Original Article

Comparative study between Urinary Neutrophil gelatinase-associated lipocalin (NGAL) and Calprotectin for Early Detection of Acute Kidney Injury among Drug Abuse Intoxicated Cases

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ABSTRACT

Background: Drug addiction is major societal problem all over the world that associated with acute kidney injury (AKI). The impact of urinary neutrophil gelatinase-associated lipocalin (NGAL) and Calprotectin on the early diagnosis of AKI have been investigated, yet no earlier comprehensive studies had been conducted in their impact among drug abuse. **Aim of the Work**: This work aimed to evaluate the role of urinary NGAL and Calprotectin in predicting AKI among drug abuse intoxicated cases admitted to Poison control Center Ain Shams University Hospitals (PCCASUH). To compare the accuracy of urinary NGAL and calprotectin in the diagnosis of AKI.

Materials and Methods: A prospective observational study was performed on 75 patients, who were presented to (PCCASUH) with acute drug abuse toxicity from September 2018 to March 2019. Blood and urine samples were collected from all patients on the 1st, and 3rd day of admission. Urine NGAL and Calprotectin were assessed and compared between patients who developed AKI and who didn't. **Results:** 75 patients included in the study, 20 developed AKI. At 1st day of admission, the mean urinary NGAL and urinary calprotectin were significantly elevated among AKI group. In third day of admission there were further significant elevation. ROC curve analysis revealed that NGAL developed sensitivity of 93.0% and a specificity of 83.0% whereas urinary calprotectin developed a sensitivity of 88.4% and a specificity of 96% **Conclusion and recommendations:** Our findings deduced that urinaryNGAL and urinarycalprotectin levels significantly elevate in acute drug abuse intoxication cases who developed AKI for up to 72 hours of hospitalization, hence it may be regarded as an early predictors of AKI and Calprotectin could be considered more accurate. It is recommended that, all acute drug abuse intoxicated patients a urinary NGAL and Calprotectin should be done for early exclusion of AKI that could be complicating.

Keywords: Drug Abuse Intoxication; Acute Kidney Injury, Neutrophil Gelatinase-associated Lipocalin

I. INTRODUCTION

Drug addiction has become a major societal concern in the modern world, it is estimated that over 269 million individuals used drugs globally in 2018, or one out of every 20 persons aged 15 to 64 years, used an illegal drug in 2018 (Niaz et al. 2020). Most of these illegal drugs or their metabolites are associated with common renal complications with wide variety of pathologic abnormalities affecting all kidney compartments, which are either attributed to their clearance through the kidney or a direct nephrotoxic impact. The injury might be acute and

reversible, or it could be chronic and lead to end-stage renal failure (Pantelias and Grapsa 2011). Acute kidney injury (AKI) is described as a sudden loss of renal activity that is functionally characterized by a rapid decrease in the glomerular filtration rate (GFR), resultant in retention of creatinine, urea, and other nitrogenous waste products in the body (De Geus et al. 2012**)**. AKI is defined by Kidney Disease Improving Global Outcomes (KDIGO) as a rise in serum creatinine of ≥ 0.3 mg/dL within 48 hours, or a 1.5-fold increase in serum creatinine compared to the baseline or urine output < 0.5mL/kg/h for six hours (Machado et al. 2014). Worldwide, the total incidence of AKI ranged from 2.5 to 92.2 % of 67,033 patients admitted to more than 300 intensive care units (ICUs) and it constitutes a considerable risk for adult fatality, with mortality ranging from 5% to 80% (Dos Santos et al. 2019).

Early diagnosis and prompt treatment can significantly decrease morbidity and mortality in patients with AKI. The loss of renal function is currently diagnosed by functional biomarkers, such as serum creatinine and estimation of urine flow rate. However, creatinine is the gold standard marker for estimation of GFR, unfortunately it considered an unreliable marker of AKI in most patients due to its greater variability according to muscle mass, age, and gender; besides, and serum creatinine levels do not alter till a significant proportion of renal function has been lost. Currently, serum creatinine is regarded as a delayed and inaccurate biomarker for the diagnosis of AKI and relying primarily on this marker might result in a delay in the start of therapeutic interventions (Zhang and Parikh 2019).

Recent researches focused on identifying novel biomarkers for the early prediction of AKI. Numerous indicators have been identified, including NGAL, interleukin18 (IL18) kidney injury molecule 1 (KIM1) (Yin 2019), Calprotectin and liver-type fatty acid-binding protein (LFABP) (Sakhuja, 2021). NGAL is a 25-kDa protein that covalently binds to matrix metalloproteinase-9 from neutrophils (Neves et al. 2020) . It is produced at a relatively low level in various organs but increases in wounded epithelial cells such as the liver, lung, renal, and colon, (Lima et al. 2022). Earlier research has shown that NGAL levels in urine and serum rise dramatically when compared to healthy controls, and that it is connected to serum creatinine. Its level rises 24 to 48 hours before creatinine in AKI patients (Neves et al. 2020). This marker aids the clinician in the early detection and management of AKI.

Calprotectin is an immunomodulatory protein, regarded as an inflammatory factor, mostly derived from neutrophils with few amounts are secreted by monocyte and macrophage. It is composed of two protein components (S100A8/S100A9) bonding to calcium. Tubular epithelial cells of the collecting system also, secrete S100A8 and S100A9 in response to inflammation; hence calprotectin is detectable in renal tissue injuries. The importance of calprotectin among other AKI biomarkers is in its unique properties that make it more practical everywhere (Şit et., al. 2017).

Even though there have been few early studies that address the impact of NGAL and Calprotectin in the early diagnosis of AKI, with varied findings, but majority of these studies are limited to patients with illicit drug poisoning (Demidchik et al. 2020). To the best of our knowledge, no earlier comprehensive study has been conducted to investigate the prevalence of AKI among drug abuse intoxicated cases and evaluate the role of NGAL and Calprotectin as an early predictor biomarker of AKI in such patient. Hence, we conducted this study.

AIM OF THE STUDY

This work aimed to evaluate the role of urinary NGAL and Calprotectin in predicting AKI among drug abuse intoxicated cases admitted to Poison Control PCCASUH. Moreover, to compare the accuracy of urinary NGAL and calprotectin in the diagnosis of AKI in clinical practice.

II. PATIENTS AND METHOD

This is a prospective observational study performed on 100 who were presented to PCCASUH with acute drug abuse toxicity from September 2018 to March 2019; and 75 patients were included aged 18-60 year old. Patients younger than 18 years old, and those with chronic kidney disease (CKD), preexisting immune disease, co-ingestions of nephrotoxins, hematological disorder and end stage renal disease on regular dialysis (ESRD) were excluded (25 patients).

Patients who developed AKI according to KDIGO criteria were assigned to the AKI group (n = 20), and those without AKI were assigned to the non-AKI group (n =55). The initial serum creatinine concentration measurement on admission was used as the baseline value. The severity of AKI was staged according to the KDIGO guideline using the highest serum creatinine concentration recorded during the hospitalization period showed in (Table 1) (KDIGO, (2012).

- **Clinical assessment for all cases was done as following:**

All admitted patients will be evaluated by full history taking including age, age of beginning of drug use, duration of abuse, occupation, marital state, and first drug used, number of abused drugs, route of use. Common acute drug abuse intoxications manifestations were summarized and mentioned in table (2) among included patients. Such as, gastrointestinal (GIT) manifestations (vomiting), respiratory manifestations (tachypnea, Crepitation Mechanical ventilation) and central nervous system depression (CNS)

Definition of acute kidney injury:

Acute kidney injury complicating acute drug abuse intoxications among included cases was done by using the urine output and creatinine components of the RIFLE criteria to define AKI (Bellomo R, et al., 2004).

- **Laboratory Parameters:**

Of all patients, who were enrolled in the study, blood and urine samples were attained on the first and third day of admission and for follow up of Complete blood Count (CBC), serum cratinine and urea Blood samples (5 ml) were collected and analyzed using Cobas Integra biochemical analyzer and Dimension® RxL Max® integrated chemistry system (Elmanama et al., 2015). Five milliliters of urine specimens were obtained from urine catheter. Three milliliters blood sample was withdrawn under aseptic conditions by suitable syringe and immediately sent to hospital laboratory for further evaluations.

- **Drug abuse screening**:

20 ml urine sample was obtained in a dry, labeled container. Samples were screened for 5 substances abuse (opiate, cannabis, benzodiazepines, barbiturates and tramadol) by enzyme multiplied immunoassay technique (EMIT) (Roche/Hitachi cobas C311) (Taskinen et al, 2017). Positive samples were confirmed by gas chromatography-mass spectroscopy (GC-MS). 10 mL capacity glass tube, fitted with a cap containing 10.0 mL urine. The samples were extracted with 15 mL of dichloro1nethane at neutral or alkaline pH by mixing and shaking for 10 min on a vortex shaker. After centrifugation at 2000 r/min for 15 min, the organic layer was transferred into another 10 rnL glass tube. The organic layers evaporated dry by a Pressure Blowing Concentrator the samples were reconstituted By 50.0 methanol. Aliquots of 1.0 µL were injected

into the GC system. Limit of detection is 10 ng/inl urine samples no false negative samples were documented. Repeatability (Intraday) and reproducibility (Inter-day precision) of retention time (RT) and relative retention time (RRT) is high with relative standard deviation RSD of RRT around 0.67°/o. Accuracy of Retention index percent error does not exceed 0.1% over weeks and months. The chemical composition of samples were perfo1med using Trace GC-TSQ mass spectrometer (Thermo Scientific, Austin, TX, USA) with a direct capillary column TG-5MS TX, USA) with a direct capillary column TG-5MS. Five milliliters of urine specimens were obtained from urine catheter and urinary NGAL Calprotectin levels were assessed using enzyme and linked Immune Assay (ELISA) according to the manufacturer's protocol (Boster Biological Technology. Co., Ltd, USA)

Statistical Analysis:

-Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis.

-According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean ± SD, the following tests were used to test differences for significance; Differences between frequencies (qualitative variables) and percentages in groups were compared by Fisher Exact test. Differences between parametric quantitative independent groups by t-test in paired by paired t., Correlation by Pearson's correlation and linear regression.

Ethical consideration. All data collected were anonymous and confidentiality issues were preserved and valid informed consent was taken an ethical approval from Research Ethics Committee (REC) Faculty of Medicine, Ain Shams University (FWA 000017847). as well as an approval from director of PCC-ASUH were obtained.

III. RESULT

As presented in Table (1), the study includes 5 drug abuse acute intoxicated patients. The mean age of the study population was 32.56±9.03, male patients constituted 76% of the study sample, while females constituted 24%. 40% of them were tramadol abusers, 18.7% were sedatives/hypnotics abusers (benzodiazepines and barbiturates), and 13.3% were mood stabilizers abusers mainly (lithium and Clozapine). Moreover, 10.7%, of studied patients were opiates abusers, 10.7% were Tricyclic Antidepressants (TCA) abusers and 6.7% were alcoholic abusers. There was a non-significant difference as regard demographic data; age and gender as well as the type of abused substances, between the two studied groups. Additionally, most of studied patients in both groups had no comorbid diseases and most of them ~ 46.7 were addict before enrolled in the study and ~ 60.4% of cases had received abused substances by oral ingestion with no statistically significant difference. Table (2) demonstrated that no statistically significant difference was found between both groups regarding GIT manifestations. However, respiratory and CNS manifestations were marked in the group of AKI with statistically significant difference, $p < 0.05$.

Table (1): Fisher Exact test of demographic data, disease history, type and mode, as well as route of abused substances among the studied groups

	All Studied patients (n=75)	**AKI Patients (n=20)**	**Non -AKI Patients (n=55)**	**P-value**
Age	32.56 ± 9.03	35.7 ± 9.8	31.4 ± 8.5	0.095 NS
Gender				0.217
Male	57 (76%)	17 (85 %)	40 (72.7 %)	NS
Female	18 (24 %)	3(15 %)	15 (27.3 %)	
Medical history				
No	57 (76 %)	14 (70 %)	43 (78.2%)	
Hypertension (HTN)	7 (9.33 %)	3 (15 %)	3 (7.3%)	
Diabetius Melliatus (DM)	0 (0.0 %)	0 (0.0 %)	0 (0.0%)	0.257
Ischemic Heart Disease	0 (0.0%)	0 (0.0 %)	0 (0.0%)	NS
Heart Faillure	0 (0.0 %)	0 (0.0 %)	0 (0.0%)	
Bronchial Asthma	10 (13.33 %)	2 (10 %)	8 (14.5%)	
DM + IHD	1 (1.3 %)	1 (5%)	0 (0.0%)	
Type of abused substances				
Tramadol	30 (40 %)	9 (45.0 %)	21 (38.2 %)	
Sedatives/hypnotic (benzodiazepines + Barbiturates)	14 (18.7 %)	1 (5 %)	13 (23.6 %)	
Opiates	8 (10.7 %)	2 (10 %)	6 (10.9 %)	0.672
TCA	8 (10.7 %)	2 (10 %)	6 (10.9 %)	NS
Alcohol	5 (6.7 %)	2 (10 %)	3 (5.5 %)	
Mood stabilizers (lithium + Selec	10 (13.3 %)	4 (20 %)	6 (10.9 %)	
Sertonin reuptake inhibitors (SSRI)				
Route				
Oral		18 (90 %)	49 (89.1 %)	0.461
Injection		2 (10 %)	3 (5.5 %)	NS
Inhalation		0 (0.0 %)	3 (5.5 %)	
Mode of poisoning				0.167 NS
Addict	35 (46.7 %)	10 (50 %)	25 (45.5 %)	
Accidently	30 (40%)	8 (40 %)	22 (40 %)	
Therapeutic Error	3 (4 %)	2 (10 %)	1 (1.8 %)	
Suicidal attempt	7 (9.3 %)	0 (0.0 %)	7 (12.7 %)	

N: number of patients. AKI: Acute kidney injury *: statistically significant difference NS: no statistically significant difference.

Table (2): Fisher Exact test of Clinical manifestations distribution among studied patients

	AKI Patients (n=20)	Non –AKI Patients (n=55)	P-value
Gastrointestinal manifestations			
Absent	9 (45%)	31 (56.4 %)	0.270 NS
Vomting	11 (55 %)	24 (43.6 %)	
Respiratory manifestations			
Absent	2 (10 %)	32 (58.2%)	
Tachypnea	3 (15 %)	12 (21.8%)	0.0001*
Crepitation	6 (35 %)	6 (10.9%)	
Mechanical ventilation	8 (40.3 %)	2 (3.6%)	
Centeral Nervous System manifestations			
Absent	3 (15 %)	15 (27.3 %)	
Coma GI	2 (10 %)	15 (27.3 %)	0.018*
Coma G II	3 (15 %)	13 (23.6 %)	
Coma G III	12 (60 %)	21 (21.8 %)	

N: number of patients. AKI: Acute kidney injury *: statistically significant difference
NS: no statistically significant difference.

Table (3) summarizes all outcomes measured in this study, including serum creatinine, serum urea, urinary-NGAL and urinary-Calprotectin at 1st and 3rd day post-admission. As represented in Table (3), the renal function profile as well as urinary-NGAL and urinary-Calprotectin was significantly elevated among patients who develop AKI in comparison with patients who hadn't. While, 3rd day post-admission there was significant further increase in AKI group as regards mentioned variables.

Table (3): Student T- Test Comparison between serial renal functions with their mean values at admission and after 3 days among studied patients

Serial renal functions	AKI Patients N= 20	Non -AKI Patients N= 55	p-value
Serum Creatinine			
1st day, on admission	1.17 ± 0.19	1.13 ± 0.20	0.048 NS
3rd day	2.33 ± 0.77	1.19 ± 0.18	0.0001a*
Serum Urea			
1st day, on admission	38.60 ± 9.70	36.92 ± 9.59	0.054 NS
3rd day	77.75 ± 14.23	38.61 ± 10.87	0.0001a*
Urinary NGAL			
1st day, on admission	98.50 ± 14.21	25.88 ± 23.19	0.0001a*
3rd day	752.90 ± 360.81	125.07 ± 56.54	0.0001a*
Urinary Calprotectin			
1 st day on admission	385.7±271.7	195.8±89	0.0001a*
3rd day on admission	962.5±680.9	250.4±47	0.0001a*

N: number of patients. AKI: Acute kidney injury NGAL: Urinary Neutrophil gelatinase-associated lipocalin *: statistically significant difference NS: no statistically significant difference

The accuracy of the urinary biomarkers NGAL and calprotectin in the detection of intrinsic AKI was assessed through ROC curve analysis. The ROC analysis of NGAL and calprotectin revealed AUROCs of 0.918 and 0.946, respectively. Urinary NGAL exhibited a sensitivity of 93.0% and a specificity of 83.0% for a threshold value of 39.0 ng/mL, whereas urinary calprotectin exhibited a sensitivity of 88.4% and a specificity of 96% for a cut-off value of 314.6 ng/mL (Figure 1 and (Table 4)

Table (4): Accuracy of Urinary NGAL and Calprotectin in predicting Acute Kidney injury among cases in the current study

Parameter	**Accuracy**	**Senesetivity**	**Specificity**
Urinary NGAL	83.7%	93.0%	83.0%
Urinary Calprotectin	91.2%,	88.4%	96%

NGAL: Urinary Neutrophil gelatinase-associated lipocalin

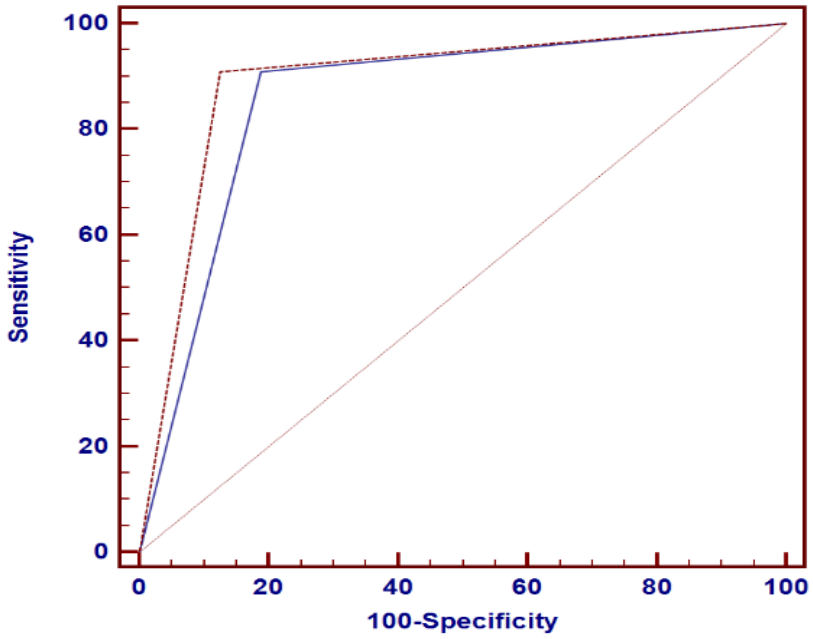

Figure (1): Receiver operating characteristic (ROC) curve for the cutoff value of U. NGAL and UR. Calprotectin.

IV. DISCUSSION

Substance abuse continues to be a large public health concern worldwide. The availability of more potent drugs, the increasing number of substances and their potential combinations poses a greater challenge to prevention and treatment of drug use disorders (World Drug Report, 2020). One of the important consequences of drug use is renal effects, which occur with or without rhabdomyolysis, may be in the form of interstitial nephritis, acute tubular necrosis, and glomerulonephritis thus lead to acute renal damage (Şit et., al. 2017). According to KDIGO, AKI is defined as an increase in serum creatinine

by 0.3mg/dL or more within 48 hours or a 1.5-fold increase in serum creatinine relative to the baseline (known or pre-established) or urine output less than 0.5mL/kg/h for six hours (KDIGO., 2012). Serum creatinine has been used to monitor renal function and renal injury. However, its levels may not increase until several days after renal injury, thereby delaying diagnosis and the provision of adequate renal replacement therapy (RRT). Moreover, creatinine levels do not rise above normal until 50% of renal function is lost. Consequently, the interest and research to identify effective new biomarkers in renal dysfunction sooner have increased (Urbschat et al. 2011).

The current study demonstrated that of 75 patients who enrolled in the current study, 20 developed AKI according to KDIGO criteria. The mean age of the study population was 32.56±9.03, male patients constituted 76% of the study sample, while females constituted 24%. 40% of studied patients were tramadol abusers which was higher than the study reported by Abdelsalam et al (2016), (29 %), but lower than Elhamady findings (77 %) (Elhamady et al. 2013). 18.7% of studied patients, were sedatives/hypnotics abusers (benzodiazepines and barbiturates), 13.3% of studied patients, were mood stabilizers abusers mainly (lithium and Clozapine). Moreover, 10.7%, of studied patients were opiates abusers, 10.7% were Tricyclic Antidepressants (TCA) abusers and 6.7% were alcoholic abusers. This was in accordance with Bassiony et al., (2018) alarming studies among Egyptian community, estimating that tramadol users have exceeded 40% of the total Egyptian drug users, being the first illicit drug of abuse followed by cannabis Egyptian anti-addiction hotline statistics. There was a non-significant difference as regard demographic data; age and gender as well as the type of abused substances between the two studied groups. Additionally, most of studied patients in both groups had no comorbid diseases and most of them ~ 46.7 were addict before enrolled in the study and ~ 60.4% of cases had received abused substances by oral ingestion with no statistically significant difference among them.

This study also revealed that, there was no statistically significant difference between both groups regarding GIT manifestations; however, the respiratory and CNS manifestations were marked in the group of AKI with statistically significant difference. This was in agreement with Li and Gunja (2013) study who reported central nervous system (CNS) presentations that were the most common with acute drug abuse intoxications. They added that respiratory complications associated need providing airway support and ensuring adequate oxygenation and ventilation. However, this was in contrary with study of Malkina, (2022) who recorded manifestations associated with AKI which included anorexia, nausea, and vomiting.

The results of this study revealed that urine output, at 1st day of admission AKI patients did not show a significant difference in serum creatinine and urea than non-AKI group, which is in line accordance with Ramesh et al. (2010) who revealed that during the first 24 hours after cardiopulmonary bypass (CPB), serum creatinine did not differ significantly between the two studied groups. This was consistent with outcomes of Elmedany, et al. (2017) who showed a significant difference in the urea and creatinine within 72 hours of admission post-open cardiac surgeries among AKI patients and those without AKI. Yim et., al. (2019) study goes with our result**,** they demonstrated that, illicit drug use was associated with acute kidney injury and renal replacement therapy independent of creatinine levels. In-addition, on the 3rd day post-admission, serum creatinine and urea were significantly higher among patients who develop AKI relative to non-

AKI. On contrary with early investigation of (Mataloun et al. 2006) who found that within the first 24 hrs. of admission, serum urea and creatinine were significantly different between AKI and no-AKI group and these results might attributed to hypotension or hypovolemia in patients admitted to the ICU with slightly elevated BUN and Cr levels.

Several studies have demonstrated that plasma and Urinary NGAL may be a promising early prediction of AKI in sepsis and after major surgery. However, the involvement of NGAL in AKI produced by acute poisonings has received little attention (Ahn et al. 2016). Recent researches considered Urinary calprotectin is a very sensitive biomarker for early diagnosis of intrinsic AKI Urinary calprotectin is a valuable recognized biomarker that can be used to differentiate prerenal and intrinsic AKI (Vakili et., al. 2021). . In this study, we compared the sensitivity and specificity of urinary calprotectin with those of serum creatinine in detecting early AKI. The purpose of this study was to see whether urine NGAL urinary calprotectin might predict AKI in addicts who were misusing commonly used psychoactive substances in Egypt (tramadol, cannabis, opiates, barbiturates, and benzodiazepines).

Regarding urinary NGAL, and urinary Calprotectin our findings revealed that there was a significant elevation in urinaryNGAL and urinary Calprotectin in AKI group (A), compared to non-AKI group, 1^{st,} and 3rd day post-admission, which reflects the potential role of urinary NGAL and urinary Calprotectin as an early biomarker in predicting of AKI. This finding was with agreement with Matsa, et al. (2014) study Who showed that urinaryNGAL concentrations was significantly higher in AKI compared to that of non-AKI patients, at the time of ICU admission and at any given point time. They postulated the mechanism of raised NGAL level at admission may correlate with tubular ischemia at admission, as urinaryNGAL, is freely filtered biomarker increasing after injury to the proximal and distal tubules, which is up regulated in AKI. This fact reinforces the utility of NGAL as an early predictor of AKI. On contradicts the findings of Bignami et., al. (2015) who discovered that urinaryNGAL didn't show any increase after cardiopulmonary bypass, and this may be attributed to utilizing NGAL ELISA test in high risk patients which is not recommended by the manufacturing companies and comparing it with low risk patients included in that study. Our results also goes with result of Heller et., al. (2011) who demonstrated that urinary calprotectin may be a helpful tool for the differentiation of prerenal and intrinsic AKI besides, calprotectin levels in prerenal AKI are comparable with those of healthy subjects and high calprotectin levels indicate intrinsic disease. Fujiu et al. (2011**)** also showed that, urinary calprotectin is implicated in inflammatory and non-inflammatory renal diseases in adult patients of the intensive care unit (ICU) and the emergency department.

The accuracy of the urinary biomarkers NGAL and calprotectin in the detection of intrinsic AKI was assessed through ROC curve analysis Fig (1) and (Table 4). The ROC analysis of NGAL and calprotectin revealed AUROCs of 0.918 and 0.946, respectively. Urinary NGAL exhibited a sensitivity of 93.0% and a specificity of 83.0% for a threshold value of 39.0 ng/mL, whereas urinary calprotectin exhibited a sensitivity of 88.4% and a specificity of 96% for a cut-off value of 314.6 ng/mL This is in sound accordance with previous results reported by Merrikhi et al. (2014) who found that on 5th day of pediatric admission at ICU the NAGL had (AUC = 0.73, sensitivity 46.1% and specificity 91.6% and cut off values of 86 .04 ng/ml), and in agreement with Wagener et al. (2006) report; (AUC= 0.80; with cutoff of 213 ng/ml, sensitivity 73 %, specificity 79 %) was more precisely predictor the presence of

AKI. This was in parallel with Seibert et al. (2013) study who found that calprotectin and NGAL can be used to differentiate the renal and prerenal forms of AKI and the urinary calprotectin is more sensitive than NGAL in this respect. Westhoff et al. (2017) study also evaluated other urinary biomarkers to differentiate prerenal and intrinsic pediatric AKIs. They showed that urinary calprotectin outperformed NGAL in discriminating between these entities, whereas KIM-1 failed to do so.

Recently, Vakili et al. (2021) results showed that urinary calprotectin has higher sensitivity and specificity than serum creatinine levels for detecting early stages of intrinsic AKI. It's early rising in urine allows us to commence our treatments at earlier stages preventing serious kidney tissue damages in children.

Conclusion and recommendations: This study showed that both u-NGAL and u-calprotectin levels measured at admission in drug abuse intoxicated patients can predict an occurrence of AKI for up to 72 hours of hospital stay and u-calprotectin was more accurate. It is recommended that, all acute drug abuse intoxicated patients a urinary NGAL and Calprotectin should be done for early exclusion of AKI that could be complicating

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دراسة مقارنة بين النجال و الكالبروتكتين البولي للكشف المبكر عن الأعتلال الكلوي الحاد بين حالات التسمم بتعاطي المخدرات

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 # قسم الطب الشرعي والسموم الأكلينيكية كلية الطب جامعة عين شمس. * قسم امراض الكلي

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الخلفية: يشكل إدمان المخدرات مشكلة رئيسية في جميع أنحاء العالم ويرتبط بالأعتلال الكلى الحادة. تم دراسة تأثير النجال والكالبروتكتين على التشخيص المبكر للأعتلال الكلوي الحاد ، ولكن لم يتم إجراء دراسة شاملة سابقة بشأن علاقتها بالتسمم الحاد للمواد المخدرة.

الهدف من العمل: يهدف هذا العمل إلى تقييم دور النجال والكالبروتكتين البولي في التنبؤ بالأعتلال الكلوى الحاد بين حالات التسمم الناتجة عن تعاطي المخدرات التي تم حجزها بمركز علاج التسمم مستشفيات جامعة عين شمس. بالأضافة الي مقارنة دقة النجال وكالبروتكتين البولي في تشخيص الأعتلال الكلوى الحاد بين هؤلاء المرضي.

المرضي والطرق: تم إجراء دراسة سريرية مستقبلية على 75 مريضاً تم استقبالهم وتشخيصهم كحالات تسمم حادة لعقاقر مخدرة في مركز علاج التسمم بمستشفيات جامعة عين شمس في الفترة من سبتمبر 2018 الي مارس 2019. تم جمع عينات الدم والبول من جميع المرضى في اليوم الأول والثالث من القبول. تم تقييم ومقارنة النجال والكالبروتكتين البولي بين المرضى الذين أصيبوا بالأعتلال الكلوى الحاد والذين لم يصابوا به.

النتائج: من بين 75 مريضًا تم اختيارهم في الدراسة ، أصيب 20 مريضًا بإعتلال الكلوى الحاد في اليوم الأول من الدخول لمركز علاج التسمم ، وكان هناك ارتفاع ذو دلالة احصائية لمستوي النجال والكالبروتكتين البولي بشكل ملحوظ بين مجموعة التي اصيبت بالأعتلال الكلوي الحاد. في اليوم الثالث من الدخول لمركز علاج التسمم كان هناك ارتفاع اكبر ذو دلالة احصائية لمستوي النجال والكالبروتكتين البولي بشكل ملحوظ بين مرضي الأعتلال الكلوي الحاد. تم تقييم دقة المؤشرات الحيوية البولية للنجال والكالبروتكتين في الكشف عن الأعتلال الكلوي الحاد من خلال تحليل منحنى ROC روك الذي أظهر أن حساسية النجال البولي بنسبة 93.0 ٪ وخصوصية 83.0 ٪ بينما كالبروتكتين البولي كان بحساسية بنسبة 88.4 ٪ وخصوصية 96 ٪

الخلاصة والتوصيات: استنتجت النتائج التي توصلنا إليها أن مستويات النجال والكالبروتكتين البولي ترتفع بشكل ملحوظ في حالات التسمم الحاد بتعاطي المخدرات مع حدوث مضاعفات القصور الكلوي الحاد لمدة تصل إلى 72 ساعة من الاستشفاء ، وبالتالي يمكن اعتبارها منبئات مبكرة لـلأعتلال الكلوي الحاد في مستوي 262.5 نانوغرام / مل و 314.6 نانوغرام / مل ، على التوالي ، ويمكن اعتبار كالبروتكتين هو الأكثر دقة. يوصي من الدراسة أن يتم إجراء مستويات النجال والكالبروتكتين البولي الكلوي لجميع المرضى المصابين بتعاطي المخدرات الحاد من أجل الاستبعاد المبكر للأعتلال الكلوي الحاد الذي يمكن أن يكون معقدًا.

الكلمات المفتاحية: تسمم تعاطي المخدرات. إصابة الكلى الحادة ، نجال، كالبروتكتين