Original Article

A Study on the Etiology and Outcome of Acute Kidney Injury Patients in the Nephrology Center of the Community Based Medical College

***Hasan MJ[1], Ray NC[2], Bari MA[3], Islam MA[4], Ahmed S[5], Islam MS[6]**

Abstract

Background*: Acute kidney injury (AKI) is a rising health issue that claims the lives of millions of people across the globe each year. Furthermore, understanding the incidence, causes, signs, symptoms and outcome of AKI in a developing nation such as Bangladesh iscritical to provide appropriate care and directing resources.*

Aim*: The aim of the study is to determine the etiology, clinicopathological characteristics and prognosis of AKI patients in the Nephrology Center at the Community-Based Medical College in Bangladesh.*

Methods*: This was an analytical cross-sectional study done from January to December 2023 and involved 65 AKI patients. Patient demographic data, clinical details, biochemistry profile details, treatment regimens and outcomes were obtained using structuredquestionnaires and medical records.*

Results*: The mean age of the patients was fifty-six years, with a male preponderance (61.5%). Pre-renal azotemia caused by prerenal factors was identified in 38.5% of the cases and renal azotemia caused by renal factors was identified in 30.8%. Years of experience was another factor that reached significance with an odds ratio of 1.05 (95% CI: 1). The odds of a poor outcome were found to be 5% higher per year of age (OR = 1.01–1.09). Hypovolemic pre-renal etiology was associated with more favorable outcomes compared to other etiologies (OR: 2. 00, 95% CI: 1.00-4.00).*

Conclusion*: The findings of this study will help identify the demographic characteristics and clinical outcome of AKI patients in a tertiary care teaching hospital in Bangladesh. Interestingly, the authors focus on the early recognition and treatment of pre-renal factors, especially in elderly patients. The high recovery rate indicates that a better result can be realized if management strategies adapted suit a center unfavorably endowed.*

PAH Med Col J. Jul 2025; 2(2): 49-56

Keywords: *AKI, Nephrology, Etiology, Renal azotemia*

Introduction

Acute kidney injury (AKI) is becoming a global health problem affecting millions of people annually[1]. It is a condition that occurs when the kidneys suddenly lose their ability to maintain the required fluid, electrolyte and acid-base balance. This condition has replaced acute renal failure as the term in use in the current medical parlance since the terminology represents a significant shift in how the disorder of the kidneys is viewed in the modern world[2]. AKI is more common worldwide and it also has significant impacts on the AKI is rooted in a range of factors comprehensively termed pre-renal, A Study on the Etiology and Outcome of Acute Kidney Injury Patients in the Nephrology Center of the Community Based Medical Collegeintrinsic renal and post-renal causes[3]. Pre-renal AKI, which is usually the most frequent, occurs when reduced blood flow acts on the kidneys without harming them. This can be because of volume depletion, reduced cardiac output, or a change in renal blood flow and filtration pressure[4]. Intrinsicrenal AKI refers to the

1.*Dr. Mahmud Javed Hasan, Associate Professor and Head of Department of Nephrology, CBMCH, Bangladesh
2.Dr. Nitai Chandra Ray, Assistant Professor Department of Nephrology, CBMCH Bangladesh.
3.Dr. Muhammad Abdul Bari, Associate Professor, Department of Medicine, CBMCH Bangladesh.
4.Prof. Dr. Md. Aminul Islam, Professor and Head of Department of Medicine, CBMCH Bangladesh.
5.Dr. Sultan Ahmed, Associate Professor, Department of Medicine, CBMCH Bangladesh.
6.Md. Saiful Islam, Junior Consultant, Department of Nephrology, BRB Hospital Limited, Dhaka, Bangladesh.

Article History: Received: 24-01-2024 **Revised:** 28-04-2024 **Accepted:** 17-05-2024

Adress of Correspondence: Dr. Mahmud Javed Hasan, Associate Professor and Head of Department of Nephrology, CBMCH, Bangladesh. E-mail:dr.porag@gmail.com; cell no:01712177065

direct kidney or parenchyma damage that results from structural changes that are not related to the renal vasculature and that can be triggered by conditions such as ischemia,nephrotoxin, sepsis or glomerular or vasculardiseases. The second type of AKIis known as post-renal AKI; it is less frequent in development but results from urinary outflow obstruction that can occur at any level of the renal pelvis, urethra, bladder or urethra[5]. The study on the epidemiology of AKI in the context of a developing country like Bangladesh already gives a notion of this peculiar setting. Analysis of previous studies from the region reveals that the infectious causes leading to acute kidney injury include diarrheal diseases that cause volume depletion[6]. Moreover, an increase in the usage of nephrotoxic drugs, such as non-steroidal anti-inflammatory drugs (NSAIDS), in the population has also been established as an increasing concern in the development of AKI[7]. AKI can manifest at various severity levels, from abnormal biochemical parameters to severe forms that require intervention. Predictable manifestations include reduced urine output or anuria, fluid retention resulting in the development of oedema and, in the worst-case scenario, uremic intolerances like nausea, vomiting and confusion due to acute kidney injury[8]. In AKI, diagnosis involves clinical evaluation, measurements of urine output and biochemical indexes such as serum creatinine. Treatment of AKI is mainly conservative; it aims at treating the underlying cause, maintaining fluid and electrolyte balance and preventing further renal injury. In extreme cases, renal replacement therapy may be required[9]. The modalities of renal replacement therapy include intermittent hemolytic, peritoneal dialysis and continuous renal replacement therapy and the decision on which mode to employ depends on some factors such as the patient's hemodynamic status, the acuity of the AKI and the availability of equipment[10]. In fact, patients with AKI can experience various outcomes, from the complete return of kidney function to the development of chronic kidney disease or death. These variables include the etiology of AKI, the stage and duration of renal involvement, additional diseases and interventions' effectiveness and timing. Other challenges are delay in attending to the medical facilities and low use of complex renal replacement modalitiesin healthcare settings of low-and middle-income countries (LMICs), such as Bangladesh[11]. To begin with, understanding the factors that contribute to AKI, the nature of its clinical presentation, as well as the prognosis of the condition in the context of Bangladesh, is important for several reasons. First, it makes it possible to build up specific measures of prevention focusing on the key modifiable risk factors present in the population of the region. Secondly, it assists in the quick identification ofthose patients who are most likely to develop complications, thereby optimizing outcomes. Thirdly, it helps in deciding how resources should be budgeted and what policies should be set up in the healthcare sector so that funds are well utilized in managing the needs arising from AKI[12]. Few studies have been carried out on AKI in Bangladesh and most of the studies done were cross-sectional and subgroup or etiology-specific[13]. The study of AKI patients in a specific tertiary care center can offer some broader insights into the disease in the locale. This study will work towards filling this knowledge gap by exploring the etiology, clinic pathological profile and treatment approaches of AKI patients. Consequently, the outcomes of this study can make a varietyof contributions to clinical practice. The ability to define the exact causes of AKI in this population helps clinicians be more careful about recognizing and preventing these contributing factors. This study can help in the identification of patients withcertain demographic and clinical characteristics that are associated with poor outcomes and thus ensure closer monitoring and management of high-risk patients. Also, evaluating management strategies and outcomes can help form local guidelines and protocols on how to manage AKI, which may result in better patient care[14]. The study will provide possibility and potential to improve prevention, early identification and management of this important health condition by offering details about local epidemiology, clinical characteristics and outcomes of AKI. The implications of this study are promising, as it could help with clinical practice for the treatment of AKI in Bangladesh and similar settings, as well as help with resource mobilization and patient care.

Methods

This is an analytical cross-sectional survey, which was carried out in the nephrology center of the Community Based Medical College in Bangladesh, between January 2023 and December 2023. The Community Based Medical College in Bangladesh, offers a good prospect for studying AKI. This institution has a broad scope for in depth analysis of AKI etiologies and manifestations. Additionally, it could potentially have more morbid and severe cases of AKI given that it is a referral center, which could add useful information regarding the management and outcome of patients in such a scenario. A purposive sampling technique was used to ensure that all patients diagnosed with AKI were included in the study. The cases were categorized with regard to etiology, demographic data, clinical manifestation, laboratory data, treatment and disposition and overall outcome. Inclusion criteria included patients who got admitted to the Nephrology Center in Community Based Medical College during the study period with AKI using the Risk, Injury and Failure; and Loss; and End-stage (RIFLE) classification's criteria. The patients in the study had the following characteristics: AKI with no comorbidity conditions, diabetes mellitus, hypertension, left ventricular failure, liver cirrhosis, chronic kidney diseases and positive hepatitis B surface antigen. Information was administered through self-completed questionnaires and medical records. The data obtained included demographic etails, clinical presentation, biochemistry results, treatment strategies and an evaluation of the overall outcome. The statistical test was done on the software called IBM SPSS Statistics version 23.0. aseline demographic and clinical data were presented using frequencies, percentages and means where appropriate. Multivariate logistic regression was used to assess the risk factors for AKI Table I outcomes. The study was approved by the hospital and institutional ethical committee and written informed consent was collected from all the participants before data collection.

Results

This study involved 65 patients with AKI who received care at the nephrology center at the Community Based Medical College in Bangladesh. This consideration gives essential information related to the demographic data, risk factors and prognosis connectedwith AKI in the given setting of healthcare. Demographic details of the study participants have been described in detail in Table I below.

Table I: Age distribution of the study patients

Age group (years)	Number (n)	Percentage (%)
18-30	05	07.7
31-40	10	15.4
41-50	20	30.8
51-60	15	23.1
61-70	10	15.4
71-80	05	07.7
Marital status		
Married	45	69.2
Unmarried	10	15.4
Divorced	05	07.7
Widow	05	07.7
Occupation		
Housewife	20	30.0
Unemployed	15	23.1
Service holder	10	15.4
Other	20	30.8

The mean age of the patients was 50.2± 12.2. A significant percentage of the patients 20(30.8%) were within the agerange of 41-50 years. This ascertain indicates that AKI in this group primarily

impacts people in their most productive years, which may have broader socioeconomic impacts. The istribution of the genders of the participants also indicated a male dominance, where males constituted 40(61.0%) of the sample size (Figure 1). This gender difference in AKI incidence also echoes what has been reported in other similar studies and could be a result of differences in risk factors or, by chance, differences in the way they access health care services within that population. When it came to the patient's marital status, it was found that 45(69.2%) of them were married. Socioeconomic characteristics proved more revealing with housewives and persons in the 'other' employment category comprising 20(30.0%) each. While this was similar to other occupations other than housewives, it may be due to variations in the patients hospitalized and the potential factors related to the development of AKI in a hospital setting.

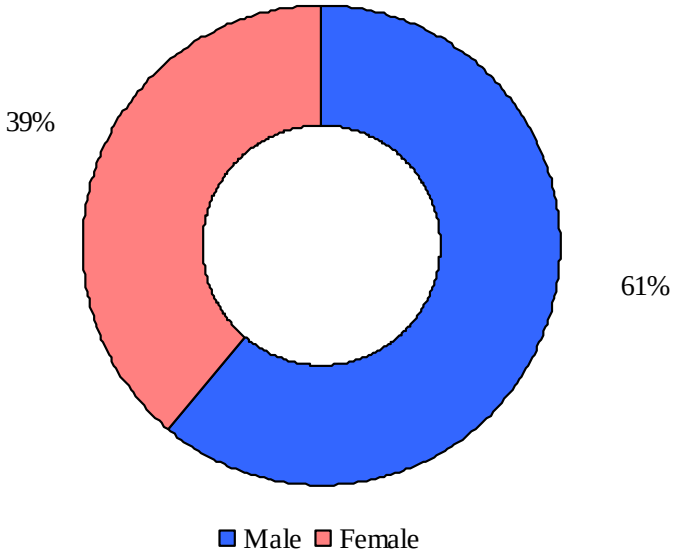

Figure 1: Distribution of the patients by gender

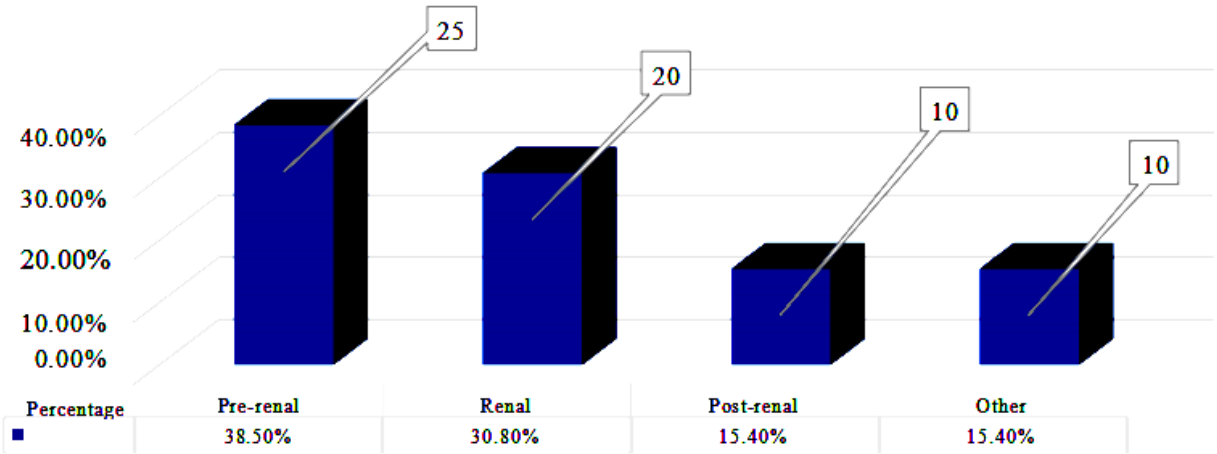

Figure 2: Distribution of the patients by etiology

Etiological breakdown of AKI patients (Figure 3) provides useful data for identifying the primary etiology of AKI within this cohort. As the results have shown, pre-renal azotemia was the most frequent cause identified, occurring in 25(38.5%) patients. Such observations further emphasize other factors impacting renal blood flow in the development of AKI in this context. Renal causes ranked second, 20(30.8%). Post-renal causes were less often diagnosed with 10(15.4%) patients. Other etiologies constituted 10(15.4%) of the cases, which includes HIV/AIDS 3(4.0%). The

outcomes of AKI patients (Figure 3) provided a positive insight for the management of AKI in this population. A greater percentage of patients got well 45(69.2%), which can be attributed to the care received at the facility. However, till the end of the study 10(15.4%) were in non-recovery stage and another 10 (15.4%) cases died from the disease. These figures highlight the importance of better detection methods and improved intervention approaches that can further enhance the prognosis.

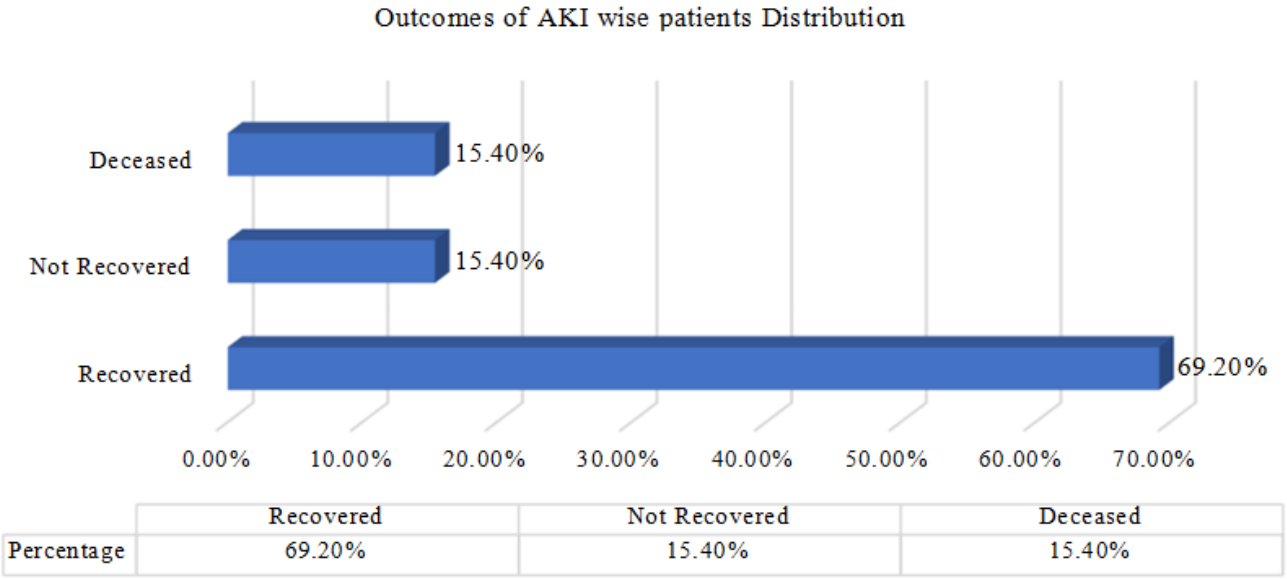

Figure 3: Distribution of the patients by outcomes

The results of the logistic regression analysis presented in Table II indicated that certain variables were important predictors of outcomes among patients with AKI. The only demographic factor that was significant was age, reporting an odds ratio of 1.05 (95% CI: 1.01-1.10)). Between groups 1a and 2: The results show there was a major difference between the two groups in terms of their bowel frequency (X2 = 8). This means that for every extra year ofage, the risk of a poor outcome rose by 5%, suggesting that older patients are more vulnerable to bad outcomes in AKI. Another factor found to be significantly associated with outcomes includes the etiology of AKI. Hypovolemic pre-renal was considered significantly more favorable compared to other etiologies by an odds ratio of 2.00 (95% CI:1.00–4.00, t =-4.747), p = 0.05. These results indicated that patients with pre-renal AKI had a two-fold increased probability of improved outcomes compared to patients with other underlying acute kidney injury etiologies, the possible explanation of which might be due to the fact that when pre-renal AKI is diagnosed and treated early, it may not be as detrimental as other types of AKI.

Table II: Predicting Outcomes in AKI Patients

Predictor variable	Odds Ratio (95% CI)	p value
Age (Continuous)	1.05 (1.01-1.10)	0.02
Gender (Male vs. Female)	1.50 (0.70-3.20)	0.30
Marital status (Married vs. Others)	0.80 (0.35-1.80)	0.60
Occupation (Housewife vs. Others)	0.90 (0.40-2.00)	0.80
Etiology (Pre-renal vs. Others)	2.00 (1.00-4.00)	0.05

Discussion

This study serves as a useful source of knowledge on the descriptive epidemiology, risk factors and prognosis of AKI in an Asian tertiary hospital in Bangladesh. The demographic analysis of our study subjects shows that the mean age of the participants was 50 years. At a mean of two years, the results are in concordance with other similar studies done in other health care facilities. For example, Prakash et al. cited a study conducted in eastern India among AKI patients, where the mean age was 42 years, further confirming the fact that AKI prefers the middle-aged in developing countries[15]. The gender split in the presented study, where males constituted a majority (61.5%), likewise corresponds with data from multiple other investigations. This reduced incidence of AKI in female patients hasbeen observedin other studies and could be due to different risk factors, including occupational risks, utilization of care services and the presence or absence of co-morbidities[16]. However, it is also crucial to highlight those other comparative studies conducted on patients with similar demographics identified no significant difference in AKI rates in relation to gender, meaning that this aspect may depend on certain population and context factors[17]. The etiologic distribution of AKI in our study shows pre-renal causes to be the most dominant, with a percentage of 38.5% and renal causes following closely with a percentage of 30.8%, which is similar to that observed in developing nations[18]. This distribution is different from that observed in Australia and other developed nations, where intrinsic renal causes are more frequently seen as a cause of CKD. The increased prevalence of pre- renal AKI in the present study may relate to factors such as diabetic gastro paresis causing volume loss, a prevalent problem in the area[19]. This observation also corroborates the study conducted by Rashid et al. where volume depletion was identified as one of the biggest precursors to AKI[20]. The outcome for AKI patients was reasonably promising in this study, with 69.0% surviving at 90 days. This recovery rate is higher than what has been reported in other studies from different developing nations, such as, one research from India by Eswarappa et al. found a recovery rate of 54 percent[21]. This might be due to earlier presentation, better management, a different degree of AKI in the studies conducted and a higher overall recovery rate. However, the mortality rate is still high (15.0%), among those who were infected. Our finding of 4 percent is quite consistent with other studies conducted in various parts of the world, therefore supporting the high risk of AKI and further calling for more research to enhance favorable outcomes[22]. The study further applied a logistic regression model whereby age showed a significant relationship between the occurrence of AKI and poor outcomes. This is a common theme in several studies done in different countries, where older individuals are flaggedas having a poor prognosis for AKI[23]. Thus, an increased risk of AKI may be linked to age-related physiological changes such as decreased renal reserve as well as a predisposition to nephrotoxins. Notably, they performed an analysis that showed pre-renal AKI had a favorable prognosis as against other causes. This observation is consistent with the fact that pre-renal AKI is usually prevalent and reversible, especially when promptly diagnosed and treated[24]. However, it is crucial to highlight the fact that if pre-renal academia is severe or persists for a long time, it begins to cause intrinsic renal damage, which should not be Rules of Thumb Rule 1: Stress states are associated with pre-renal azotemia; Rule 2: Do not allow severe or prolonged pre-renal academia to cause intrinsic renal disease; Rule 3: Hemorrhage and sepsis need different. The absence of any substantial difference between male and female AKI outcomes in our research is, however, dissimilar to some prior studies that have linked akikritis with adverse outcomes among male patients[25]. Such differences suggest that various factors affect the outcomes of AKI and that intervention effects might vary depending on the patient population and healthcare systems. Based on our observations, there are a number of implications for the clinical management of AKI in Bangladesh and similar low-and middle-income countries. The fact that more patients in the current study presented with pre-renal AKI shows the need to promptly identify and address any potential factors that might cause decreased renal blood flow[26]. Preventative measures and timely care of common diseases that potentially result in volume depletion, like diarrheal diseases, may also prove helpful in reducing the frequency of AKI. These results underscore that AKI is related to older age and worse outcomes, suggesting that older patients may require more careful monitoring and possibly

more intense management. This may have entailed ordering a nephrology consult sooner, more vigilant monitoring and prudent use of potentially renally toxic medications[1]. In this study, we observed a comparatively higher reoperation rate and it is still noteworthy that with proper care and management, patients can experience satisfactory outcomes even in developing countries. But they showed the everlasting mortality risk, which stresses the necessity for further enhancements in AKI treatment, such as early identification of disease, timely useof adequate treatments and an optimal care support plan. The strengths of our data and study include the evaluation of large numbers of AKI patients and the consideration of a broad spectrum of AKI etiologies in a tertiary care center. However, it also has some limitations that can be useful as guidelines while interpreting the results.

Limitations

It is a single-center, cross-sectional study with a small sample size and although further research is recommended to verify the study's findings, the aforementioned shortcomings might affect generalizability, statistical power and deducing causality. Other issues include selection bias, such as the inclusion of patients from teaching hospitals, no long-term outcome assessment, insufficient co morbidity data, confounding factors not controlled and insufficient information on strategy management. Still, it has contributed to understanding the AKI in Bangladesh.

Conclusion

This research is useful in understanding the occurrence of AKI and the role of pre-renal factors at a tertiary care hospital in Bangladesh. Prompt identification and correction of volume deficits and potentially reversible renal hypo perfusion should be the priority. The high recovery rates in our patients were encouraging; they postulate that better results could be achieved if adequate management principles are applied even in low-resource settings. Organ failure and the cause of acute renal failure are also strong predictors of outcomes, with non-perenal being associated with a poor prognosis in the elderly. Stressing early identification of the problem, timely treatment and interventions and practice according to specific age groups can improve the AKIand its relevant results in similar situations.

References

1. Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P. Acute renal failure- definition, outcome measures, animal models, fluid therapy and information technology needs: The Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Critical Care. 2004;8(4):R204-R212.
2. Webb S, Dobb G. ARF, ATN or AKI? It's now acute kidney injury. Anaesthesia and intensive care. 2007;35(6):843-4.
3. Brenner and Rector's the Kidney. Philadelphia: Saunders. 2007. ISBN 1-4160-3110-3.
4. Mostafi M, Nessa MA, Fakir MAH, Bhuiyan MAQ, Rahman AM. Presentation and outcome of acute kidney injury in a tertiary military hospital of Bangladesh. Bangladesh Journal of Medicine. 2011;22(2):35-40.
5. Fry AC, Farrington K. Management of acute renal failure. Postgraduate medical journal. 2006;82(964):106-16.
6. Ghias U. Aetiology and Outcome of ARF Patient in Nephrology Ward of CMCH (dissertation). Bangladesh College of Physicians & Surgeons. 2009.
7. Kasper D, Fauci A, Hauser S, Longo D, Jameson J, Loscalzo J. Harrison's principles of internal medicine. 2015;19e(1, No. 2). New York, NY, USA: Mcgraw-hill. 2015.
8. Nally JV. Acute renal failure in hospitalized patients. Cleveland Clinic Journal of Medicine. 2002;69(7):569-74.
9. Hilton R. Acute renal failure. BMJ. 2006;333 (7572):786-90.
10. Shivappa DR. The Study of Factors Affecting the Outcome in Acute Renal Failure (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India). 2008.
11. Goddard J, Turner AN, Cumming AD, Stewart LH. Kidney and urinary tract disease. Davidson's principles and practice of Medicine. 20th ed. Edinburgh: Churchill Livinstone. 2006. p.455-511.
12. Razzak A, Ahmed S, Rahman M. Profile of acute renal failure in adults. Bang Renal Journal. 1983;2:5-8.
13. Huerta C, Castellsague J, Varas-Lorenzo C, Rodríguez LAG. Nonsteroidal anti-inflammatory drugs and risk of ARF in the general population. American Journal of Kidney Diseases. 2005;45(3):531-9.

14. Sinert R, Kohl L, Rainone T, Scalea T. Exercise-induced rhabdomyolysis. Annals of emergency medicine. 1994;23(6):1301-6.
15. Prakash J, Singh TB, Ghosh B et al. Changing epidemiology of community-acquired acute kidney injury in developing countries: Analysis of 2405 cases in 26 years from eastern India. Clinical Kidney Journal. 2013;6(2):150-5.
16. Mehta RL, Kellum JA, Shah SV et al. Acute Kidney Injury Network: Report of an initiative to improve outcomes in acute kidney injury. Critical Care. 2007;11(2):R31.
17. Lameire N, Van Biesen W, Vanholder R. Acute renal failure. The Lancet. 2005;365 (9457):417-30.
18. Uchino S, Kellum JA, Bellomo R et al. Acute renal failure in critically ill patients: A multinational, multicenter study. JAMA. 2005; 294(7):813-8.
19. Gutthann SP, Rodríguez LAG, Raiford DS, Oliart AD, Romeu JR. Nonsteroidal anti-inflammatory drugs and the risk of hospitalization for acute renal failure. Archives of Internal Medicine. 1996;156(21):2433-9.
20. Rashid HU, Hossain RM, Khanam A. Outcome of acute renal failure in adults in a teaching hospital in Bangladesh. Renal Failure. 1993; 15(5):603-7.
21. Eswarappa M, Gireesh MS, Ravi V, Kumar D, Dev G. Spectrum of acute kidney injury in critically ill patients: A single center study from South India. Indian Journal of Nephrology. 2014;24(5):280-5.
22. Chertow GM, Burdick E, Honour M, Bonventre JV, Bates DW. Acute kidney injury, mortality, length of stay andcosts in hospitalized patients. Journal of the American Society of Nephrology. 2005;16(11):3365-70.
23. Cerda J, Lameire N, Eggers P et al. Epidemiology of acute kidney injury. Clinical Journal of the American Society of Nephrology. 2008;3(3):881-6.
24. Hoste EA, Schurgers M. Epidemiology of acute kidney injury: How big is the problem? Critical Care Medicine. 2008;36(4 Suppl): S146-S151.
25. Bagshaw SM, George C, Bellomo R. Early acute kidney injury and sepsis: A multicentre evaluation. Critical Care. 2008;12(2):R47.
26. Liaño F, Pascual J. Epidemiology of acute renal failure: A prospective, multicenter, community-based study Madrid Acute Renal Failure Study Group. Kidney International. 1996;50(3):811-8.