

## Evaluation of efficacy of Neutrophil Gelatinase Associated Lipocalin as a biomarker for AKI

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### ABSTRACT:

**Background:** The phrase "acute coronary syndrome" (ACS) describes a collection of heart conditions marked by a sudden, sharp reduction in blood supply to the heart muscle. The present study was conducted to assess efficacy of Neutrophil Gelatinase Associated Lipocalin as a biomarker for AKI. **Materials & Methods:** 95 patients with acute coronary syndrome of both genders were taken. Urine samples were collected. Urine NGAL tests were measured using a standardized clinical platform. Serum creatinine levels at baseline, 24 hours, and 48 hours were also assessed. **Results:** Out of 95 patients, 55 were males and 40 were females. The mean serum creatinine level at baseline was 1.05 mg/dl, after 24 hours was 1.23 mg/dl and after 48 hours was 1.76 mg/dl. The difference was significant ( $P < 0.05$ ). The mean urinary NGAL level was 72.5 in non-AKI and 405.2 in AKI group. The difference was significant ( $P < 0.05$ ). We found statistical correlation between Urinary NGAL and AKI ( $P < 0.05$ ). **Conclusion:** Urine neutrophil gelatinase associated lipocalin has shown promise as a biomarker for acute kidney injury (AKI) in patients with acute coronary syndrome.

**Keywords:** Acute Coronary Syndrome, Acute kidney injury, Neutrophil Gelatinase Associated Lipocalin

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**This article may be cited as:** Kushwaha SK. Evaluation of efficacy of Neutrophil Gelatinase Associated Lipocalin as a biomarker for AKI. J Adv Med Dent Sci Res 2017;5(5):-126-128.

### INTRODUCTION

The phrase "acute coronary syndrome" (ACS) describes a collection of heart conditions marked by a sudden, sharp reduction in blood supply to the heart muscle. It typically encompasses conditions like unstable angina and myocardial infarction, or heart attack. ACS is a medical emergency that requires immediate attention.<sup>1</sup> The underlying cause of ACS is usually the rupture of an atherosclerotic plaque in one of the coronary arteries, which may lead to the formation of a blood clot.<sup>2</sup> This clot can partially or completely restrict blood flow via the artery, which can lead to ischemia, or a lack of oxygen, in the heart muscle. The severity of the issue depends on the degree of blockage and the level of damage to the heart muscle.<sup>3</sup>

10.0% to 30% of patients admitted to the hospital following an acute myocardial infarction (AMI) may develop acute kidney damage (AKI), a common condition.<sup>4,5</sup> AKI is more prevalent in high-risk patients (10.0% to 25.0%), such as those undergoing cardiac surgery, sepsis, or congestive heart failure treatment in hospitals. It has been demonstrated that urine levels of Neutrophil Gelatinase Associated Lipocalin (NGAL) are an early indicator of acute renal injury.<sup>6</sup> There are currently more advanced tools for NGAL early bedside detection. NGAL may soon

replace serum creatinine as an early test for acute kidney injury (AKI), as the latter is a poor and delayed indicator of the condition.<sup>6</sup> It may serve as a biomarker for a number of additional renal and non-renal disorders, according to recent research. The amount of NGAL in the blood and urine increases as a result of the injured kidney's tubules having significantly increased expression of NGAL messenger RNA and protein.<sup>7</sup> The present study was conducted to assess efficacy of Neutrophil Gelatinase Associated Lipocalin as a biomarker for acute kidney injury.

### MATERIALS & METHODS

The present study was carried out on 95 patients with acute coronary syndrome of both genders. Patients' relatives gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. A thorough examination and history were performed. Urine samples were collected. Urine NGAL tests were measured using a standardized clinical platform. Serum creatinine levels at baseline, 24 hours, and 48 hours were also assessed. Data thus obtained were subjected to statistical analysis.  $P$  value  $< 0.05$  was considered significant.

**RESULTS**

**Table I Distribution of patients**

Total- 95		
Gender	Male	Female
Number	55	40

Table I shows that out of 95 patients, 55 were males and 40 were females.

**Table II Estimation of serum creatinine level**

Serum creatinine level	Mean	P value
Baseline	1.05	0.01
After 24 hours	1.23	
After 48 hours	1.76	

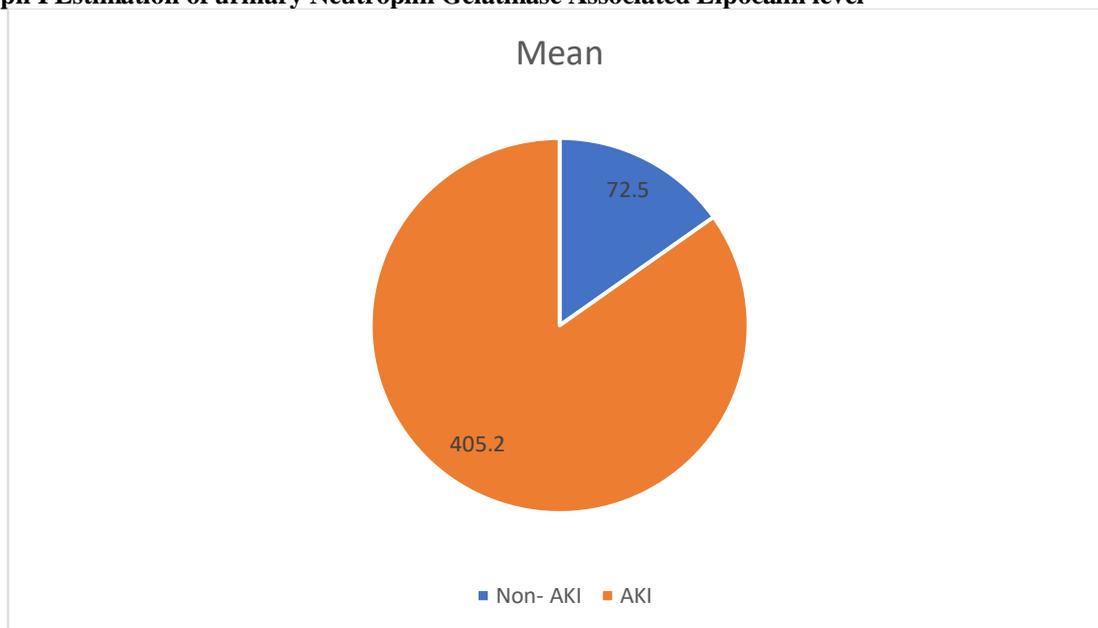
Table II shows that mean serum creatinine level at baseline was 1.05 mg/dl, after 24 hours was 1.23 mg/dl and after 48 hours was 1.76 mg/dl. The difference was significant (P< 0.05).

**Table III Estimation of urinary Neutrophil Gelatinase Associated Lipocalin level**

Groups	Mean	P value
Non- AKI	72.5	0.01
AKI	405.2	

Table III shows that mean urinary NGAL level was 72.5 in non- AKI and 405.2 in AKI group. The difference was significant (P< 0.05).

**Graph I Estimation of urinary Neutrophil Gelatinase Associated Lipocalin level**



**Table IV Correlation between urinary Neutrophil Gelatinase Associated Lipocalin and AKI**

Variable	Value
Pearson Correlation value (r)	0.78
P value	0.02

Table IV shows statistical correlation between Urinary NGAL and AKI (P<0.05).

**DISCUSSION**

Unstable angina is indicated by chest pain or discomfort that occurs at rest or with minimal exertion. The pain could be unbearable and last for a few minutes. Unlike a heart attack, unstable angina does not cause irreversible damage to the heart muscle.<sup>8</sup> In non-ST segment elevation myocardial infarction (NSTEMI), a partial blockage of a coronary artery causes a reduced blood flow to a portion of the

heart muscle.<sup>9</sup> This damages the heart muscle, although not to the same extent as in a full-blown heart attack. When a coronary artery is totally blocked, leaving a large portion of the heart muscle entirely exposed, a more severe type of ACS known as ST segment elevation myocardial infarction (STEMI) takes place.<sup>10</sup> We found that out of 95 patients, 55 were males and 40 were females. We found that mean serum creatinine

level at baseline was 1.05 mg/dl, after 24 hours was 1.23 mg/dl and after 48 hours was 1.76 mg/dl. With peak values that can be reached within 4 hours of a contrast angiography scan and remain noticeably increased for up to 24 hours before entirely normalizing by 48 hours, serum NGAL is a biomarker with a "narrow diagnostic window," according to Padhy et al.<sup>11</sup>The area under the curve (AUC) was 0.81 ( $p = 0.03$ ) at six hours after the contrast examination, with a sensitivity of 97.64% and a specificity of 67.78% at a cut-off point of 96.35 ng/mL; at the twenty-fourth hour, the AUC was 0.89 ( $p < 0.01$ ), with sensitivity of 96.63% and specificity of 68.72% at the defined reference level of 97.57 ng/mL.

We found that mean urinary NGAL level was 72.5 in non- AKI and 405.2 in AKI group. We found statistical correlation between Urinary NGAL and AKI ( $P < 0.05$ ). Jiang et al.<sup>12</sup> established a stable and repeatable measurement for HCC with self-made monoclonal antibodies (McAbs) and Variable domain of heavy chain of heavy-chain antibody (VHHs) increase the sensitivity. With hybridoma technology and phage display technology: R-HCC as a screening antigen and N-HCC as the detector for antigens to obtain the specific antibody and established an enzyme-linked immunosorbent assay for human cystatin C using self-made McAbs and VHHs. They have successfully obtained three McAbs; 5 F2, 4E4, 1E11 and four VHHs; 3-2, 3-24, 3-33 and 4-5 which were specific for HCC. The measurement of HCC was established with the self-made monoclonal antibodies and VHHs with a high sensitivity the lower limit of detection at 0.5 ng/ml and the detection range at 0.5 ~ 31.3 ng/ml.

The limitation of the study is small sample size.

## CONCLUSION

Authors found that urine neutrophil gelatinase associated lipocalin has shown promise as a biomarker for acute kidney injury (AKI) in patients with acute coronary syndrome.

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