

Assessment of Knowledge, Attitude, Practice, and Prescription Adherence in Cardiorenal Syndrome Patients

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Abstract

Cardiorenal syndrome (CRS) has been defined in various ways, reflecting the complexity of the interplay between cardiac and renal function. The development of Type 1 and 2 CRS is attributed to several key factors, including increased intra-abdominal pressures, renin-angiotensin-aldosterone system activation, sympathetic nervous system activation, and renal inflammation caused by heart failure. A 6-month prospective observation study conducted to find out the knowledge, attitude and practice in CRS patients. Overall 74 patients who fulfilled the inclusion criteria were part of the study. Co-morbidities were analyzed using the Chi-square test to assess the favorable (N) and non-favorable outcomes (N) knowledge, attitude, and practice are critical for improving medication adherence. Empowering patients with knowledge about their disease, its symptoms, and treatment options is a game-changer. It not only shifts their attitude but also influences their daily habits. As a healthcare team, we need to work together - doctors, pharmacists, and other medical professionals - to provide the best possible care.

Key words: Cardiorenal syndrome; Knowledge, attitude, and practice; Medication adherence; Morisky Medication Adherence Scale; Comorbidities

INTRODUCTION

The complex interaction between cardiac and renal function in pediatric populations has been recognized, yet a standardized classification and definition have not been established. CRS has been defined in various ways, reflecting the complexity of the interplay between cardiac and renal function. CRS is a complex condition characterized by heart, kidney, and vascular system dysfunction.^[1] A primary disorder affecting one of these organs can trigger sudden or prolonged impairment in the others.^[2] The impact of one organ's damage on another can be either direct or indirect and encompasses a complicated feedback system comprising regulatory hormones, inflammatory molecules, and oxidative stress responses.^[3] The incidence of CRS depends on the subtype. Among patients with acute decompensated heart failure (ADHF), 25–33% develop acute kidney injury (AKI), which independently predicts

worse outcomes, including longer hospitalizations, renal replacement therapy, higher readmission rates, increased stroke risk, and mortality. Roughly 60% of ADHF cases with AKI involve worsening of pre-existing chronic kidney disease (CKD). In addition, CKD is a common comorbidity in 26–63% of individuals with chronic heart failure.^[4] Injury to glomerular cells (endothelial, mesangial, and podocytes) due to hypertension (HTN) and diabetes causes increased albumin filtration into Bowman's space, overwhelming proximal tubular cells with excessive reabsorption demands. The suggestion has been to reframe the circumstance,

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resulting in apoptosis of renal tubular cells, further nephron loss, and progression of kidney disease. Albuminuria and gross proteinuria have been associated with the risk of AKI in a variety of settings.^[5]

The development of Type 1 and 2 CRS is attributed to several key factors, including increased intra-abdominal pressures, renin-angiotensin-aldosterone system (RAAS) activation, sympathetic nervous system activation, and renal inflammation caused by heart failure.^[6] In patients with ADHF, static volume overload increases lead to elevated central venous pressure (CVP), which is closely linked to renal impairment.^[2] The elevated CVP leads to reduced RVP, creating a low-flow state that compromises renal blood flow by decreasing the perfusion pressure gradient, resulting in renal hypoperfusion.^[7] Although the connection between the two diseases was poorly understood for a long time, recent research has highlighted the critical role of elevated CVPs. CRS Types 1 and 2 are exacerbated by factors such as increased intra-abdominal pressure, RAAS and sympathetic nervous system activation, and heart failure-induced renal inflammation.^[8] In many developing countries, Knowledge, Attitude, Practice (KAP) surveys are extensively utilized to gather essential information for planning and implementing effective public health initiatives. KAP surveys are valuable tools for identifying misconceptions and misunderstandings that can hinder the success of public health initiatives. However, despite their importance, there is a notable lack of discussion around the benefits and limitations of KAP surveys, particularly in diverse settings. The knowledge component of KAP surveys assesses a

community's understanding of key public health concepts, while the attitude component evaluates the emotional and psychological responses to these concepts. Nevertheless, many KAP studies neglect to report on attitudes, likely due to the complexity of accurately capturing and representing the opinions and attitudes of specific populations. Furthermore, attitudes are deeply intertwined with knowledge, beliefs, emotions, and values, and can be either positive or negative, making their measurement a delicate task. The practice component of KAP surveys evaluates respondents' self-reported behaviors and actions related to health, including treatment and prevention strategies. KAP surveys have been criticized for only providing descriptive data, lacking explanatory insights into the reasons behind and timing of specific treatment, prevention, and practice behaviors.^[9] A significant knowledge gap exists regarding the population affected by CRS, highlighting the need for further research.^[10]

Our study aims to assess knowledge, attitude, practice, and prescription adherence in CRS patients on physician-pharmacist collaboration by using the KAP Score.

METHODOLOGY

A 6-month prospective observation study was carried out from November 2019 to March 2020 in patients admitted to Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, which is an 850-bedded tertiary-care teaching hospital at Chinnaoutpalli, Gannavaram Mandal, Krishna district, Andhra Pradesh (India). Overall,

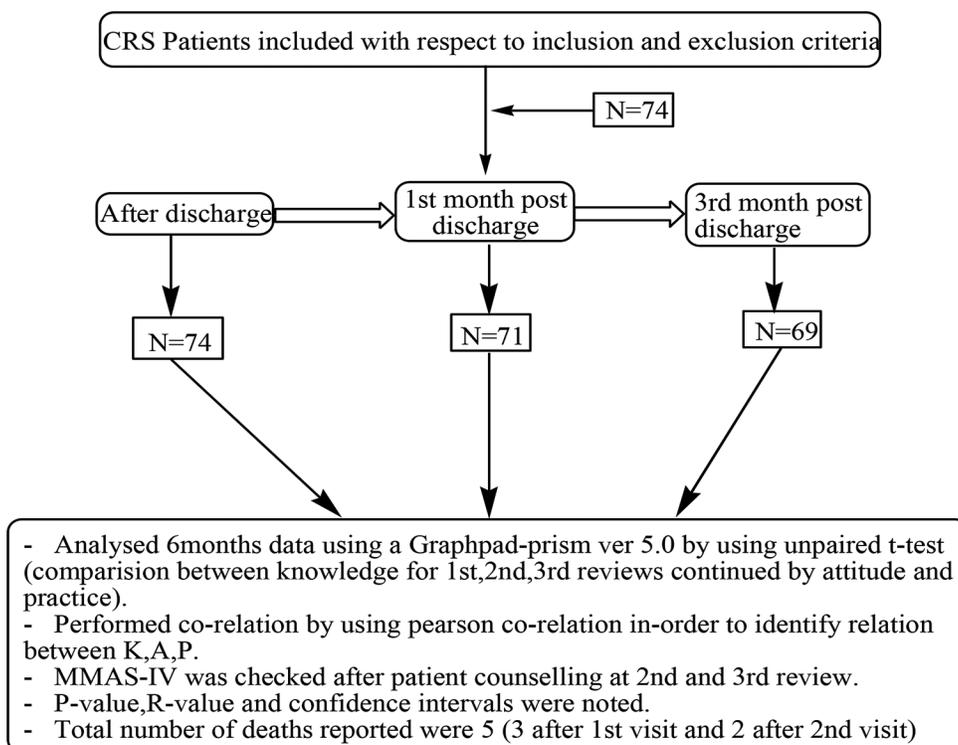


Table 1: Represents the type of CRS

Category	K1				K2				K3			
	<i>n</i>	<i>n</i> %	Mean	SD	<i>n</i>	<i>n</i> %	Mean	SD	<i>n</i>	<i>n</i> %	Mean	SD
Gender												
Male	42	52.8	2.47619	2.20020	41	56.9	5.60976	1.73029	39	56.5	7.53846	1.41135
Female	32	43.2	2.14286	1.62956	31	43.4	5.66667	1.6656	30	43.5	7.92857	1.24510
Age												
20–40	10	13.5	2.30000	1.76698	10	14.0	5.80000	1.39841	10	14.4	7.90000	1.37032
41–60	36	48.6	2.75000	2.06155	36	43.0	5.91429	1.52183	35	50.7	7.93939	1.32144
61–80	24	32.5	1.66667	1.73623	23	32.3	5.13636	1.45718	22	31.8	7.35000	1.42441
Above 80	4	5.4	1.25000	1.50000	3	10.7	4.75000	0.957427	2	3.1	7.00000	0.816497
Marital status												
Married	56	75.6	2.00000	1.79899	54	75	5.39623	1.41882	53	76.8	7.64000	1.35164
Unmarried	3	4	3.00000	3.00000	3	4.1	7.00000	2.00000	3	4.3	8.00000	1.73205
Widowed/ Divorced	15	20.4	3.06667	2.12020	15	20.9	6.00000	1.51186	13	18.9	7.85714	1.35062

CRS: Cardiorenal syndrome

74 patients who fulfilled the inclusion criteria were part of the study.

Study procedure

Overall 74 patients ($n = 74$) who fulfilled the inclusion criteria were involved in the study. A tailored data collection form was meant to capture comprehensive information, including patient demographics, medical history, medication, allergic status, diagnosis, treatment chart, case notes, and data on laboratory results, and ESC guidelines. The 4-item Morisky Medication Adherence Scale (MMAS-4) scale and the KAP assessment scale were also used to document patient data. All the recorded data was reviewed independently. The collected data underwent statistical analysis and were interpreted. Data were analyzed using a standard database such as Micromedex, knowledge assessment scale, and adherence scale. The distribution of different types of cardiorenal syndrome among the study population is shown in Table 1.

RESULTS AND DISCUSSION

At Table 2 showed the comparison among the population (N), percentage frequency (N%), mean values and standard deviations (SD) for the baseline knowledge (K1), knowledge at 1st follow up (K2) and knowledge at 2nd follow up (K3) were shown and at different categories (gender, age and marital status) and also for Attitude (A), Practice (P) and MMAS-4, these calculations were done at Tables 2-4, respectively.

As Table 2, showed the baseline knowledge (K1) total population of males were $n = 42$, percentage frequency (N%) was 52.8% for these the calculated SD and mean were

2.47619 and 2.20020, respectively.,and the female population (N) were 32, and the percentage frequency (N%) was 43.2% and the SD and mean values were 2.14286 and 1.62956, respectively, in the category of gender.

Knowledge at 1st follow-up (K2), the population of men (N) was 41, and women were 31, and the percentage frequency (N%) of men and women were 56.9 and 43.4, respectively. The mean values for men and women were 5.60976 and 5.66667, and the SDs of both men and women were calculated as 1.73029 and 1.26656, respectively.

At the 2nd follow-up (K3), the population consisted of 39 men and 30 women, with a percentage frequency (N%) of 56.5% for men and 43.5% for women, respectively. The mean values for men and women were 7.53846 and 7.92857, and the SDs of both men and women were calculated as 1.41135 and 1.24510, respectively.

At Table 3, the calculations of population (N), percentage frequency (N%), mean, and SDs of the MMAS-4 were calculated. The baseline measurements for the MMAS-4 scores revealed a mean of 1.71 (SD: 1.07) for males and 1.94 (SD: 1.19) for females. At the 1st follow-up, the mean scores increased to 3.08 (SD: 0.93) for males and 3.07 (SD: 0.86) for females. By the 2nd follow-up, the mean scores further increased to 3.56 (SD: 0.60) for males and 3.61 (SD: 0.57) for females. These results demonstrate a progressive improvement in MMAS-4 scores over time, with statistically significant differences observed between baseline and follow-up measurements. The distribution of different types of cardiorenal syndrome observed in the study population is illustrated in Figure 1. Changes in medication adherence as assessed by the Morisky Medication Adherence Scale are depicted in Figure 2.

Table 2: Represents the knowledge in patients at 2 follow up period

Category	MMAS-4 (Baseline)				MMAS-4 (1 st follow up)				MMAS-4 (2 nd follow up)			
	<i>n</i>	<i>n</i> %	Mean	SD	<i>n</i>	<i>n</i> %	Mean	SD	<i>n</i>	<i>n</i> %	Mean	SD
Gender												
Male	42	52.8	1.71429	1.06578	41	56.9	3.07692	0.928627	39	56.5	3.56410	0.598017
Female	32	43.2	1.93750	1.18967	31	43.4	3.07143	0.857584	30	43.5	3.60714	0.566947
Age												
20–40	10	13.5	1.60000	1.17379	10	14.0	2.80000	0.918937	10	14.4	3.60000	0.516398
41–60	36	48.6	2.10526	1.18069	36	43.0	3.33333	0.735980	35	50.7	3.69697	0.466694
61–80	24	32.5	1.58333	0.974308	23	32.3	3.00000	0.973329	22	31.8	3.55000	0.604805
Above 80	4	5.4	1.25000	0.500000	3	10.7	2.00000	0.816497	2	3.1	2.75000	0.957427
Marital status												
Married	56	75.6	1.73214	1.15193	54	75	3.02000	0.936559	53	76.8	3.56000	0.577115
Unmarried	3	4	2.66667	1.52753	3	4.1	3.33333	1.15470	3	4.3	3.33333	1.15470
Widowed/ Divorced	15	20.4	1.93333	0.883715	15	20.9	3.21429	0.699293	13	18.9	3.71429	0.468807

MMAS-4: 4-item Morisky Medication Adherence Scale

Table 3: Represents the population (*n*), percentage frequency (*n*%), mean MMAS-4 scores, along with the standard deviation of patients with various demographics

Demographic / Clinical Variables	Favorable Outcome (<i>n</i>)	Non-favorable Outcome (<i>n</i>)	Chi-square, df	<i>P</i> -value	Significance
Gender					
Male	27	15	0.1862, 1	0.6661	Not significant
Female	19	13			
Co-morbidities					
HTN	8	2	22.18, 8	0.0046	**Yes
T2DM	4	2			
HTN+T2DM	26	10			
HTN+T2DM+CKD	0	4			
HTN+T2DM+CAD	5	1			
HTN+T2DM+CKD+CAD	0	3			
HTN+T2DM+CAD+COPD	0	1			
HTN+T2DM+CKD+Hypothyroidism	0	3			
None	3	2			
Creatinine levels					
1.3–3.0	28	2	30.05, 2	<0.0001	***Yes
3.0–6.0	18	16			
Above 6.0	0	10			
Hemoglobin levels					
5.0–8.0	17	19	8.352, 2	0.0154	*Yes
8.0–12.0	23	9			
Above 12.0	6	0			

HTN: Hypertension, T2DM: Type 2 diabetes mellitus, CKD: Chronic kidney disease, CAD: Coronary artery disease, MMAS-4: 4-item Morisky Medication Adherence Scale

Gender

A Chi-square test was conducted to examine the relationship between gender and treatment effectiveness. The results

showed that among males, 27 had favorable outcomes and 15 had non-favorable outcomes, while among females, 19 had favorable outcomes and 13 had non-favorable outcomes. However, the Chi-square analysis revealed a non-significant

difference between the two groups ($\chi^2 = 0.1862$, $df = 1$, $P = 0.6661$), indicating that the treatment outcomes showed no significant influenced by gender.

Comorbidities

Co-morbidities were analyzed using the Chi-square test. The favorable (N) and non-favorable outcomes (N) of the HTN was 8 and 2 and for Type 2 diabetes mellitus (T2DM) was 4 and 2 and the patients with HTN and T2DM were 26 and 10 and the patients with HTN, T2DM and CKD were 0 and 4 and the patients with HTN and T2DM and coronary artery disease (CAD) were 5 and 1 and the patients with HTN, T2DM, CKD and CAD were 0 and 3 and the patients with HTN, T2DM, CKD and chronic obstructive pulmonary disease (COPD) were calculated as 0 and 1 and the patients with HTN, T2DM, CKD and hypothyroidism were calculated as 0 and 3 and the patients with no comorbidities were 3 and 2, respectively. The Chi-square test difference was calculated as 22.188, and the $P = 0.0046$; the results obtained were significant.

Creatinine levels

A Chi-square analysis was performed to investigate the association between creatinine levels and treatment outcomes.

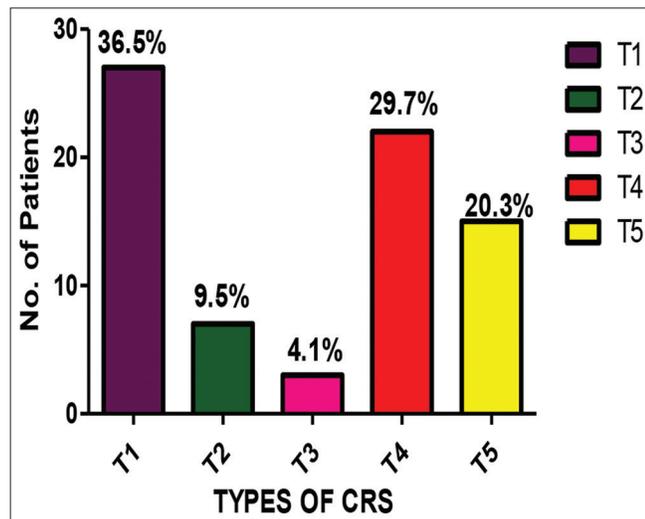


Figure 1: Represents the type of cardiorenal syndrome

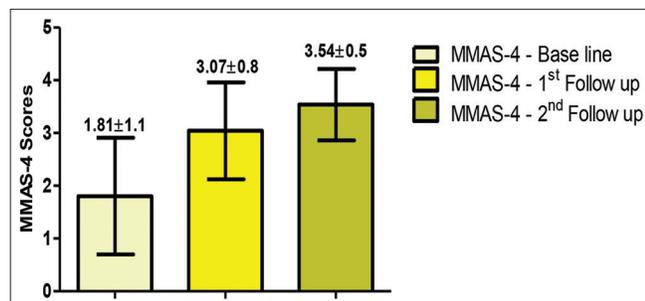


Figure 2: Represents the Morisky medication adherence scale score

The results revealed a strong link between creatinine levels and outcomes ($\chi^2 = 30.05$, $df = 2$, $P < 0.0001$). Specifically, patients with creatinine levels between 1.3 and 3.0 showed favorable outcomes in 28 cases and non-favorable outcomes in only two cases. In contrast, patients with creatinine levels between 3.0 and 6.0 had a more balanced distribution of outcomes (18 favorable, 16 non-favorable), while those with creatinine levels above 6.0 exhibited predominantly non-favorable outcomes (0 favorable, 10 non-favorable).

Hemoglobin levels

A Chi-square analysis was performed to investigate the correlation between hemoglobin levels and patient outcomes, revealing a statistically significant difference ($\chi^2 = 8.3522$, $P = 0.0154$). The analysis showed that patients with hemoglobin levels between 5.0 and 8.0 had a relatively balanced distribution of favorable (17) and non-favorable (19) outcomes, while those with levels between 8.0 and 12.0 had a higher proportion of favorable outcomes (23) compared to non-favorable outcomes (9). Notably, patients with hemoglobin levels above 12.0 exhibited exclusively favorable outcomes (6). This study aimed to classify patients with CRS, assess their therapeutic effect, and investigate their KAP regarding the disease. In addition, the study explored the impact of comorbid conditions on patient outcomes across different CRS subtypes and assessed treatment adherence using the KAP score. Two groups were formed based on their outcomes: favorable outcome (stable at discharge and follow-up) and non-favorable outcome (required dialysis initiation, expired before discharge, or died within 3 months).

CONCLUSION

KAPs are critical for improving medication adherence. Empowering patients with knowledge about their disease, its symptoms, and treatment options is a game-changer. It not only shifts their attitude but also influences their daily habits. As a healthcare team, we need to work together – doctors, pharmacists, and other medical professionals – to provide the best possible care. By educating patients and involving them in their treatment, we can improve health outcomes, ensure patient safety, and enhance their overall quality of life. In remote areas, where many patients are farmers, housewives, or unemployed, patient counseling can make a significant difference. By taking the time to educate and advise patients, we can improve their perception of their condition, boost medication adherence, and ultimately reduce hospitalizations and mortality rates. It is all about giving patients the tools and knowledge they need to take control of their health.

Limitations in the study

Our study had some limitations that might have affected what we found. For one, we had a pretty small group of

participants, which means we might have missed some important connections that would have shown up with a bigger group. Another thing that held us back was that our institution did not have use to Cystatin C testing, which would have given us more information to work with. And finally, we did not consider the different treatments people were getting, like medications, therapies, and devices, which could have influenced our results.

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