients with Obstetric-related AKI in a tertiary health carecentre in Makurdi, North central, Nigeria.

MATERIALS AND METHODS

This study was a retrospective study carried out in Benue State University Teaching Hospital Makurdi over a three year period from January 2016 to December 2019.

Ethical clearance was obtained from ethical committee on research of the Benue State University Teaching Hospital, Makurdi. Case notes and dialysis records of all patients who fulfilled the inclusion criteria were retrieved and reviewed. Data obtained from patient's record were age, aetiology of Obstetric-related AKI, estimated glomerular filtration rate (eGFR), treatment and outcome (discharged or died).

Data Analysis

Statistical analysis was done using the Statistical Package for Social Sciences (SPSS) version 19.0 by Chicago Inc. Data analysis was done using frequency, proportions, means and standard deviation to summarize variable.

Definition of terms

The estimated GFR was calculated using the chronic kidney disease epidemiology collaboration (CKD –EP I) equation [12]

Acute Kidney injury was defined and staged using Kidney Disease Improving Global Outcome (KDIGO) criteria as follows [13].

Stage 1 – Serum creatinine rise of 1.5-1.9 times baseline or ≥26 micromol/L increase or urinary output of < 1.5 ml/kg per hour 6-12 hours.

Stage 2 – Serum creatinine 2-2.9 times baseline or urinary output of < 0.5 mls/kg per hour for more than 12 hours.

Stage 3 – Serum creatinine 3.0 times baseline or serum creatinine ≥ 354 micromol/L or requirement for renal replacement therapy (RRT) or urinary output of 0.3 ml/kg per hour for 24 hours or anuria for 12 hours.

Preeclampsia was defined as blood pressure reading > 140/90 mmHg diagnosed for the first time after 20 weeks of gestation with > 2+ proteinuria on the dipstick [14]. Eclampsia was defined as the presence of new onset grand mal seizures in a woman with preeclampsia [14].

RESULTS

A total of 21 patients had Obstetric (pregnancy related) Acute Kidney Injury over the period under review. The age range was between 20 and 40 years with a mean age of 29.3±5.23. Majority of the patients were Christians twenty (95.2%) while one (4.8%) was a Muslim. Nineteen (90.5%) of the patients were married while two (9.5%) were single. Seventeen (81%) were Multipara while four (19.5%) were Primipara. Majority of the patients eighteen (85.7%) were referred from the rural areas while three (14.3%) were referred from urban areas. Sixteen (76.2%) of the patients had poor or no antenatal history while five (23.8%) had good antenatal history.

Twelve (57.1%) of the patients were delivered via caesarean section while nine (42.9%) had spontaneous vagina delivery. Twelve patients (57.1%) were managed conservatively while nine (42.9%) had haemodialysis. Of the 12 patients that were managed conservatively, four (19.1) died while eight (38.1%) recovered. Of the 9 patients that had haemodialysis two (9.5%) died while seven (33.3%) recovered. Six (28.5%) patients died while 15 (71.4%) recovered (Table 1).

The common clinical features at presentation were oliguria 16 (76.2%), oedema 14 (66.7%), dyspnea 12 (57.1%), fever 8 (38.1%) and abdominal pain 7 (33.3%) (Table 2).

The common causes of Obstetric AKI were post-partum haemorrhage (8) (38.1%), Puerperal sepsis 6 (28.6%), and preclampsia-eclampsia 4 (19.0%) (Table 3)

Table 1: Socio-demographic and Clinical Characteristic of Patients n = 21

Parameters	N(%)/Mean (SD)
Mean age	29.3 ± 5.23
Religion	
Christianity	20 (95.2)
Islam	1 (4.8)
Marital Status	
Single	2 (9.5)
Married	19 (90.5)
Parity	
Primipara	4 (19.1)
Multipara	17 (80.9)
Rural	18 (85.7)
Urban	3 (14.3)
Good Antenatal history	5 (23.8)
With no or poor Antenatal history	16 (76.2)
Smoking	Nil
Alcohol	4 (19.1)
Mode of delivery	
Spontaneous vagina delivery	9 (42.9)
Caeserean section	12 (57.1)
Conservative management	12 (57.1)
Haemodialysis	9 (42.9)
Mortality– Dialysis	2 (9.5)
Mortality- Conservative managment	4 (19.1)

Table 2: Clinical Features at presentation, n= 21

Clinical feature	Number	Percentage
Oliguria	16	76.2
Oedema	14	66.7
Dyspnoea	12	57.1
Fever	8	38.1
Abdominal Pain	7	33.3
Encephalopathy	3	14.3
Hypertension	3	14.3
Hypotension	2	9.5
Convulsion	2	9.5
Loss of consciousness	1	4.8

Some patients had more than one feature

Table 3 Distribution according to aetiology(n-21)

Aetiology	Number	%
Post-partum haemorrhage	8	38.1
Puerperal sepsis	6	28.6
Preeclampsia-eclampsia	4	19.0
Septic abortion	3	14.3
Total	21	100

DISCUSSION

Obstetric AKI though now a rare entity in developed countries is still common in developing countries. For instance the prevalence of obstetric AKI in studies done in Ethiopia, Ghana and Pakistan were 55%, 25.7% and 18% respectively[15][16][17].

The age range from our study was 20-40 years. This was similar with studies done by Najar et al [18] and

Arrayhani et al [19] who reported age range of 18-40 years but lower than that reported by Aminu et al [20] and Makusidi et al [21] who reported age range of 17-35 years and 15-30 years respectively. The higher age range in our study compared to other studies may be related to the culture of early marriage that is associated with Islamic practices in North Western Nigeria where those studies were done. From our study majority of women with Obstetric AKI were Multigravid which is similar to some studies [20] [22]. Majority of the patients with AKI were delivered through Caesarean section which is similar to a study done in Akure, Ondo State, Nigeria by Adejumo et al [23].

Oliguria was the most common presenting complain of our patients with Obstetric AKI similar with findings from Aminu et al[20] in a study done in Gusau, Zamfara state and Adejumo et al [23] from their study done in Akure, Ondo State, Nigeria. This may be due to the fact that post partum haemorhage was the most common cause of Obstetric AKI in these studies. Oliguric AKI is the commonest form of AKI and is seen in situations of volume depletion like haemorrhage.[24] Significant blood loss causes inadequate renal perfusion and subsequent oliguria from Pre –renal AKI [23]. Postpartum haemorrhage accounted for the largest proportion of Obstetric AKI patients in our study similar to findings reported by Makuisidi et al [21] and Aminu et al [20] in Sokoto and Zamfara States, in Nigeria respectively. Also Rizwan et al [10] reported postpartum haemorrhage as the commonest cause of Obstetric AKI in a study done in Pakistan [10].

Puerperal sepsis was also a common course of Obstetric AKI from our study. This is similar to a study done by Patel ML et al [25] and several studies across Indian and Asia. [26][27]. In contrast, Pre-eclampsia-eclampsia which was the commonest course of Obstetric AKI in a study done in Osogbo, Nigeria [28] and some studies done in Asia,[29][30] is third in the aetiology of Obstetric AKI in our study.

Septic abortion used to be the commonest course of Obstetric AKI in the late seventies[30].The proportion of AKI due to septic abortion has decreased over the past two decades [31]. The decreased incidence of septic abortion over the past 2 decades might be due to legalization of abortion, increased awareness and advocacy on safe abortion thereby reducing complications arising from unsafe abortion and availability of improved health care delivery [25].Septic abortion ranked fourth in aetiology of Obstetric AKI in our study. The discrepancy in aetiological factors of Obstetric-related AKI between studies conducted across the world may be due to differences in antenatal care, improvement in the detection and management of obstetric haemorrhage in some centres as well as early detection and prompt management of preeclampsia-eclampsia [25].

Obstetric related AKI is a major cause of maternal mortality. Maternal mortality in our study was 28.6%. This is similar to that reported by Okafor et al [32]Aminu et al [20] and Adejumo et al [23] who reported mortality rates of 29.0%, 30.8% and 34.4% respectively. This finding is however lower than that reported by Makusidi et al [21] and Okunola et al [28] who reported 45.0% and 66.7% respectively. Reason for this could be that the study done in Sokoto focused more on patients requiring renal replacement therapy and were more likely to be patients with advanced disease. The higher mortality reported from Osogbo could be explained by the differences in aetiology. While majority of the causes of Obstetric AKI in our study was due to haemorrhage, that in Osogbo was caused by Toxaemia of pregnancy which carried poorer prognosis in the setting of renal failure,

However studies done outside Nigeria revealed lower maternal mortality rate from Obstetric-related AKI. For instance studies done across India revealed maternal mortality rates ranging from 15-20% [25][29], Pated et al [25] reported 20% Chugh et al [30] 9% and Goplani et al reported 18.57% [8]. In Pakistan maternal mortality from AKI ranges from 6-25%. [33][34]

Factors that were associated with mortality from our

study include poor antenatal care, low literacy rate and inadequate emergency obstetric care in our peripheral hospitals, late referral and delay in making diagnose similar to previous studies. [23][35] Fifteen (71.4%) patients recovered in our study. This is comparable to a study done by Patel et al [25] who recorded 76% in a study done in India but lower than studies done in developed countries [28]. Better rate of recovery from developed countries may be due to high literacy rate, better health care delivery including antenatal and postnatal care.[25]. The limitations of the study include the possibility of missing or incomplete data being a retrospective study, small number of patients and the fact that long term outcome of the patients could not be determined owing to the fact that a lot of the patients were lost to follow up.

CONCLUSION

Obstetric AKI in our study is mainly due to haemorrhage and sepsis. Most of them were referred from rural areas and peripheral centres with poor antenatal and postnatal services. Provision of health care facilities with well trained workforce especially in rural areas will go a long way in mitigating the problems and complications arising from Obstetric-related AKI which is a common cause of maternal and fetal morbidity and mortality in our environment.

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Author Contribution
Dr Ogiator Monday conceptualized and designed the study. Dr Maanongun Michael and Dr Iwuozo Emmanuel contributed to implementation of the study and revision of the manuscript. All authors were involved in the writing and revision of the manuscript.

Data availability.
The data used to support the findings of the study are available from the corresponding author upon reasonable request.

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Ethical approval
The study was approved by the institutional Ethics Committee

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