



STUDY OF ETIOLOGY, CLINICAL CHARACTERISTICS AND OUTCOME OF CARDIORENAL SYNDROME IN A TERTIARY CARE HOSPITAL.

General Medicine

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ABSTRACT

Introduction: Cardiorenal syndrome is defined as disorders of heart and kidney whereby acute or chronic dysfunction in one organ may induce acute or chronic dysfunction of other. **Aim :** To study the etiological comorbidities, clinical characteristics and outcome of various cardiorenal syndrome and correlation of SOFA SCORE with outcome of cardiorenal syndrome. **Materials and methods :** A prospective observational study was conducted over 18 months on 120 patients diagnosed with various types of cardiorenal syndromes in a tertiary care hospital. All relevant history, examination findings, clinical presentation, laboratory parameters like CBC, detailed LFTs, RFTs, ECG findings, X ray chest, 2 D Echo findings, USG abdomen noted. SOFA score was calculated at 0 and 48 hrs of admission. **Results:** In our study out of 120 patients with CRS 64.16% were male and 35.84% were female, 40 % were smokers, 35.83% had diabetes, 32.5% were hypertensive and 44 % had other systemic illnesses, highest mortality (85.71%) was found in CRS 3 followed by CRS 5 (56.67%), CRS 4 (33.33%). 100 % of patients with CRS 3 needed hemodialysis while 33 % of CRS 1, 34 % of CRS 2, 58 % of CRS 4 and 47 % of CRS 5 patients required hemodialysis. Mean SOFA score on admission in those who died was 6.72 ± 2.27 and those who discharged was 4.06 ± 3.67 . Mean SOFA score at 48 hrs of admission in those who died was 8.02 ± 2.56 and those who discharged was 2.02 ± 1.82 . Out of 40 (36.67%) deaths, 66% had hypertension and 48.83 % had diabetes. **Conclusion:** CRS can occur in all age groups with male preponderance, need of ICU care and hemodialysis was higher among CRS type 3 patients whereas mortality was highest in type 3 CRS. Poor is the SOFA score worst is the prognosis. Hypertension and diabetes were associated with poor outcome whereas SLE, leptospirosis, sepsis were the predominant systemic illnesses in CRS patients.

KEYWORDS

CRS, hemodialysis, hypertension

INTRODUCTION:

The first definition of CRS came from the Working Group of the National Heart, Lung, and Blood Institute in 2004, which defined CRS as the result of interactions between the kidneys and other circulatory compartments that increase circulating volume, which exacerbates the symptoms of heart failure (HF) and disease progression.¹ Acute Dialysis Quality Initiative outlined a consensus approach in 2008 that categorize CRS into 2 main groups, cardiorenal and Reno cardiac syndromes, based on the *primum movens* of the disease process.²

Mortality and hospitalization rates remain high in heart failure (HF) patients. One of the factors that contribute to worse outcomes in HF is the presence or development of renal dysfunction during management of HF. Epidemiological data shows the rising of incidence of chronic cardiac diseases including hypertension, heart failure and valvular heart disease have led to increased prevalence of the CRS.³ In hospitalized patients Indian study, all age groups having CRS, elderly male patients more commonly involved.⁴ There is one more study involving hospitalized 7 children, significant risk of mortality seen associated with an increasing incidence of CRS.⁵

Types of CRS :

1. Acute cardiorenal: Heart failure leading to AKI
2. Chronic cardiorenal: chronic heart failure leading to CKD
3. Acute nephrocardiac : AKI leading to heart failure
4. Chronic nephrocardiac : CKD leading to heart failure
5. Secondary CRS : Systemic disease leading to heart and kidney failure eg. sepsis, vasculitis

We intend to find in this study the etiological comorbidities of cardiorenal syndrome, clinical characteristics and outcome of various cardiorenal syndrome as well correlation of sequential organ failure assessment score (SOFA SCORE) with outcome of cardiorenal syndrome in a tertiary care hospital.

AIMS AND OBJECTIVES:

- To study patient profile, clinical features and outcome of cardiorenal syndrome.
- To determine the SOFA score at 0 and 48 hrs of admission in cardiorenal syndrome patients and its correlation with outcome.

Selection Criteria:

- 1) Patients with age more than 12 years.
- 2) Patients having primary cardiac disease now presenting with renal involvement.
- 3) Patients having primary renal problems now presenting with

- cardiac involvement.
- 4) Patients of systemic disorders including AFIs(Acute febrile illnesses) presenting with cardiorenal syndrome

Exclusion Criteria:

- 1) Patients or relatives refusing to give written informed consent.
- 2) Patients who expire within 24 hrs of admission.

Methodology :

This was Prospective observational study conducted over 18 months after securing permission from the Institutional ethics committee. History has been taken and data has been collected from indoor patients in with cardiorenal syndrome.

laboratory parameters include: Complete blood counts (CBC), Liver function test, Renal function test, X-ray chest, 2D echo, X-ray KUB and USG(A+P). SOFA score was calculated at 0 and 48 hrs of admission of patients with cardiorenal syndrome and its correlation with outcome was studied. Final diagnosis of patients has been made according to type of cardiorenal syndrome. The outcome was compared amongst them to see the prognosis of different types of CRS.

Statistical Analysis

Proper statistical analysis was done with help of Biostatistician using paired/unpaired "t" test, chi square test. P value ≤ 0.05 was considered to be significant.

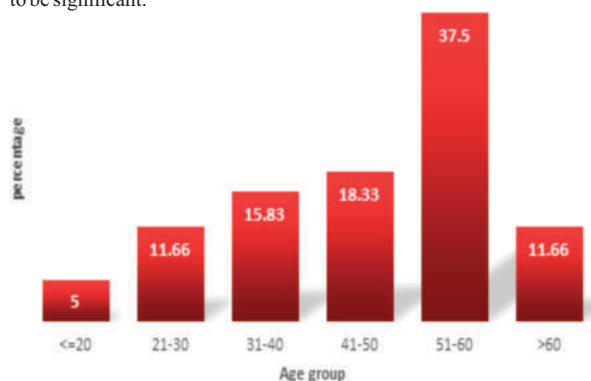


Figure 1. Age group

Maximum number of patients of CRS are in 51-60 age.

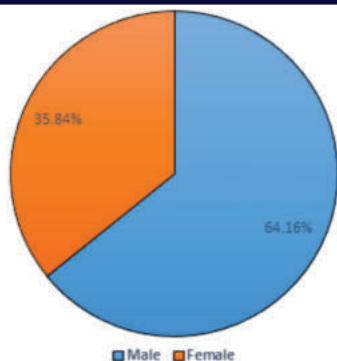


Figure 2. Gender distribution

Out of 120 patients, 64.16 % were male and 35.84% were female.

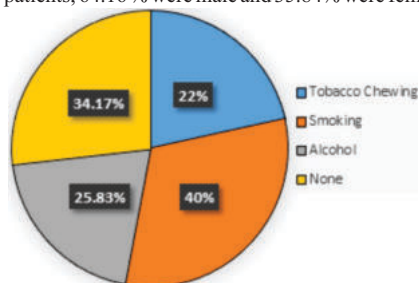


Figure 3. Distribution as per addiction

27.50% of patients were tobacco chewers, 40% were smokers, 25.83% were alcoholics while 34.17% patients had no history of addiction.

Table-1. Distribution of Study Subjects as per Etiological Comorbidities (n=120)

Comorbidities	NUMBERS	PERCENTAGE (%)
Diabetic	43	35.83
Hypertension	39	32.5
Obesity	18	15.00
Others*	53*	44.16
None	13	10.00

*Other systemic illnesses include:

Acute febrile illness with myocarditis with acute renal failure	1 (0.83%)
Alcoholic liver disease	1 (0.83%)
COPD	1 (0.83%)
COPD with cor pulmonale	1 (0.83%)
CVA	1 (0.83%)
Sepsis	6(5.00%)
Glomerulonephritis	1 (0.83%)
Hyperthyroidism	1 (0.83%)
Hypothyroidism	9 (7.50%)
Leptospirosis	9 (7.5%)
Membranous nephropathy	1 (0.83%)
Peripartum Cardiomyopathy	2 (1.66%)
Pneumonia	1 (0.83%)
Pulmonary TB	2 (1.66%)
RPGN	4 (3.33%)
SLE	11 (9.16%)
Takayasu Arteritis	1 (0.83%)

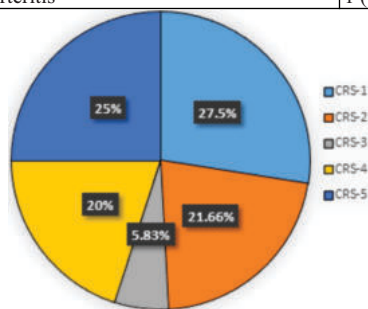


Figure 4: Types of CRS

As per above data, 45.8% of cases had diabetes, 45.83% had hypertension, and 44% of cases had other systemic illnesses like alcoholic liver disease (0.83%), sepsis (6%), systemic lupus erythematosus (11%), leptospirosis with multiorgan dysfunction (9%), hypothyroidism (9%), peripartum cardiomyopathy (1.66%), pneumonia (0.83%), pulmonary tuberculosis (1.66%)

out of the 120 patients, 33 (27.5%) subjects diagnosed with type 1 CRS, 26 (21.6%) with type 2 CRS, 7(5.8%) s with type 3 CRS, 24(20%) with type 4 CRS and 30(25%) with type 5 CRS.

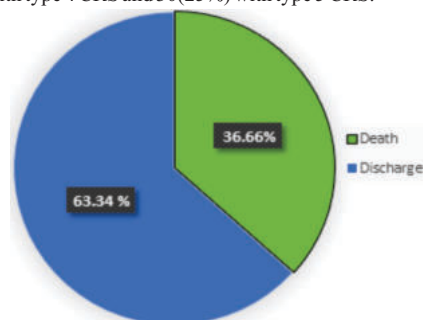


Figure 5. Outcome

76 (63%) patients discharged from and 44(36%) died during hospital course.

Table-2. CRS and Outcome

Type of CRS	DeathNo(%)	Discharge No(%)	Total No(%)	P-Value
CRS-1	8(24.24)	25(75.75)	33(100)	0.001
CRS-2	5(19.23)	21(80.76)	26(100)	
CRS-3	6(85.71)	1(14.28)	7(100)	
CRS-4	8(33.33)	16(66.66)	24(100)	
CRS-5	17(56.67)	13(43.33)	30(100)	
Total	44(36.66)	76(63.33)	120(100)	

Highest mortality (85.71%) was found in CRS 3. The difference between association of CRS subtypes with outcome is statistically significant (p value 0.001).

Table 3. Comparison of SOFA Score on Admission with Outcome. (n=120)

Outcome	SOFA SCORE (On Admission)		P-Value
	Mean	SD	
Death	6.72	2.27	<0.001
Discharge	4.06	3.67	

Mean SOFA score on admission in those who died was 6.72±2.27 and those who discharged was 4.06±3.67.

Table-4 Comparison of SOFA Score At 48 Hrs with Outcome

Outcome	SOFA SCORE (At 48 Hrs)		P-Value
	Mean	SD	
Death	8.02	2.56	<0.001
Discharge	2.02	1.82	

Mean SOFA score at 48 hrs of admission in those who died was 8.02±2.56 and those who discharged was 2.02±1.82 and this difference was found to be statistically significant. It shows more the SOFA score worst is the outcome.

Table 5. Association of Diabetes with Outcome

Diabetes	Death No (%)	Discharge No (%)	Total No (%)	P-Value
Yes	21(48.83)	22 (51.16)	43(100.00)	0.03
No	23(29.87)	54(70.12)	77(100.00)	
Total	44 (36.67)	76 (63.33)	120 (100.00)	

Death rate was higher among diabetic patients and there is significant association between diabetes and CRS outcome

Table 6. Association of Hypertension with Outcome

HTN	Death No (%)	Discharge No (%)	Total No (%)	P-Value
Yes	26(66.67)	13 (33.33)	39 (100.00)	0.000
No	18(22.22)	66 (77.78)	81(100.00)	
Total	44 (36.67)	76 (63.33)	120 (100.00)	

This association between hypertension and outcome of CRS patients is found to be statistically significant.

Table 6. Need of Hemodialysis

Type of CRS	Need of haemodialysis No (%)	No Need of haemodialysis No (%)	Total No (%)	P-Value
CRS-1	11 (33.33)	22(66.67)	33 (100)	0.008
CRS-2	9 (34.62)	17 (65.38)	26 (100)	
CRS-3	7 (100.00)	0 (0.00)	7 (100)	
CRS-4	14 (58.33)	10 (41.67)	24 (100)	
CRS-5	16 (53.33)	14 (46.67)	30 (100)	
Total	57 (47.50)	63 (52.50)	120(100)	

As per the data, 100 % of patients with CRS 3 needed haemodialysis.

DISCUSSION

Cardiorenal syndrome represents an interaction between the heart and kidneys in terms of acute and chronic disease settings⁶ CRS is not uncommon and it is of critical importance to analyse the risk factors, clinical characteristics and outcome for understanding the natural history, morbidity and mortality. There are limited number of studies in investigating the epidemiology and clinical profile of CRS⁷. The present study was carried out to determine the same.

In the present study out of 120 subjects more than 50% of the study subjects were belong to 41-60 years .Mean age was 47.48± 14.03 years. However, in the study done in UK by De Silva et al⁸ the mean age was 71 years which was significantly higher than the Indian studies. This may be due to the fact that the cardiovascular disorder occurs in younger population in India compared to the other western countries.⁹ This lower age of presentation in our study can have significant effect on family economy as well as social stability. In the present study 64.16% patients were male and 35.84% were female. Similar findings were observed in the study done by HR Shah et al¹⁰ in which 66% of the study subjects were males and study done by Reddy MP et al¹¹ in which 67% of the study subjects were male and 33% were females. This may be due to women develops illnesses like diabetes, hypertension which can contribute to CRS to lesser extent than men and show rise after menopause. Considering the addiction, majority (40%) of the study subjects were smokers whereas 27.50% were tobacco chewers and 25.83% were alcoholic. In the present study out of 120 patients of cardiorenal syndrome 35.83% were diabetic, 32.5% were hypertensives, 15% were Obese. These are the morbidities which play key role in development of cardiorenal syndrome. Systemic disease is the underlying cause of secondary cardiorenal syndrome (Type 5). In general, any systemic or autoimmune disease will result in frequently observed cardiorenal syndrome pathophysiology such as RAAS activation, inflammation and oxidative stress¹² Present study found that 9.16 % had SLE, 7.5% had leptospirosis and 7.5% had hypothyroidism and 5% had sepsis. Of all the CRS highest mortality (85.71%) was found in CRS type 3 followed by CRS type 5 and CRS type 4 in our study. Similar to this study done Prothasis M et al¹³ reported highest mortality in type 3 followed by type 5 and type 4. Prevalence of type 5 CRS was highest (38.4%) followed by CRS type 1 (32.1%), CRS type 2(15.8%), CRS type 3 (7.9%) and CRS type 4(5.8%). Mean SOFA Score on admission in those who died was 6.72 ± 2.27 and those who survived/discharged was 4.06 ± 3.67 and this difference was found to be statistically significant. This shows more the SOFA score worst is the outcome. Mean SOFA Score at 48 hrs of admission in those who died was 8.02 ± 2.56 and those who survived/discharged was 2.02 ± 1.82 and this difference was found to be statistically significant. This shows that more the SOFA score worst is the outcome. Considering the risk factors, present study reported that mortality was higher in <40 years of age as compared to greater than 40 years of age, this is because in our study patients who are < 40 years have more prevalence of CRS 3 and CRS 5. Mortality was high among males as compared to females. In the present study mortality among diabetic was 48.83 % and hypertensive was 66.67%. So presence of diabetes and hypertension are associated with poor outcome.

CONCLUSION

The present study concluded that CRS can occur in all age groups more commonly in middle aged people with male preponderance . Many patients were addicted to smoking followed by tobacco chewing and alcohol. Prevalence of CRS type 1 was highest among all followed by CRS type 5. Poor is the SOFA score worst is the prognosis in cardiorenal syndrome. Need of interventions like hemodialysis was higher among CRS type 3 patients. Mortality was highest in type 3 CRS. Risk factors such as hypertension, Diabetes were significantly associated with worst outcome whereas SLE, Leptospirosis and sepsis

were the predominant systemic illnesses among the patients with CRS. Early detection and optimal management of HTN, Diabetes CAD, and sepsis is required to decrease mortality.

Conflict Of Interest

The Authors have no conflicts of interest that are directly relevant to the content of this case

Financial Resources : There are no financial resources to fund this study.

Informed Consent : Informed Consent was obtained from the patient.

Author's Contribution : All the authors contributed equally to the case report.

Data And Materials Availability : All data associated with this study done at tertiary care centre hospital are present in the paper.

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