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An observational study of fluid administration in AKI and its relationship to outcome of the patients

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Abstract---Background: The concept of acute renal failure (ARF) has undergone significant re-examination in recent years. Mounting evidence suggests that acute, relatively mild injury to the kidney or impairment of kidney function, manifest by changes in urine output and blood chemistries, portend serious clinical consequences . Acute kidney injury (AKI) is a common pathology In the intensive care unit (ICU) and postoperative setting[3] and is often associated with hemodynamic instability requiring fluid resuscitation with large volumes of fluid. Over the last 5 years there has been increased recognition that fluid accumulation is common in these patients and is exacerbated once AKI and oliguria develop . Objective: To determine the mean fluid balance and correlate with the outcome measured in terms of Mortality and morbidity among the patients with AKI. Materials and Methods: The present prospective observational study was done by the Department of Emergency Medicine at tertiary care hospital, from July 2016 to December 2016 among the patients admitted with the diagnosis of Acute kidney Injury. Based on the previous studies using the sample size formula a minimum sample of 50 was obtained and selected for the purpose of the study who met

the inclusion criteria. Results: Majority of patients with AKI were in the age group of 61-70 with mean age of 58.5 ± 16.4 years. Out of 50 patients, incidence of AKI is more among males 29 (58%) when compared to females 21(42%). Out of 50 patients 34 (68%) of them presented with decreased urine output, 31(62%) of them presented with fever. Among the patients who required dialysis the mean fluid balance was 381.06 ml when compared to the patients with mean fluid balance of 526.41 who did not require dialysis. Out of 50 patients 44(88%) recovered and 6(12%) did not survive . Conclusion : Patients with diabetes / hypertension, especially in elderly need to be vigilant with respect to symptoms of AKI like oliguria. Goal directed fluid resuscitation is recommended in patients with AKI keeping in mind that higher MFB has been associated with higher mortality.

Keywords---kidney injury, azotemia, renal failure, oliguria, fluid replacement.

Introduction

The concept of acute renal failure (ARF) has undergone significant re-examination in recent years. Mounting evidence suggests that acute, relatively mild injury to the kidney or impairment of kidney function, manifest by changes in urine output and blood chemistries, portend serious clinical consequences^[1]. Traditionally, most reviews and textbook chapters emphasize the most severe reduction in kidney function, with severe azotemia and often with oliguria or anuria. It has only been in the past few years that moderate decreases of kidney function have been recognized as potentially important, in the critically ill, and in studies on contrast-induced nephropathy.^[2] Acute kidney injury (AKI) is a common pathology in the intensive care unit (ICU) and postoperative setting^[3] and is often associated with hemodynamic instability requiring fluid resuscitation with large volumes of fluid. Over the last 5 years there has been increased recognition that fluid accumulation is common in these patients and is exacerbated once AKI and oliguria develop^[4]. Several studies have shown that fluid accumulation has a significant relationship with adverse outcomes, including increased mortality and reduced renal functional recovery^[5]. Oliguria has been shown to be associated with a poorer prognosis ^[6]. Whether this is a reflection of the severity of the underlying disease or the positive fluid balance that ensues is unclear. These data have prompted several questions regarding the role of fluid administration in AKI, including the amount, type and duration of fluid and its relationship to outcomes ^[7].

Objective

To determine the mean fluid balance and correlate with the outcome measured in terms of Mortality and morbidity among the patients with AKI.

Materials and Methods

The present prospective observational study was done by the Department of Emergency Medicine at tertiary care hospital, from July 2016 to December 2016 among the patients admitted with the diagnosis of Acute kidney Injury. Based on the previous studies using the sample size formula a minimum sample of 50 was obtained and selected for the purpose of the study who met the inclusion criteria.

Inclusion Criteria

- All patients admitted in tertiary care hospital with raise in the renal parameters more than the baseline, or assumed creatinine value according to the definition mentioned below for AKI
- Acute on chronic kidney disease
- Age >15 yrs.

Exclusion Criteria

- Patients on maintenance haemodialysis
- Age <15 yrs.
- Fluid overload states other than CKD and AKI

As per the proforma, for patients admitted with AKI, relevant history was taken and necessary investigations like RFT, TLC, 2DECHO was done. Total amount of fluids given to the patient which included both oral and intravenous fluids, blood transfusions and total output of the patient was calculated on day to day basis during the entire hospital stay right from the admission in ER till discharge and net fluid balance was determined. Response to the amount of fluids given was monitored clinically, by relevant investigations and by CVP monitoring throughout the hospital stay. Mean fluid balance was calculated and outcome was measured in terms of mortality, need for dialysis and need for MV support.

Statistical Analysis

Data entry was done by Microsoft Excel 2007 version and analysis done using EPI INFO version 7. Data was presented in percentages and proportions. Chi square test/Fischer test was used wherever necessary with $p < 0.05$ considered statistically significant.

Results

A total of 50 study subjects were enrolled for the purpose of the study

Table 1
Social Profile of the study subjects

		No. of patients	Percentage
Age (years)	21-30	6	12.0
	31-40	1	2.0

	41-50	7	14.0
	51-60	11	22.0
	61-70	14	28.0
	71-80	7	14.0
	81-90	4	8.0
Gender	Female	21	42.0
	Male	29	58.0
Co Morbidity	Diabetic	36	72
	HTN	29	58
	CKD	10	20
	No co-morbidity	9	18

Majority of patients with AKI were in the age group of 61-70 with mean age of 58.5 ± 16.4 years. Out of 50 patients, incidence of AKI is more among males 29 (58%) when compared to females 21(42%). Out of 50 patients, 36(72%) of patients were diabetic, 29 (58%) of them were hypertensive, 10(20%) of them were known case of CKD and 9(18%) of the patients did not have any comorbidities.

Table 2
Distribution of study subjects based on dialysis, Symptoms and signs distribution

		No. of patients	Percentage
Symptoms	Decreased urine output	34	68
	Fever	31	62
	Vomiting/loose stools	23	46
	Shortness of breath	25	50
	Edema	8	16
	Others	2	4
Dialysis	Required	16	32
	Not required	34	68

Out of 50 patients 34 (68%) of them presented with decreased urine output, 31(62%) of them presented with fever, 25(50%) of them presented with vomiting / loose stools, 23 (46%) of them with SOB ,8 (16%) of them with edema and 2(4%) of them presented with other complaints.

Table 3
Mean fluid balance in Dialysis patients

Dialysis	Number of patients	Mean fluid balance (ml)	SD	P-value
Required	16	381.06	593.840	0.287
Not required	34	526.41	358.486	

Among the patients who required dialysis the mean fluid balance was 381.06 ml when compared to the patients with mean fluid balance of 526.41 who did not require dialysis.

Table 4
Distribution of study subjects based on the outcome of the study subjects

Outcome	No. of patients	Percentage
Recovered	44	88
Death	6	12
Total	50	100

Out of 50 patients 44(88%) recovered and 6(12%) did not survive.

Table 5
Mean fluid balance Vs Outcome

Outcome	No. of patients	MFB in L/24hrs	SD	p-value
Recovered	44	0.46	0.42	0.538
Death	6	0.58	0.61	

MFB was 586.5 in the non-survival group when compared to MFB of 465.36 in the survival group.

Discussion

This study mainly focuses on the mean fluid volume given to patients with AKI admitted in Yashoda hospital during the period of July 2016 to Dec 2016 meeting the inclusion criteria and its relationship with the final outcome in terms mortality and morbidity. In the Present study the mean age of incidence of AKI was found to be 58.5±16.4 years of age. In other studies, done by Prakash J et al^[8] reported a younger mean age of patients (44.9±17) while on otherhand, Teixeira C et al^[9] have reported a mean age of 66.3±14.1. By and large they are in agreement with the knowledge that nephron number and hence reserve capacity of kidney gradually declines with age. In the present study, incidence of AKI is more among males i.e 29 out of 50 (58%) when compared to females i.e 21 out of 50 (42%).

Similar male predominance was observed in Teixeira C et al^[9] study wherein 63.6% were males and 36.4% were females. In Bernieh B et al^[10] study 55.5% of patients with AKI were males when compared to 44.4% females. Similarly in Prakash J et al^[8] study , there was similar male predominance observed with 56.5% males and 46.5% females. The prevalence of diabetes is 72% which is more in the present study when compared to other studies. It is in stark contrast to prevalence of diabetes in general population (6.5% in 2014 according to WHO). This might indicate that incidence of AKI is more in Diabetics when compared to the normal population. Prevalence of HTN is 58% which is quite similar to Teixeira C et al^[9] study and more when compared to other two studies. Prevalence of CKD is 20% in the present study which is quite similar to other studies. In this study 18% of patients didn't have any comorbid conditions which indicates that incidence of AKI is high among patients with underlying comorbidities.

It was noted that Oliguria was the most common presenting feature, comprising of 68% in the present study. This finding was comparable with the studies done

by Teixeira C et al^[9] which showed oliguria comprising of 68.9% and Bernieh B et al^[10] which showed oliguria comprising of 78%. In the present study it was found that fever was seen in 62% which might indicate an infection as precipitating event or might be due to superimposed hospital acquired infections. Vomiting and shortness of breath were found to be in 46% and 50% of patients respectively, whereas in Bernieh B et al^[10] study vomiting comprised of 80% and in Teixeira C et al^[9] study SOB comprised of 33.3%.

In the present study 16% of the patients were found to have edema which is comparable with Bernieh B et al^[10] study i.e 20%. In the present study, out of 50 patients 16 of them (32%) needed dialysis. Among the patients requiring dialysis, 12 of them survived (75%) and 4 of them did not survive (25%). In Teixeira C et al^[9] study 50.8% of the patients required dialysis which is more when compared to the present study. Among them 45.5% survived and 54.5% of them did not survive. Mortality rate of patients requiring dialysis in this study is comparatively higher than the present study. In Prakash J et al^[8] study 54.3% of the patients required dialysis which is again higher when compared to the present study. Among these patients' survivors were 20% and 80% were non-survivors which was again more compared to the present study. Higher mortality in patients requiring dialysis might be because of the severe form of disease at presentation.

In the present study out of 50 AKI patients, 44 (88%) patients survived and 6 (12%) of them were non-survivors. Non-surviving patients had higher mean fluid balance (0.61 ± 0.61 L/day) when compared to the survival group (0.46 ± 0.42 L/day) with p value of 0.53. This is statistically not significant but numerologically significant. This study is comparable with the Teixeira C et al^[8] study, wherein out of 132 patients 50% of mortality was observed. Non-surviving patients had higher mean fluid balance (1.31 ± 1.24 L/day) when compared to the survival group (0.17 ± 0.72 L/day) with p value of <0.001 which was statistically significant. This further reiterates that higher mean fluid balance is associated with worst outcomes in general and higher mortality in particular.

Conclusion

Patients with diabetes / hypertension, especially in elderly need to be vigilant with respect to symptoms of AKI like oliguria. Goal directed fluid resuscitation is recommended in patients with AKI keeping in mind that higher MFB has been associated with higher mortality. Further studies need to be done regarding optimal fluid management in AKI patients with respect to etiology and presence or absence of oliguria.

References

1. Hoste EAJ, Clermont G, Kersten A, Venkataraman R, Angus DC, De Bacquer D, et al. RIFLE criteria for acute kidney injury are associated with hospital mortality in critically ill patients: a cohort analysis. *Crit. Care* 2006;10(3):R73.
2. Levy EM, Viscoli CM, Horwitz RI. The effect of acute renal failure on mortality. A cohort analysis. *JAMA* 1996;275(19):1489-94.
3. Chertow GM, Burdick E, Honour M, Bonventre J V, Bates DW. Acute kidney injury, mortality, length of stay, and costs in hospitalized patients. *J Am Soc*

- Nephrol 2005;16(11):3365–70.
4. Payen D, de Pont AC, Sakr Y, Spies C, Reinhart K, Vincent JL. A positive fluid balance is associated with a worse outcome in patients with acute renal failure. *Crit Care* 2008;12(3):R74.
 5. Bouchard J, Soroko SB, Chertow GM, Himmelfarb J, Ikizler TA, Paganini EP, et al. Fluid accumulation, survival and recovery of kidney function in critically ill patients with acute kidney injury. *Kidney Int* 2009;76(4):422–7.
 6. Macedo E, Malhotra R, Bouchard J, Wynn SK, Mehta RL. Oliguria is an early predictor of higher mortality in critically ill patients. *Kidney Int* 2011;80(7):760–7.
 7. Godin M, Bouchard J, Mehta RL. Fluid balance in patients with acute kidney injury: emerging concepts. *Nephron Clin Pract* 2013;123(3–4):238–45.
 8. Prakash J, Murthy a S, Vohra R, Rajak M, Mathur SK. Acute renal failure in the intensive care unit. *J Assoc Physicians India* 2006;54(October):784–8.
 9. Teixeira C, Garzotto F, Piccinni P, Brienza N, Iannuzzi M, Gramaticopolo S, et al. Fluid balance and urine volume are independent predictors of mortality in acute kidney injury. *Crit. Care* 2013;17(1):R14.
 10. Bernieh B, Al Hakim M, Boobes Y, Abuchacra S, Dastoor H. Pattern of acute renal failure in a tertiary hospital in the United Arab Emirates. *Transplant Proc [Internet]* 2016;36(6):1780–3.
 11. Widana, I.K., Dewi, G.A.O.C., Suryasa, W. (2020). Ergonomics approach to improve student concentration on learning process of professional ethics. *Journal of Advanced Research in Dynamical and Control Systems*, 12(7), 429-445.
 12. Widana, I.K., Sumetri, N.W., Sutapa, I.K., Suryasa, W. (2021). Anthropometric measures for better cardiovascular and musculoskeletal health. *Computer Applications in Engineering Education*, 29(3), 550–561. <https://doi.org/10.1002/cae.22202>
 13. Gandamay, I. B. M., Antari, N. W. S., & Strisanti, I. A. S. (2022). The level of community compliance in implementing health protocols to prevent the spread of COVID-19. *International Journal of Health & Medical Sciences*, 5(2), 177-182. <https://doi.org/10.21744/ijhms.v5n2.1897>