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ACUTE KIDNEY INJURY IN HOSPITALIZED PATIENTS FREQUENCY OF VARIOUS ETIOLOGIES.

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ABSTRACT… Objectives: To identify magnitude of various etiologies causing acute kidney injury (AKI) in hospital admitted patients at Nishtar hospital, Multan. **Study Design:** Cross sectional observational study. **Setting:** Medical Unit-IV, Nishtar Hospital and Medical University, Multan. **Period:** The study span was six month extending from February 2018 to July 2018. **Material and Methods:** In our setting, we took a sample of 383 patients admitted to medical unit- IV for variety of medical conditions using non-probability purposive sampling technique. Patients having an age range of 30-70 years and either gender were taken. Those patients who had previously deranged kidney functions, Reno grafting, snake envenomation and kalapathar (PPD) poisoning were not considered for study. **Results:** The age of patients ranged from 36 years to 62 years and had a mean of 47.94±8.14 years. There were54% male and 46% female patients in our setting. The most common presenting medical disorders requiring indoor admission were pulmonary diseases seen in 38.9% patients then hepatobiliary disorders 27.4%, infections 24% and diabetes 9.6%. Out of 383 patients, 107(27.9%) patients had AKI. It was more prevalent (p=0.000) diabetic patients 46%, hepatobiliary disorders 36.1%, infectious diseases 27.1% and then respiratory tract diseases 18.1%. While working on etiological causes of AKI, we found drugs were frequent inciting factor, present in 39.3% patients then was sepsis 19.6%, volume loss 17.7% and hypotension 8.5%. Combined fluid depletion plus sepsis was noted in 6.5% patients followed by sepsis plus drugs in 4.6% and sepsis plus drugs plus hypotension seen in 3.7% patients. However, drugs were major contributory factor of AKI in patients having hepatobiliary diseases 65.8% and diabetes 35.3%. In patients of respiratory tract diseases having AKI, fluid loss 36.0% and sepsis 28.6% were recurring findings. Among patients of infectious diseases, sepsis 40% and drugs 28% were more common. **Conclusion:** Occurrence of Acute kidney injury among hospitalized patients was statistically significant (p=0.000) in patients with diabetes mellitus and hepatobiliary disease at the time of admission. While noting etiological factors, it was seen that drugs were the most prevalent followed by septicemia, then hypovolemia among the factors responsible for AKI.

Key words: Acute Kidney Injury, Etiological Causes, Hospital Admitted Patients.

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INTRODUCTION

Acute renal failure (ARF) and Acute Kidney Injury (AKI) signify disease complex which occur in the background of different medical catastrophes and manifests itself in any way like minimal rise in serum creatinine to complete cessation of urine. Most of the time it remains under-diagnosed and then results in adverse outcomes.[1] Clinical complex leading to fall in glomerular filtration rate (GFR) and urine output is essentially labeled as acute kidney injury (AKI).[2] Acute kidney injury(AKI) is common in the background of other medical disorder and is responsible for high mortality in these conditions.[3] The prevalence of AKI is showing up soaring trend and risk of death is still high despite of massive research efforts.[4-5] It becomes essentially significant to identify the underlying causes of ARF, as outcome is greatly influenced by specific underlying etiology.[6] Epidemiological surveys may be helpful to chalk out planning and develop ways to identify controllable and reversible factors causing ARF.[7] ARF related to obstetric diseases and fluid depletion from gut are examples of reversible and controllable causes.[8] It's a dilemma that these frequently encountered conditions are more

common in the developing as compared to the developed countries.[9]

AKI is more frequently seen in hospitalized settings in comparison to community settings.[10] In hospitalized patients, AKI tends to be a grave manifestation where it occurs in combination of various co morbidities and it reaches at a frequency of 20% to 40%.[11]

In 2013, Schissler et al[12] studied different causes of AKI and suggested that volume loss (26.4%) and drugs (17.2%) are the most frequent etiologies leading to AKI. Singh et al.[13] in 2013found that drugs 39.2%, septicemia 19.6%, fluid loss 17.8%, hypotension 7.8% are commonly encountered factors responsible for AKI.

By providing optimal care and expedient management, it is possible to minimize risk of AKI and in turn minimizing morbidity and mortality.[14] As Nishtar hospital, Multan is the largest medical institute in South Punjab and so far, no study has been done here to identify reversible causative factors of AKI. The results of this study may then be generalized to identify patient population having risk of AKI and also etiological causes which endanger the patients for AKI. By doing so, in time intervention and planning steps can be taken in order to avoid undue morbidity and mortality linked to AKI.

MATERIALS AND METHOD

In our setting, we took a sample of 383 patients admitted to medical unit- IV for variety of medical conditions using non-probability purposive sampling technique. Patients having an age range of 36- 62 years and either gender were taken. The study span was six month extending from February 2018 to July 2018. Those patients who had previously deranged kidney functions, Reno grafting, snake envenomation and kalapathar (PPD) poisoning were not considered for study. Once included in study, the 1st level of serum creatinine was labeled as the base line value. Persistence of serum creatinine above 2 mg/dl (177μmol/L) on two blood samples drawn with 12 hours interval, in spite of resuscitation for any hemodynamic or mechanical compromise was labeled as Acute Renal Failure (ARF). History, physical examination and investigations were carried out to reach the cause of acute renal failure.

To identify the etiology of ARF, we applied different clinical criteria. Fall in blood pressure less than 90/60 mmHg, postural hypotension and signs of fluid loss were indicative of renal hypo perfusion.

Drug induced nephrotoxicity was causative factor if a patient took any of known nephrotoxic medicine for at least 3 days during his/her hospital stay. Sepsis was considered in those who had positive blood culture or fever $>$ 100°F (37.5°C) and associated with TLC $>10\times10^9$ /L. Presence of urinary sodium $<$ 10 mEq/L in a patient severe liver failure was thought to have hepatorenal syndrome. All data were entered in a pre – tested, pre designed and validated proforma.

The data analysis was done by using SPSS-version 24. Frequencies were calculated for qualitative variables such as diabetes, hypotension, sepsis, respiratory illness, hepatobiliary diseases, gender and acute kidney injury while mean and standard deviation were evaluated for the age of sample patients. Association of various underlying factors with AKI were ascertained by applying Chi-square test and keeping confidence level 95%.

RESULTS

The age of patients in our study ranged from 36 years to 62 years and had a mean of 47.94$\pm$8.14 years. There were54% male and 46% female patients in our setting. The most common presenting medical disorders requiring indoor admission were respiratory tract disease seen in 38.9% patients then hepatobiliary disorders 27.4%, infections 24% and diabetes 9.6% as shown in Table-I.

Out of 383 patients, 107(27.9%) patients had AKI. It was more prevalent (p=0.000) diabetic patients 46%, hepatobiliary disorders 36.1%, infectious diseases 27.1% and then pulmonary diseases 18.1% (Table-II). However, statistical difference in the rate of AKI in male versus female was not pronounced (25.8% vs. 28.6%; p=0.525).

While working on etiological causes of AKI, we found drugs were frequent inciting factor, present in 39.3% patients then was septicemia 19.6%, fluid loss 17.7% and low BP 8.5%. Combined fluid depletion plus septicemia was noted among 6.5% patients followed by septicemia plus drugs/ medication in 4.6% and septicemia plus drugs plus low BP seen in 3.7% patients (Table-III).

There was little statistical difference with regard to age (p=0.153) and gender (p=0.371) when stratification of the responsible factors against age and sex was done. However, drugs were major contributory factor of AKI in patients having hepatobiliary diseases 65.8% and diabetes 35.3%. In patients of respiratory tract diseases having AKI, fluid loss 36.0% and septicemia 28.6% were recurring findings. Among patients hospitalized with infectious diseases, septicemia (40%) and drugs (28%) were more common. The difference observed was significant statistically having p<0.000. (Table-IV).

Medical Disease at Admission	Frequency	Percentage
Hepatobiliary Disorders	105	27.4
Pulmonary diseases	149	38.9
Infectious diseases	92	24
Diabetes mellitus	37	9.6
Total Patients	383	100.0

Table-I. Frequency of various medical disorders enforcing hospital admission

AKI	Medical Disorders Enforcing Admission (n=383)				P-Value
	Hepatobiliary Disorders	Pulmonary diseases	Infectious diseases	Diabetes mellitus	
Yes (n=107)	38(36.1%)	27(18.8%)	25 (27.1%)	17 (46%)	0.000
No (n=276)	67(63.8%)	122(81.2%)	67 (72.8%)	20 (54%)	
Total	105 (100%)	149 (100%)	92(100%)	37 (100%)	

Table-II. Frequencies of AKI among medical disorders enforcing admission.

Responsible Factors	Frequency	Percentage
Fluid loss/Hypovolemia	19	17.7
Drugs/Medication	42	39.3
Septicemia	21	19.6
Low BP	9	8.4
Fluid Loss plus Sepsis	7	6.5
Septicemia plus Drugs	5	4.6
Drugs plus Hypotension plus Sepsis	4	3.7
Total	107	100

Table-III. Frequency of various etiological factors

Responsible Factors	Underlying medical disorders enforcing admission (n=107)				P-Value
	Hepatobiliary Disorders	Pulmonary Diseases	Infectious Diseases	Diabetes Mellitus	
Fluid Loss	4 (10.5%)	10 (36.0%)	3 (12 %)	1 (5.8%)	0.000
Medication/Drugs	25 (65.8%)	4 (15.8%)	7 (28%)	6 (35.3%)	
Septicemia	1 (2.6%)	8 (28.6%)	10 (40%)	2 (11.7%)	
Low BP	1 (2.6%)	3 (12.2%)	2 (8%)	2 (11.7%)	
Fluid loss plus Sepsis	3 (7.8%)	1 (3.7%)	2 (8%)	3 (17.6%)	
Septicemia plus Drugs	3 (7.8%)	1 (3.7%)	1 (4%)	NIL	
Septicemia plus Drugs plus Low BP	1 (2.6%)	NIL	NIL	3 (17.6%)	
Total	38 (100%)	27 (100%)	25 (100%)	17 (100%)	

Table-IV. Comparison of etiological factors across different underlying medical conditions

DISCUSSION

Acute kidney injury (AKI) is overburdening and exhausting health care facilities and resources. However, AKI is frequently being encountered in hospital settings rather than in the community. In hospital admitted patients, AKI is a grave situation when it is accompanied by other co morbid health issues that coexist in 20% to 40% of the cases.[15] In our study, 107 (27.9%) patients had AKI. Our results closely resemble with results of Coca et al;[16] who noticed 26.6% frequency in US population and Medve and Gondos[17] found 24.4% frequency of AKI in Hungarian people. The intention to conduct this study was to find out the frequency of various etiologies causing AKI in tertiary hospital settings.

The age of cases in our study ranged from 36 years to 62 years and had a mean of 47.94±8.14 years. Mean age of patients which Schissler et al[12]; noticed in American population having indoor admission related AKI was 69.5±11.1. This difference is believed to be due to longer life span of Americans. In our setting, we had 54% males and 46% females. Wang et al[18]; in (2012) had also seen a slightly high male predominance (51.9% vs. 48.1%) of AKI in American Population. Wang et al;[18] also noted that the among the underlying causes enforcing hospital admission commonest was pulmonary diseases seen in 39.9% patients, then hepatobiliary disorders 26.4%, infectious diseases 23.8% and diabetes mellitus 9.9%. Our findings resembles with that of Schissler et al[12]; who observed pulmonary diseases in 39.6% of admitted patients. In another study, AKI was noticed in patients with pulmonary diseases at a rate of 30% at the moment of ICU admission.[19] In Indian study conducted in 2013 by Singh et al[13]; noticed somewhat similar frequencies i.e. hepatobiliary disorders 25.49%, infectious diseases 21.57% and diabetes mellitus 3.92%. Upon identification of individual risk factors instigating AKI, drugs were predominant, seen in 39.3% patients then septicemia in 19.6% patients and fluid loss/hypovolemia in 17.7% patients. In India Reddy KT et al;[20] collected data of ICU admitted patients having AKI and found sepsis in 32%, fluid loss in 61.3% of patients causing acute renal failure . Kim MH et al;[21] found that AKI was more common in patients admitted with respiratory disease up to 50.5 % followed by diabetes mellitus up to 26.1% and those with liver disease frequency was 20.8%. Iavecchia L et al[22], has identified that drugs contribute to 54.1% cases of AKI in hospitalized patients.

Combined fluid loss plus sepsis was noticed in 6.5% patients followed by septicemia plus drugs in 4.6% and septicemia plus drugs plus hypotension in 3.7% patients. In another Indian study Singh et al;[13] noted frequencies of various causes of AKI like drugs 14.8%, sepsis 53.1%, volume loss 6.5%. Davenport A et al;[23] noted that impaired renal function occurs in 25% to 50% of cirrhotic patients having acute hepatic decompensation.

When the etiological factors instigating AKI were stratified, difference with respect to age ($p=0.172$) and sex ($p=0.431$) was statistically insignificant. However, drugs contributed to majority of AKI cases in patients having hepatobiliary disorders i.e. 65.7% and diabetes mellitus i.e. 38.9%. Patients having pulmonary diseases developed AKI in the background of fluid loss (37.0% cases) and septicemia (29.6% cases). Patients admitted with infectious diseases developed AKI more frequently due to septicemia (37.5% cases) and drugs (29.2% cases). The difference was statistically pronounced ($p=0.000$). Ali et al.[24] conducted a study in Northern Scotland and found septicemia was a predisposing factor in 47% of patients and fluid loss up to 32%. Bagshaw et al[25] also noted sepsis in 42.1% of AKI patients. Martin GS et al;[26] noticed that sepsis contributed to AKI in15% patients and the results were very much similar to our results as we noted septicemia as precipitant cause in 19.2% patients.

Our study is unique in a sense as it is first of its kind in local population. It will provide solid baseline data regarding frequency of different instigating factors causing AKI. We observed that presences of few instigating factors in association with certain peculiar medical disorders are more hazardous regarding AKI acquisition. Once identified measures can be taken to decrease the load of AKI in hospital settings just by avoiding

that particular instigating factor.

CONCLUSION

Acute kidney injury is an serious threat among hospital admitted patients. Occurrence of Acute kidney injury among hospitalized patients was statistically significant (p=0.000) in patients with diabetes mellitus and hepatobiliary disease at the time of admission. While noting etiological factors, it was seen that drugs were the most prevalent followed by septicemia, then hypovolemia among the factors responsible for AKI. Drugs cause more serious harms in patients with hepatobiliary diseases and diabetes. Fluid loss and septicemia are more injurious to cause AKI in patients with pulmonary diseases. Taking into account of all above data regarding precipitating medical conditions and etiological factors we can chalk out plan to reduce the magnitude of the problem and longer indoor stay of the patients.

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3	Mehboob Qadir	Data collection, Co-ordination with Co-author.	