ORIGINAL RESEARCH PAPER

Biochemistry

TO STUDY THE LAB PROFILE OF ACUTE RENAL FAILURE IN DIFFERENT STAGES OF SEPSIS SYNDROME.

KEY WORDS: Acute Renal failure, Kidney function test, clinical manifestation

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ABSTRACT

Renal involvement in sepsis syndrome especially in critically ill patients is common and sepsis still remains a major problem both as a precipitating and complicating factors in acute Kidney injury.

Aims And Objectives:- To study the clinical manifestations and lab profile of acute renal failure in different stages of sepsis syndrome.

Materials Sand Methods:- Fifty patients of septicaemia with renal involvement were studied in the department of Biochemistry, Patna medical college, Patna from January 2019 to December 2020. Result:- Azotemia, oliguria, metabolic acidosis, anaemia, hyperkalemia hypocalcemia and proteinuria were the commonly encountered renal manifestations in patients with sepsis syndrome.

Conclusion:- Diabetes mellitus, hypertension, older age (>60 years), pre-existing CKD, nephritic syndrome, HIV infection, malignancy and nephrotoxic drug intake were important risk for the development of sepsis, AKI or both.

INTRODUCTION

Sepsis syndrome is very often associated with a downward spiral through a spectrum of systemic of systemic inflamm atory response syndrome (SIRS) culminating in organ failure and death[1]. They are frequently encountered disorders in critical care environment and are associated with increased morbidity and mortality[2,3,4]. The mortality in sepsis syndrome increases as SIRS progress to an established state of shock associated with failure of an increasing numbers of organ systems[1].

Spesis and particularly septic shock are important risk factors for the development of acute kidney injury (AKI). AKI in sepsis is generally not an isolated event but often a component of the multiple organ dysfunction syndrome (MODS) that may complicate sepsis[5].

Complicating AKI in sepsis adversely affects the outcome [1,5,6]. Preexisting renal insufficiency also serves as a common risk factor in the development of AKI in sepsis syndrome [6]. It is of interest to note that while survival form isolated AKI has improved, mortality rates over the last 30 years, despite significant improvements in resuscitation and renal supoort[5].

MATERIALS AND METHODS

The present was conducted in the department of Biochemistry, Patna medical college, Patna from December 2019 to 31st September 2020. The diagnosis was based on detailed history and KFT analysis. Blood sample was taken from all aseptic conditions and sample was analysed for KFT. Data was clinically analysed.

RESULT

50 patients of septicaemia with renal involvement were studied. Their age distribution is as follows.

Table-1 : Age Distribution

Age (years)	No. Of patients (n=50)	Percentage of Patients (%)
15 – 30	9	18
31 – 45	15	30
46 – 60	13	26
>60	13	26

3.% of patients belonged to the age group of 31-45 yrs. While 26% of patients were in the age group of 40-60 yrs;. and 26% were above the age of 60 yrs. 18% of patients belonged to the age group of 15-30 yrs.

Table-2: Sex Distribution

Age (years)	No. Of patients (n=50)	Percentage of Patients (%)
Male	35	70
Female	15	30

Sex distribution of 50 septicaemic patients with renal involvement is as follows.

There was a male preponderance found with the M : F ratio being 2.3:1

Table-3 : Renal Manifestation in Different Subgroups of Sepsis Syndrome

Renal Manifestation	Sepsis /SIRS (n=19) [%]	Severe Sepsis/ Severe SIRS (n=2) [%]	Septic Shock/ SIRS shock (n=15) [%]	MODS (n = 2) [%]	Refractory septic shock (n=12) [%]	Total (n=50) (%)
Pyuria	8[42]		2[13]			10[20]
Oliguria	17[89]	2[100]	14[93]	2[100]	12[100]	47[94]
Hematuria	4[21]			1[50]		5[10]
Proteinuria	8[42]	2[100]	5[33]			15[30]
Azotemia	19[100]	2[100]	15[100]	2[100]		50[100]
Uraemia	4[12]		3[20]	1[50]	12[100]	12[24]
Fluid overload	3[15]	1[50]			4[33]	4[8]
Metabolic acidosis	17[89]	1[50]	15[100]	1[50]		44[88]
Hyponatremia	3[15]	1[50]	2[13]		10[83]	10[20]
Hypernatremia					4[33]	2[4]
Hypokalemia	1[5]	1[50]	1[6.6]		2[16]	4[8]
Hyperkalemia	10[52]	1[50]	5[33]		1[18]	21[42]
Hypocalcemia	12[63]		5[33]		5[41]	18[36]
Hyperphosphatemia	8[42]	1[50]	2[13]		1[8]	12[24]

Hyperuricemia	9[47]		1[6.6]		1[8]	11[22]
Anaemia	16[84]	2[100]	9[60]	2[100]	6[50]	35[70]

Renal manifestations were studied in different subgroups of patients with sepsis syndrome and results obtained are as follows :

In sepsis/SIRS azotemia (100%), oliguria and metabolic acidosis (89%) each, anaemia (84%), hypocalcemia (63%), hyperkalemia (52%) were the most common manifestations, Hyperuricemia (47%) protein uria, pyuria, hyperphos phatemia (42%) each were less common manifestations and hematuria, uraemia (21%) each, fluid overload, hyponatremia (15%) each, hypokalemia (5%) were the least common manifestation.

In severe sepsis/severe SIRS oliguria, proteinuria, azotemia anaemia (100%) each were more common manifestations and fluid overload, metabolic acidosis, hyponatremia, hypo/hyperkalemia, hyperphosphatemia (50%) each were loss common manifestations.

In septic shock/SIRS shock azotemia, metabolic acidosis (100%) each, oliguria (93%) were the most common manifestations. Proteinuria, hyperkalemia hypocalcemia (33%) each were less common and uremis (20%), pyuria, hyponatremia, hyperphosphatemia (13%) each, hypokale mia, hyperuricemia (6.6%) were least common manifes tations.

In MODS oliguria, azotemia, anaemia (100%) each were more common and proteinuria, uraemia, metabolic acidosis (50%) each were less common manifestations.

In refractory septic shock oliguria, azotemia (100%) each, metabolic acidosis (83%) were the most common and anaemia (50%), hyperkalemia (41%), uraemia, hyponatremia (33%) each were less common and hypernatremia, hypokalemia (16%) each, hypocalcemia, Hyperphospha temia, hyperuricemia (8%) each were least common manif estations.

Overall oliguria, azotemia, metabolic acidosis, hyperkalemia, hypocalcemia, anaemia are the most common manifestations and pyuria, hematuria, proteinuria, fluid overload, hyperu ricemia, hyperphosphatemia are less common and hypokale mia, hypernatremia are least common manifestations.

Table-4 : Correlation Of Severity Of Arf According To Serum Creatinine Levels With The Outcome

Mean serum creatinine [mg%]	No. of Patients n [50]	Mortality N (27) [%]
1.2-3	18	11 [40.7]
>3	32	16 [59.2]

Severity of AKI according to serum creatinine levels with the outcome is determined in the patients are as follows.

Mortality in patients with mean serum creatinine of > 3 mg% was found to be higher (59.2%) than patients with serum creatinine value of 1.2-3 mg% that is (40.7%).

DISCUSSION

Renal involvement in sepsis syndrome especially in critically ill patients is common and sepsis still remains a major problem both as a precipitating and complicating factors in acute Kidney injury.

In the present study, 50 patients of sepsis syndrome with renal involvement were studied. The mean age (in years) was 44.4 with an age range of 15 to 80 years, with male; female ratio being 2.3:1 A Study by Karnik A.M et al[20] has also reported a male predominance in their study of 35 patients with systemic inflammatory response syndrome (SIRS), especially below the age of 40 years. They have concluded that premenopausal women seem to be protected.

As per the 1992 & 2001, ACCP/SCCM consensus conference definition criteria[7] of sepsis 38% of patients had sepsis/SIRS, 30% HAD SEPTIC SHOCK SIRS shock, 24% were in refractory septic shock and 4% had secere sepsis and MODS respectively in our study.

The commonest focus of infection in the present study was respiratory tract (26%) followed by kidney and urinary tract (22%) and skin and soft tissue (22%). This was followed by intra-abdominal causes (20%), OBGY infection (10%) and postoperative causes (8%), Orodental (2%) was the least common source of infection. This report is in accordance with the National Nosocomial Infections Surveillence (NNIS) system report (1992 to 1997) where nosocominal pneumonia was ranked second most common hospital acquired infection just behind the urinary tract infection and both types of infection are frequent causes of sepsis due to gram negative bacteria[2].

Among the renal manifestations studied Azotemia (100%), oluguria (94%), metabolic acidosis (88%), Anemia (70%), Hyperkalemia (42%), hypocalcemia (36%), proteinuria (30%) were commonly incountered while uraemia (24%), hyponatremia (20%), hematuria (10%), fluid overload (8.1%), hypokalemia (8%), hypernatremia (4%) were less commonly encountered in patients with sepsis syndrome and AKI in present study.

Of the various types of renal failure studied in patients with sepsis syndrome, intrinsicrenal injury (54%) was commonly encountered followed by pre renal (26%) and AKI on CKD (20%). This can be partly explained by the fact that sepsis affects renal function not only by it's systemic hemodynamic effects but also by directly causing an imbalance between the vasodilatory and vasoconstrictory substances locally in the kidney with the aid of myriads of soluble mediators thereby profoundly declining the renal blood flow[16]. These mediators also have a direct toxic effect on renal tubular cells 11. Also most of the patients were from medical intensive care unit and were critically ill for a longer time prior to admission thereby might have already progressed from pre-renal to intrinsic renal failure on admission. Nephrotoxic drugs might have added to the intrinsic renal injury in 12 patients who received them.

Overall mortality studied in patients with sepsis syndrome and AKI was 54% Neveu.H. et al[11] reported that only 10-30% of patients with sepsis induced AKI will leave the hospital alive

Hombarbi. R. Et al[22] reported a crude mortality of 74% among their 168 patients of sepsis induced AKI.

A higher mortality of 100% was found in patients with regractory septic shock followed by septic shock group (40%) then with sepsis/SIRS (31.5%). As sepsis syndrome is a continuum of injury response ranging from sepsis to septic shock to refractory septic shock, it is expected that the mortality rate will also increase with progression from sepsis to refractory septic shock as found in present study. Mortality was reported as 17% in patients with sepsis, 20% severe sepsis and 46% in patients with septic in a study on natural history of SIRS by ranger franssto M. Et al.[2]

A recent review of severe sepsis in French intensive care unit found a 28 day mortality rate of 58%.[2]

The present study has also shown that intrinsic renal failure is associated with statistically significant increased mortality of 81.4% compared with 38.4% in pre-renal and 10% in AKI on

CKD group. AKI in sepsis is often a component of the multiple organ dysfunction syndrome that may complicate sepsis indicating that similar mechanism are operative in inducing dysfunction of various organ system[5]. Thus pre-renal renal failure may indicate lesser degree of insult that is reversible by adequate management of pre-renal adverse events while development of intrinsic renal failure would indicate a more severe degree of insult mandating rnal replacement therapy. Complicating AKI in sepsis is known to adversely affect the outcome thus enhancing the higher motality in patients with intrinsic renal failure in the present study in comparison to those with pre-renal failure.

Lowest mortality of 10% in the AKI on CKD group in the present study is due to the fact that 80% of patients with AKI on CKD belonged to the sepsis/SIRS group which had the least mortality of 31.5%. Also similar low mortality in patients with pre-existing CKD is reported by Groveneveld AB. Et al[23] in a study of ARF in MICU starting that patients with AKI on CKD may be accustomed to the loss of renal function.

The present study also showed an increased mortality of 59.2% in patients with serum creatinine value above 3 mg% as compared to mortality of 40.7% in those with serum creatinine value less than 3mg%. Similar findings of increased mortality of bacteraemic patients with serum creatinine value above 3 mg% has been reported by Shmuely et al 6 in a study on 2722 bacteraemic patients Susan H Hou et al[24] has reported a mortality rate of 64% in patients with serum creatinine value above 3 mg% compared to 15% in patients with serum creatinine 3 mg% in a study of hospital acquired AKI. This finding can be explained by the fact that mortality is higher in patients with severe degree of renal failure.

Mortality in the present study was higher in those patients of sepsis induced AKI who did not receive renal replacement therapy (62.4%) compared to those who receive the same 38%. Other studies have not documented a substantial benefit of renal replacement therapy in modifying the mortality rate in patients with AKI. Stott et al[25] has documented a 54% mortality rate with peritoneal dialysis 70% mortality rate with hemodialysis, 67% mortality rate with both hemodialysis and peritoneal dialysis together and 41% mortality with conservative treatment in their patients with AKI. This discrepancy rekects the difference for renal replacement therapy and possibly also the timely availability of the hemodialysis facility.

Elderly age, Diabetes mellitus, malignancy, HIV infection and nephritic syndrome compromise the host defense system and increase the likehood of infection and potentially the development of sepsis[2] Old age, hypertension, diabetes mellitus causes afferent arteriolar pathology in the kidney which limits renal autoregulation consequently, glomerular filtration may decrease already at minor reductions of blood pressure. This predisposition causes them to easily develop renal failure in syndrome[11].

CONCLUSION

1. Males predominate females by a ratio of 2.3:1 in developing sepsis induced AKI however mortality remains uninfluenced by sex .Age above 60 is associated with increased risk of developing sepsis induced AKI and is also associated with a higher mortality due to same. Azotemia, oliguria, metabolic acidosis, anaemia, hyperkalemia hypocalcemia and proteinuria were the commonly encountered renal manife stations in patients with sepsis syndrome. Mortality increases with increasing severity of renal failure as indicated by a serum creatinine above 3 dmg./dl. Diabetes mellits, hypertension, older age (>60 years), pre-existing CKD, nephritic syndrome, HIV infection, malignancy and nephrotoxic drug intake were important risk for the develop ment of sepsis, AKI or both.

REFERENCES

1. BREEN D and BIHARI D in acute renal failure as a part of multiple organ failure, the slippery slope of critical illness. Kidney international vol. 53; supplement 66 (1998), s-25 to s-33.
2. BALK R and LARRY C. In severe sepsis and septic shock, definition, epidemiology and clinical manifestations, critical care clinics vol. 16, April 2000; 179-192.
3. BALK R and BONE RC in the septic syndrome, definition and clinical implication critical case clinics vol. 5; 1989, 1-8.
4. BONE RC in the pathogenesis of sepsis annals of int. Medicine vol. 115; 1991, 457-469.
5. ABEL THIJS and LAMBERT THIJS in pathogenesis of renal failure in sepsis kindney international vol. 53, suppl. 66; 1998, s-34 to s-37.
6. JOCHIMESEN F, SCHAFER J H. MAURER A, DISTLER A in impairment of renal function if medical intensive care. Predicatability of acute renal failure critical care Med. 1990; 18, 480-485.
7. LINE and CHAN in factors influencing survival in ARF treated by hemodialysis Am. Journal of Med. Vol. 145, non. 1985; 2067-2069.
8. BALSLOV J.T. JORGENSEN H E in a survey of 499 patients with acute renal insufficiency causes, treatment complications and mortality Am. Journal of Med. 1963; 34, 753-764.
9. HALL J W, JOHNSON W J, MAHER ET et al in immediate and long-term prognosis in ARF Am. Intern Med. 1970; 73, 515-521.
10. KUMAR R, HILL L M, MCGEOWN M G in ARF in the elderly. Lancel – 1973; 1, 90-91.
11. MC LEISH K R, FUFY F C, KLEIT S A in factors affecting prognosis in acute renal failure following cardiac operations surgery Gynecology, obstetrics Journal 1977; 145, 329-341.