

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

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Abstract

Background: Acute renal injury during preeclampsia is a relatively common complication in intensive care and grafted with significant morbidity and mortality.

Objective: Describe the diagnostic and therapeutic aspects of acute kidney injury during preeclampsia at Parakou University Hospital in Benin in 2019.

Patients and Method: This was a descriptive and analytical observational cross-sectional study with prospective data collection that took place from March 18th to August 18th, 2019 (5 months) in the intensive care unit and the maternity ward. Women with preeclampsia were included. Acute renal failure, dependent variable has been diagnosed and classified according to the criteria of Kidney Disease Improving Global Outcomes (KDIGO).

Results: A total of 88 patients were included in the study, 39 developed acute kidney injury (44.32%). The average age was 26.42 ± 6.23 years. The majority was primigest (44.32%), pregnancy had not been followed 61.54%. The majority were classified as stage 1 (46.15%). The patients admitted to the intensive care unit were at stages 2 and 3 for acute kidney injury. The table was associated with eclampsia in 38.46%, HELLP syndrom in 10.26% and acute pulmonary edema in 12.82%. Medical treatment was based on hydroelectrolytic rebalancing, magnesium sulfate, antihypertensive and transfusion of red blood cells and fresh frozen plasma. Cesarean section was performed for 76.92% of cases. The outcome was positive for 71.79% of patients.

Conclusion: Preeclampsia is a risk factor for acute kidney injury and is a maternal prognosis factor.

Keywords: Acute kidney failure, Preeclampsia, Prognosis, Parakou

INTRODUCTION

Pregnancy is defined according to the World Health Organization (WHO) as a period of about 9 months during which a woman carries the embryo, then the fetus which grows in her womb and, for most women, is a time of great happiness and fullness [1]. Unfortunately, during pregnancy, the woman

and the fetus face various health risks and many of these conditions expose them to morbid risks during pregnancy, childbirth and in the days after the postpartum period. Among them, we can mention the toxemia of pregnancy called preeclampsia [2]. Preeclampsia is an expression of kidney damage. It involves hypertension blood pressure, edema and proteinuria [3].

This kidney damage could progress to acute renal injury (AKI) if severe preeclampsia [4]. This is always a circumstance that worsens the maternal prognosis [5, 6]. AKI is a real public health problem due to its burden and its severity, especially in pregnant women [7, 8].

Since the 1960s, the incidence of pregnancy-induced AKI worldwide has declined, from one case of AKI in 3,000 pregnancies to one in 20,000 pregnancies [9, 10]. In the developed countries like Canada, despite an increase from 1.66 to 2.68 AKI cases for 10000 pregnancies between 2003 and 2010 the incidence remains low [11]. In France nowadays it does not represent only 2-3% of AKI compared to 20-40% in the 1950s and 1960s [12].

In developing countries, however, the incidence remains high. It's the case from India in 2010 where 20% of AKI cases were pregnancy-related [13]. In Morocco the incidence was 66 cases per 10,000 pregnancies in 2013 [14]. This bearing is still highest in sub-Saharan Africa where in 2006 in Senegal 50% of AKI among adults were due to pregnancy [7]. In the literature, preeclampsia appears to be the first cause of these AKI during pregnancy. In Benin, it is a frequent complication evaluated at 4.8% in Porto-Novo in 2017 by Ogoudjobi et al., but the AKI only represented 0.61% of complications [15]. In Parakou, approximately 11.73% of pregnant women developed AKI in 2016 according to Ahoui et al. And proteinuria was significantly associated with occurrence of this AKI [7]. Faced with this high risk of occurrence of an AKI during the preeclampsia, we initiated this work which objective was to describe the diagnostic and therapeutic aspects of AKI in preeclampsia in Hospital University of Parakou in Benin.

PATIENTS AND METHOD

Study Framework

The study took place in the intensive care unit and the Maternity Department of Parakou University Hospital. It is a multipurpose resuscitation unit working 24 hours a day with 11 beds. Maternity is a multicare unit (gynecological and prenatal consultations, childbirth,

various surgeries, vaccination unit, family planning and various advices).

Study Method

This was a cross-sectional descriptive and analytical study with collection prospective data, which took place over a period of five months from March 18th to August 18th, 2019.

The study population consisted of all admitted pregnant women or children for preeclampsia in the maternity ward and for all deliveries admitted for preeclampsia in the maternity ward and transferred to intensive care.

Inclusion Criteria

Was included in the study any patient admitted for preeclampsia (pregnant ≥ 20 WA or postpartum < 42 days) with PAS ≥ 140 mmHg and / or PAD ≥ 90 mmHg with proteinuria ≥ 2 crosses with or without edema of the lower limbs and having given their free and informed consent or that of the family to participate in the study.

Non-inclusion Criteria

Were not included the patients who came with added preeclampsia and other vasculo-renal syndromes.

Exclusion Criteria

Were excluded patients with a history of kidney diseases, diabetes and patients who did not have a kidney exam during their hospital stay.

Sampling

we carried out an exhaustive recruitment of patients admitted for preeclampsia and meeting our inclusion criteria. The variables studied were classified in two groups.

- *Dependent variable* represented by acute renal injury which has been diagnosed and classified according to the *Kidney Disease Improving Global Outcomes* (KDIGO) criteria of 2012 revised in 2017 [16,17]. A single criterion is sufficient to establish the stage of severity. The Classification of acute renal injury according to KDIGO is presented in Table 1.

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

Table I. Classification of acute kidney failure according to KDIGO

Stage	Serum creatinine	Diuresis
1	<ul style="list-style-type: none"> • Increase 1.5–1.9 times baseline OR • Increase $\geq 3 \text{ mg/L}^{-1}$ 	<ul style="list-style-type: none"> • $< 0.5 \text{ ml/kg/h} > 6 - 12 \text{ h}$
2	Increase 2.0–2.9 times baseline	<ul style="list-style-type: none"> • $< 0.5 \text{ ml/kg/h} > 12 - 24 \text{ h}$
3	<ul style="list-style-type: none"> • Increase 3 times baseline, OR • Increase $\geq 40 \text{ mg/L}^{-1}$, OR • Initiation of renal replacement therapy, OR • For patients < 18: glomerular filtration rate $< 35 \text{ ml/min/1,73 m}^2$ 	<ul style="list-style-type: none"> • $0.3 \text{ ml/kg/h} > 24 \text{ h}$, OR • Anuria $> 12 \text{ h}$

From <https://kdigo.org/wp-content/uploads/2016/10/KDIGO-2012-AKF-Guideline-English.pdf>: Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group, 2012; 2017 [27; 28].

Renal injury in preeclampsia is defined by level of serum creatinine exceeding 10 mg/L [18].

➤ **Independent Variables:** grouped together in socio-demographic, clinical, paraclinical, therapeutic, progressive and prognostic.

Sociodemographic Data

Age, level of education, profession, married or not, place of residence, way of life (supplementation of salt at the table, fruits and vegetables consumption (at least 5 fruits and vegetables per day))

Clinical Data

Mode of admission (referred or direct) and reason for referral, treatment previous; gynecological history (preeclampsia / eclampsia, pregnancy, parity, intergenetic space (< 2 years or > 2 years), number of prenatal consultations (ANC), place childbirth, term of pregnancy; general signs (general condition (good or bad), arterial hypertension, edema of the lower limbs, proteinuria, jaundice, hemoglobinuria physical signs: Glasgow score (GCS), diuresis (oliguria, anuria or normal), haemorrhages, convulsive fits, crackling rales, hydrops).

Paraclinical Data

hemoglobin level (anemia if $< 10 \text{ g/dL}$); platelets (thrombocytopenia if $< 150 \text{ G/L}$; transaminases (elevated if $>$ twice normal); blood ionogram, serum creatinine, stage of AKI (stage 1, 2 or 3).

Therapeutic Data

medical treatment (oxygen therapy, sulphate protocol magnesium, antihypertensives, diuretics, anticonvulsants, analgesics, transfusion).

Obstetric Treatment

caesarean section or vaginal delivery.

Collection of Data

Data Collection Method and Tool

It was done through an individual interview with each patient during which an individual file was completed with in addition the referral sheets, patient diaries, medical records and operative reports. An informed consent form has been completed and signed by patients or by a representative of the family. The study was conducted after obtaining authorization from local ethics and biomedical research committee of the University of Parakou.

Collection Process

Each patient received at entry (D1) a blood sample for determination of: creatinemia, azotemia, blood count (CBC) blood ionogram (sodium, potassium, chloride), transaminases (ASAT, ALAT).

- Those with serum creatinine $< 10 \text{ mg/L}$ were considered to have no AKI and classified in Non-Cases.

- Those with a creatinemia $\geq 10 \text{ mg/L}$ benefited from a

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

second renal assessment on D2 of the first assessment with the results found:

- an increase in serum creatinine meeting the definition of KDIGO and were included as Case;
- an increase in creatinemia but which did not meet the definition of KDIGO or a decrease in the latter and were considered to have no AKI and classified in Non-Cases.

The AKI was monitored by measuring creatinemia on the 7th day, 14th day and at one (1) months and the criterion of good recovery was based on a return of lower serum creatinine to the patient's baseline. Transaminases and CBC were repeated according to initial disruption.

Data Processing and Analysis

The data were coded and analyzed using EPI INFO software. The data have been captured and analyzed using the Epi Info's software versions 3.5.1 and 7.1.1.14 from Center of Disease Control (CDC) respectively. The data analysis was carried out in two parts:

1- A descriptive section which consisted of calculating the percentages for the qualitative variables and means and standard deviation for quantitative variables;

2- An analytical component which consisted in measuring the association between the dependent variable and the independent variables. The measure of association used was the Odd ratio (OR). The tests Chi-square, Fischer, or Yates-corrected Chi-square statistics were used as appropriate to determine the degree of significance of the association (p-value). The materiality threshold was set at 0.05.

RESULTS

Sociodemographic Data of Patients Admitted for Preeclampsia

During the study period, 1204 patients were admitted to the Gyneco-obstetrics department of Parakou University Hospital. Among them, 104 (8.64%) developed preeclampsia and according to our inclusion criteria we collected 88 cases (84.62%). The average age was 26.42 ± 6.23 years with extremes of 16 and 45 years. The slice of age most represented is that of

20 to 30 years or 51.14% (n = 45). Fifty seven female patients were out of school (64.77%) compared to 31 female patients (35.23%). The self-employed women were 42 (47.73%), housewives 32 (36.36%), pupils / students 8 (9.09%) and 6 patients (6.82%) were civil servants. The women married represented 81.82% (n = 72) of our population and unmarried 18.18% (n = 16). Sixty-eight patients (77.27%) lived in urban areas compared to 22.73% (n = 20) in rural area. Eighty-one patients (92.05%) were taking salt supplementation at the table and 69 patients (78.41%) regularly consumed fruits and vegetables.

Clinical and Paraclinical Data of Patients Admitted for Preeclampsia

Clinical Data

Fifty-eight patients (65.91%) had been referred from another health center against 30 (34.09%) admitted directly. Hypertension in pregnancy was the main reason in 53.33% of cases, followed by eclampsia (20%), altered state of consciousness (20%), oliguria and preeclampsia represented respectively 10% of the reasons for admission and anuria 6.67%. Seventy-eight patients (88.64%) were still pregnant compared to 10 (11.36%) postpartum arrivals. Among the 78 patients, 10 had a term <32 WA, 26 patients a term between 32 and 36 WA and 42 patients a term > 37 WA. The diuresis was normal in 69.32% of patients (n = 61), there was oliguria in 21.59% (n = 19) and anuria in 9.09% (n = 8). Several gyneco-obstetric histories were noted: preeclampsia 7 cases (7.95%), eclampsia 2 cases (2.27%). Concerning the gesture we have identified 39 "primigestes" (44.32%), 17 "paucigestes" (19.32%), 32 "multigestes" (36.36%). As for parity we have collected 37 nulliparas (42.05%), 14 first-time (15; 91%), 19 pauciparas (21.59%) and 18 multiparous (20.45%). The intergenerational space was appreciated and we have noted that it was <2 years in 9 cases (21.95%) and ≥ 2 years 32 (78.05%) As for the number of antenatal consultation performed within the series, it was <4 times in 64 cases (72.73%) and ≥ 4 times in 24 patients (27.27%). Table 2 shows the distribution of admitted patients for preeclampsia based on clinical data (N = 88).

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

TableII. Distribution of patients admitted for preeclampsia according to the clinical data (N = 88)

Variables	Number	%
Général signs		
General condition good	58	65.91
General condition bad	30	34.09
Systolic blood pressure <160	18	20.45
Systolic blood pressure ≥ 160	70	79.55
Diastolic blood pressure < 110	37	42,04
Diastolic blood pressure ≥ 110	51	57.96
Feet edema yes	72	81.82
Feet edema Non	16	18.18
jaundice yes	9	10.23
jaundice Non	79	89.77
Proteinuria		
++	14	15,91
+++	25	28.41
++++	49	55.68
Hemoglobinuria		
Negative	78	88.64
Non significative	6	6.82
Significative	4	4.54
Physical signs		
Convulsive fit	24	27.27
Hemorrhage	6	6.82
Crackling groams	6	6.82
Hydrops	1	1.14
motor deficit	1	1.14
Coma with GSC ≥13	5	16.67
Coma with GSC] 8,12]	15	50.00
Coma with GSC ≤ 8 »	10	33.33

Paraclinical Data

Table 3 shows the distribution of patients admitted for preeclampsia according to paraclinical data

TableIII. Distribution of patients admitted for preeclampsia according to the paraclinical data

Variables	Averages	Extremes	Values	Numbers / %
			≥ 10 mg/L	77 / 87,5
Creatinine blood level mg/L	108,85 ± 8,6	6,1 et 102,7	< 10 mg/L	11 / 12,5
Urea blood level g/L	0,26 ± 0,03	0,1 et 1,7	Anemia	31 / 56,36
Haemoglobine g/dL	10,28 ± 1,05	4 et 13,3	Good	24 / 43,64
			Lack of platelet	25 / 89,29
Platelets G/L	164,5 ± 20,86	35 et 428	Normal	3 / 10,71
Transaminases				
ASAT : Ui/L	136,81 ± 15,1	8 et 700	Hight	22 / 48,89
ALAT ; Ui/L	99,58 ±14,24	13 et 634	Normal	23 / 51,11

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

According to the KDIGO guidelines of 2012 and revised in 2017, among the 77 patients who had plasma creatinine ≥ 10 mg / L, we have, after achievement of plasma creatinine at 48 hours of hospitalization in 39 patients with acute renal injury (AKI).

Sociodemographic, Clinical and Paraclinical Data of Patients Admitted for Affected Preeclampsia (AKI)

Sociodemographic Data

In our sample, 30 patients (76.92%) were referred from another health versus 9 (23.08%) who were admitted directly to the maternity ward. Among them, 19 (48.71%) had received previous treatment (antihypertensive and / or anticonvulsant) and 19 others were on herbal medicine. Twenty-four patients (61.54%) had done less than 4 antenatal consultations (ANC), and 15 (38.46%) had performed more than 4 ANC. The average of ANC performed was 2.53 ± 2 with extremes of 0 and 8. Regarding pregnancy, the primigestes were 19 (48.72%), paucigestes 5 (12.82%) and multigestes 15 (38.46%). Regarding parity, in our

sample, 18 patients (46.15%) were nulliparous, 7 (17.95%) primiparous, 3 (7.69%) pauciparous and 11 (28.21%) multiparous. Thirty-three patients (84.62%) had their pregnancy in progress against 6 patients (15.38%) come postpartum. Among the 33 patients, the average gestational age was 37.10 ± 6.68 WA with extremes of 22 and 45 weeks of amenorrhea. So seven patients (21.21%) had a gestational age < 32 WA, 18.18% of them ($n = 6$) had a gestational between 32 - 36 and 20 patients (60.61%) were beyond 37 WA.

Clinical Data

Functional, General and Physical Signs

Dyspnea was present in 5 patients (12.82%) and absent in 87.18% of cases ($n = 34$). Thirteen patients (33.33%) had oliguria, 8 (20.51%) had anuria and 18 (46.16%) had normal urine output. The average systolic blood pressure was 183.95 ± 26.1 mmHg with extremes of 130 and 263 mmHg and blood pressure diastolic average was 113.46 ± 23.03 with extremes of 58 and 150 mmHg. The Table 4 shows the distribution of patients with AKI according to the data clinics.

Table IV. Distribution of patients with AKI according to clinical data

Variables	Effectif	%
General condition		
Good	19	48,72
Bad	20	51,28
Systolic blood pressure		
< 160	8	20,51
≥ 160	31	79,49
Diastolic blood pressure		
< 110	14	35,90
≥ 110	25	64,10
Feet edema		
Oui	31	79,49
Non	8	20,51
Proteinuria		
++	5	12,82
+++	11	28,21
++++	23	58,97
Haemoglobinuria		
Négative	29	74,36
Non significative	6	15,38
Significative	4	10,26

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

Convulsive fit	15	38,46
GCS		
≤ 8	8	40,00
9 - 12	7	35,00
≥ 13	5	25,00
Crackling groams	5	12,82
Hemorrhage	2	5,13

Laboratory Data of Patients with AKI

Table 5 shows the averages and extremes of the laboratory tests of the patients with acute kidney injury

TableV. Representation of the means and extremes of biological blood tests of patients with AKI

Variables	Moyennes	Extrêmes
Creatinine level (mg/L)		
H 0	164 ± 10,27	10.1 et 102.7
H 48	22.93 ± 11.83	13.68 et 99.50
Urea level (g/L)	0.38 ± 0.34	0.1 et 1.7
Haemoglobine (g/dL)	10.28 ± 1.05	4 et 13.3
Platelets (G/L)	164,5 ± 20.86	35 et 494
Na⁺(mEq/L)	136 ± 2.08	135 et 140
K⁺ (mEq/L)	3.9 ± 0.52	3.42 et 6.96
Cl⁻ (mEq/L)	107 ± 2.65	104 et 109
ASAT (Ui/L)	136.81 ± 15.1	8 et 700
ALAT (Ui/L)	99.58 ± 14.24	13 et 634

The distribution of patients according to the stage of ARI (KDIGO 2012) is recorded in Table 6 (N = 39).

TableVI. Distribution of patients with ARI according to stage of AKI

Stage	Number	%
1	18	46.15
2	12	30.77
3	9	23.08

Therapeutic Data for Patients with Acute Renal Failure

Among the patients with an AKI, 25 (64.10%) were treated in the maternity unit for 14 (35.90) transferred to intensive care. The medical treatment consisted of a rebalancing hydroelectrolytic or even a filling based on crystalloids (Salted serum 0.9%, Serum glucose 5%, Ringer lactate) associated with bicarbonate serum in the case of metabolic acids and of hyperkalemia. All patients received oxygen therapy using glasses. Magnesium sulfate was administered to 24 patients (74.36%). The antihypertensive drugs were used in 79.49% of cases (n = 31). The drugs used

were: Nicardipine; 29 patients (93.54%), Clonidine; one patient (3.23%) and combination Clonidine + Nicardipine; one patient (3.23%). Furosemide has been used in 6 cases (15.38%). The other therapies consisted of transfusions (Red blood cell; 7 cases and Fresh frozen plasma 2 cases)

In our study, 30 patients (76.92%) gave birth by caesarean compared to 9 (23.08%) by base track. The indication for dialysis was made in the 8 patients with anuria and in one patient with « OAP » refractory to diuretics but it was not performed in any for financial reasons.

Progressive and Prognosis of Patients with AKI

In our study, out of 88 patients with preeclampsia we recorded 11 deaths or a percentage of 12.5%. The 11 deceased patients were all affected of IRA. The average length of hospitalization was 7.26 ± 6.30 days with extremes of 1 and 28 days. The outcome was favorable in 28 of the patients with ARI (71.79%) with total recovery of renal function in varying times. The clinical picture is complicated by eclampsia in 38.46% of cases, HELLP Syndrom in 10.26% of patients and OAP in 12.82%

DISCUSSION

Clinical and Paraclinical Data

The study allowed us to note that most patients were referred from centers peripheral health (76.92%). This finding is identical to that made by Tondi et al. who reported that 71.9% of the patients in their series had been referred [19]. This high rate references found both in our study and in the international literature shows the inadequacy of the implementation of a decision tree in our maternity hospitals explains the references of pregnant women at the stage of complications, a situation that could be avoided.

High blood pressure in pregnancy was the main reason for referral (53.33%) in our series followed by eclampsia (20%), altered state of consciousness (20%), oliguria (10.00%) and anuria (6.67%). On the other hand, in the study by Missamou et al. the alteration of consciousness was the main reason for admission (62%) [20]. Nulliparous (46.15%) were the most affected in our study unlike the studies by Nalini et al. in India (2010), Ansari et al. in Pakistan (2008) and Ngomas where the multiparas were the most reached with 54.4%, 52% and 57% respectively [21,22,23]. Tondi et al. reported in their study that 53.1% of patients were first-time mothers [19]. This percentage diversity could be explained by the fact that our study concerned only cases of preeclampsia and according to data from the literature, nulliparity is a risk factor [24] while other studies all involved obstetric AKI cases.

According to WHO recommendations, at least 4 antenatal consultations are recommended for the proper follow-up of a normal pregnancy or at best one per month [25]. In our study, the pregnancy was

not monitored (absence of prenatal consultations) or had been poorly monitored (less than 4 antenatal consultations) in more than half of the patients (61.54%). This observation has been made by others including Hachim et al. (96%) in 2001 in Casablanca [26]. Ngomas et al. (64.5%), Nalini et al. (61.4%) [23, 21]. This finding could be explained by the fact that not only the majority of patients were not educated (no culture of pregnancy monitoring) but also they were self-employed with low income monthly (47.73%). Yet ANC offers the opportunity for patients to do check-ups to detect preeclampsia early as well as AKI. However it did not exist in our study a statistically significant association between the number of ANC and the occurrence of an AKI.

Almost 3/4 of the patients in our series (79.49%) had edema. This result is higher than those reported by Keita et al. in 2018 in Mali (53.3%) and Tondi (37.5%) [27,19]. These different findings confirm the inconsistency of edemas during of preeclampsia.

On admission, the average SBP was 183.95 ± 26.1 mmHg and the average DBP 113.46 ± 23.03 mmHg. High blood pressure was severe in 79.49% of patients, which is corroborated by the data in the literature according to which it is the patients with severe preeclampsia which causes more AKI [11, 28].

Oliguria was objectified in 33.33% of patients. Similar rates had been reported by other authors including Tondi et al. (40.5%) and Ahoui et al. (44.71%) [19,7]. For Kabbali et al., more than half of the patients were in oliguria (57%) [26]. In the series by Hachim et al., 71% of patients were in oliguria [29]. That in pregnant and postpartum women, our results are similar to those data in the literature that oliguria is the main functional sign of AKI.

The average serum creatinine in our study was 164 ± 10.27 mg / L. It is higher than those of Kabbali (48.41 ± 37.32 mg / L) and Hachim (95.85 ± 57.36 mg / L) but lower than that reported by Tondi (352 ± 100 mg / L) [29, 26,19]. Creatinine, substance nitrogen comes from the breakdown of creatine, especially present in the muscles. It's a indicator of kidney condition. The higher its value, the more it reflects the degree to which the kidney function. Thus in our study, the high value of the average creatinemia reflects the significant degree of renal impairment in our patients.

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

In our series we have classified the patients according to the practical recommendations of KDIGO 2012 unlike the other authors who mostly used Risk Injury Failure Loss End-stage (RIFLE). Nevertheless there is a correspondence which can be made. KDIGO stages 1, 2 and 3 will correspond respectively to R, I and F of RIFLE. In our series, the patients presented more AKI at stage 1 (46.15%) and this finding is similar to that reported by Ngomas (49.2%: R) [23]. Missamou brought in a percentage 85.19% of patients classified as stage 3 according to the AKI classification [20]. The classification of KDIGO was set up because it synthesizes the previous classification which is part of the RIFLE. She avoids considering the most severe form of an Acute Kidney Injury (AKI) which is fundamental since it is now accepted that minor modifications on renal function have a significant impact on the outcome of patients with short and long term.

Therapeutic Data

According to data in the literature, the mechanism underlying hypertension is dominated by vasoconstriction. In our series, 79.49% of our patients received antihypertensive treatment including a vasodilator. A similar finding has been reported by Tondi (84.37%) [19]. In response to the physiopathological mechanism which explains this HTA, in our study, Nicardipine was the most used molecule (93.54%) (Recommended as a first-line treatment over others, especially antihypertensive central drugs). This explains its majority use in our series despite its high cost). If hypertension persists despite treatment, we combine other antihypertensive drugs such as centrally acting antihypertensives (3.23%) and sedatives. In our series almost all of our patients benefited from hydration with crystalloids (87.18%) which is similar to Tondi's result (90.63%) and superior to Kabbali's (52%) [19, 29]. This treatment is justified by the fact that although the woman is edematous during PE, it is vascular empty which is responsible for the occurrence of functional AKI notified above. Thus the management of an ARI during pregnancy is going well and well by vascular filling in order to perfuse the kidney, as in the population in general. In our series, diuretics (Furosemide) were used in only 6 patients (15.38%). Among these 6 patients, 5 had presented a picture of PAO, hence the need to use diuretics to ensure water depletion in the lung parenchyma. The only remaining one who received secondary treatment

diuretic is a case of AKI with anuria in which an initial vascular filling in 48 hours was done without success and given the installation of a hypervolemia table, we have resorted to Furosemide to force diuresis.

Almost $\frac{3}{4}$ of the patients (74.36%) benefited from treatment with magnesium sulfate. Tondi had found roughly the same percentage (68.75%) [19]. The use of sulfate vast majority of magnesium in our study is based on data from the literature. In effect during PE, there is cerebral vasoconstriction in the brain posterior which causes (depending on the degree) oxygen weaning with the consequence the onset of seizures. Magnesium sulfate by its mode of action (blocking of voltage-dependent calcium channels and sodium channels at the level of excitable cells) causes a vasodilator effect on small blood vessels allowing intracerebral reperfusion. Therefore it is the drug of choice in the treatment and prevention of eclampsia. But during the AKI its use is limited and prohibited by some authors. Before the time required to make the diagnosis of AKI according to KDIGO, it was used in the vast majority of patients in our sample without knowledge of their kidney condition.

In our series, 17.95% of patients received a blood transfusion. This rate is very low compared to that reported by Keita (37.7%), Tondi (50%) and Kabbali (59%) [27, 19, 29]. During pregnancy the hemoglobin level drops due to hemodilution physiological. Cases of severe anemia which required a blood transfusion in our study could be attributed to the management of a HELLP syndrom.

Almost three quarters of our patients (76.92%) gave birth by Caesarean section. Kabbali reported a lower rate (68%) and Tondi a higher rate (90.63%) [27, 49]. By against, in Ansari et al. the majority of patients gave birth vaginally (71%) [22]. The relatively high rate of caesarean section in our study could be explained by several settings. First, the patients were referred (76.92%) and in a table emergency room that required immediate intake in the operating room for a cesarean. The free of charge has contributed to faster and more effective action on the part of the nursing staff; secondly in case of ARI, the expulsion of the fetus must be done quickly to limit progression of kidney injury [9].

The indication for dialysis was made in 23.08% of cases (n = 9). For some financial reasons and lack of

Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

a universal health insurance program, no that she was unable to benefit from this dialysis. This observation was made by Tondi who for the same reasons only one patient was able to be dialysed out of the 8 in her series [19]. With a percentage higher but still low, in their series, Missamou et al. and Ngomas et al. Could dialyze 4% and 4.9% of patients who were in need [20,23]. This low rate of dialysis is the reflection of a health system in our countries where social security is absent and health care costs are largely covered by the households themselves. The high cost of dialysis therefore becomes an obstacle to its implementation. On the other hand, at Zelmat 25% could be dialyzed [30]. In Benin, a health insurance project could be set up and its application would help to reduce the mortality of these patients and give better results.

CONCLUSION

At the end of this work, which aimed to describe the diagnostic aspects and treatments for acute renal failure in preeclampsia in hospital University of Parakou in 2019, we can remember that the AKI is very present with a frequency of 44.32%. Those most affected are young, primigravidae and nulliparous. The typical profile of a patient at risk of developing an ARI is a patient with a history of PE, primiparous, between 32-36 WA and with a short intergenetic space. The anomaly of the most common urine output was oliguria. Treatment is essentially based on hydroelectrolytic rebalancing or even vascular filling, the use of antihypertensive drugs, magnesium sulfate, transfusion (red blood cell and fresh plasma frozen). The death rate from AKI in the present study is quite significant and could have been low if patients had been on dialysis

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Acute Kidney Injury During Preeclampsia at Parakou University Hospital in Benin in 2019: Diagnostic and Therapeutic Aspects

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