

**Aggressive diuresis and length of stay
in patient with acute decompensated
congestive heart failure**

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BACKGROUND

- Acute decompensated congestive heart failure (ADCHF) is one of the most common causes of hospitalization in population above 65 years of age.
- The congestive heart failure cost in 2012 estimated to be 30.7 billion dollar, 68% of this cost is direct medical cost.
- Projections show that by 2030, the total cost of CHF will increase almost by 127% to \$69.7 billion from 2012. This equals \$244 for every US adult.

BACKGROUND

- Loop diuretics therapy is the main stay of treatment of ADCHF
- So far there is insufficient literature data that guide dosing or define the goal of diuresis during hospitalization.
- The dose of diuretics are usually based on clinical judgment and expert opinion.
- Side effects of loop diuretics therapy including worsening renal function, hypotension, electrolyte imbalance and arrhythmia limit their use specially in the setting of chronic kidney disease.



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ORIGINAL ARTICLE

Diuretic Strategies in Patients with Acute Decompensated Heart Failure

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DOSE trial (Diuretic Optimization Strategies Evaluation)

- DOSE trial was conducted by the American heart, lung and blood disease institute, **Heart failure clinical research network**, and was published in 2011.
- Randomized double blinded clinical trial that was conducted in 26 medical centers in United States and Canada.
- This trial compared the use of high versus low dose of diuretics, and bolus versus continues infusion.
- Results showed no difference in outcome, complication or length of hospitalization between groups.

Outcome in DOSE trial

Table 2. Secondary End Points for Each Treatment Comparison.^a

End Point	Bolus Every 12 Hr (N=156)	Continuous Infusion (N=152)	P Value	Low Dose (N=151)	High Dose (N=157)	P Value
AUC for dyspnea at 72 hr	4456±1468	4699±1573	0.36	4478±1550	4668±1496	0.04
Freedom from congestion at 72 hr — no./total no. (%)	22/153 (14)	22/144 (15)	0.78	16/143 (11)	28/154 (18)	0.09
Change in weight at 72 hr — lb	-6.8±7.8	-8.1±10.3	0.20	-6.1±9.5	-8.7±8.5	0.01
Net fluid loss at 72 hr — ml	4237±3208	4249±3104	0.89	3575±2635	4899±3479	0.001
Change in NT-proBNP at 72 hr — pg/ml	-1316±4364	-1773±3828	0.44	-1194±4094	-1882±4105	0.06
Worsening or persistent heart failure — no./total no. (%)	38/154 (25)	34/145 (23)	0.78	38/145 (26)	34/154 (22)	0.40
Treatment failure — no./total no. (%)†	59/155 (38)	57/147 (39)	0.88	54/147 (37)	62/155 (40)	0.56
Increase in creatinine of >0.3 mg/dl within 72 hr — no./total no. (%)	27/155 (17)	28/146 (19)	0.64	20/147 (14)	35/154 (23)	0.04
Length of stay in hospital — days			0.97			0.55
Median	5	5		6	5	
Interquartile range	3–9	3–8		4–9	3–8	
Alive and out of hospital — days			0.36			0.42
Median	51	51		50	52	
Interquartile range	42–55	38–55		39–54	42–56	

DOSE trial

- 308 Patients were enrolled in study between march 2008 to November 2011.
- Length of stay was similar between study groups (median of 5 days in bolus and continues infusion group , median of 6 days in low dose vs 5 days in high dose group.
- Worsening renal function was similar between bolus vs continues infusion group, but showed mild difference between high and low dose group (23% vs 14% respectively with p-value 0.04
- Survival was similar between study groups, as median number of days alive and out of hospital were almost the same (50-52 days)

Our study

- In this study we compared patient who received aggressive diuresis that we defined as urine output > 1500 ml/day vs patient who did not achieve this goal in the first 24 hour of hospitalization.
- Retrospective study based on 483 medical records review of patients admitted with ADCHF at Mercy hospital during the year of 2013. Records were sourced by ICD-9 codes for congestive heart failure.

Inclusion and Exclusion criteria

➤ Inclusion criteria:

- Age between 18-85 years of age.
- Documented ADCHF symptoms (dyspnea, lower extremity swelling)
- Documented ADCHF signs (rales, lower extremity edema, JV distension)
- Documented evidence of ADCHF imaging (pulmonary venous congestion)

Inclusion and exclusion criteria

➤ Exclusion criteria:

- Patient who have ESRD on dialysis.
- Serum Creatinine level >3 mg/dl
- Patient with cardiogenic shock who required use of inotropic agents
- Acute comorbidity such as ACS or COPD exacerbation.

Endpoints

➤ **Primary endpoint:**

- Length of hospitalization

➤ **Secondary endpoints:**

- Worsening renal function, defined as rise in creatinine level by 50% of their admission level
- Hypotension defined as systolic blood pressure less than 90 mm Hg
- Arrhythmias, defined as atrial or ventricular tachyarrhythmia lasting greater than one minute, AV heart block greater than 1st degree.
- In hospital death.

Population

483 patient
were
admitted to
SBMH
with
ADCHF

EXCLUDED

289 PATIENT
WERE EXCLUDED

-162 patients with age
above 85 years

-59 patients with
ESRD on dialysis

-68 patients had acute
comorbid conditions
on admission

INCLUDED

194 PATIENTS
WERE INCLUDED

-127 patients did not
meet goal of aggressive
diuresis.

-67 patient did meet
goal of aggressive
diuresis

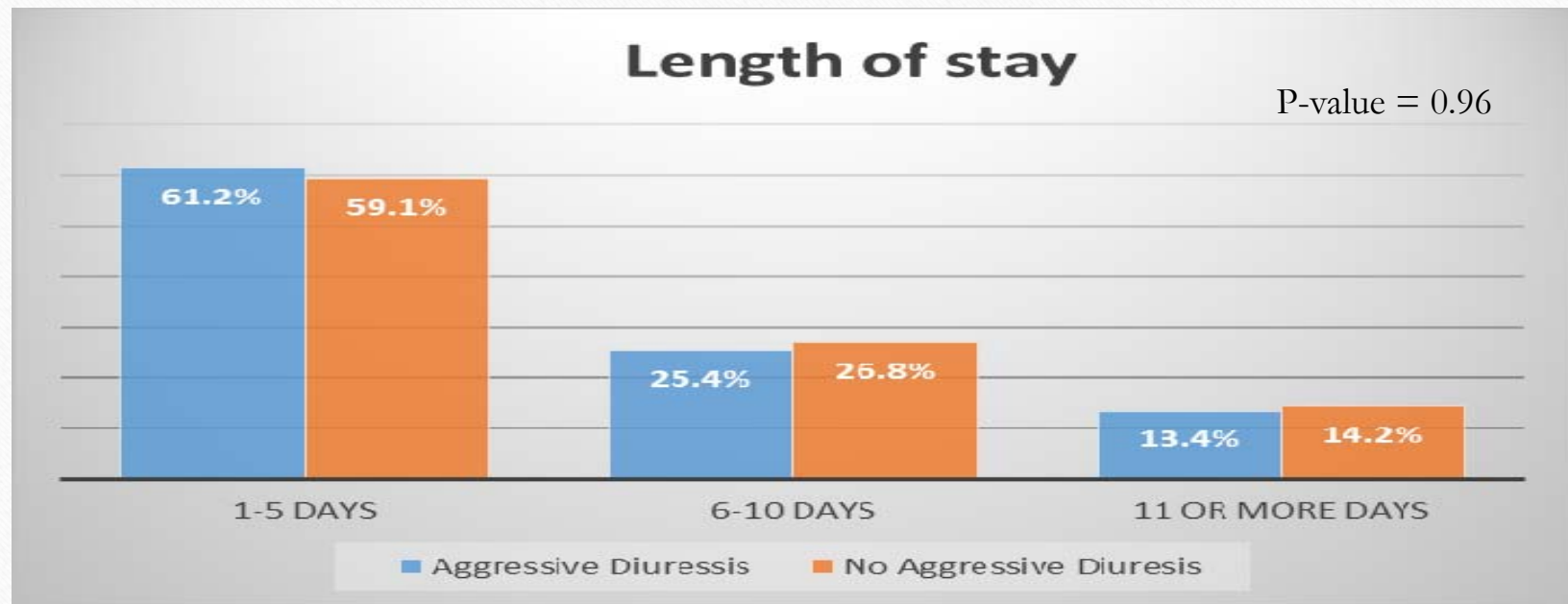
Study population

	Aggressive Diuresis	No Aggressive Diuressis
AGE		
>60	51 (76%)	109 (85%)
< 60	16 (23%)	18 (15%)
GENDER		
Male	35 (52%)	61 (48%)
Female	32 (48%)	66 (52%)
RACE		
White	64 (95%)	118 (93%)
Black	2 (3%)	7 (5.5%)
Hispanic	1 (2%)	2 (1.5%)
CHF		
Systolic	39 (58%)	72 (57%)
Diastolic	28 (42%)	55 (43%)

Results

Aggressive diuresis **vs.** non aggressive diuresis

Length of stay



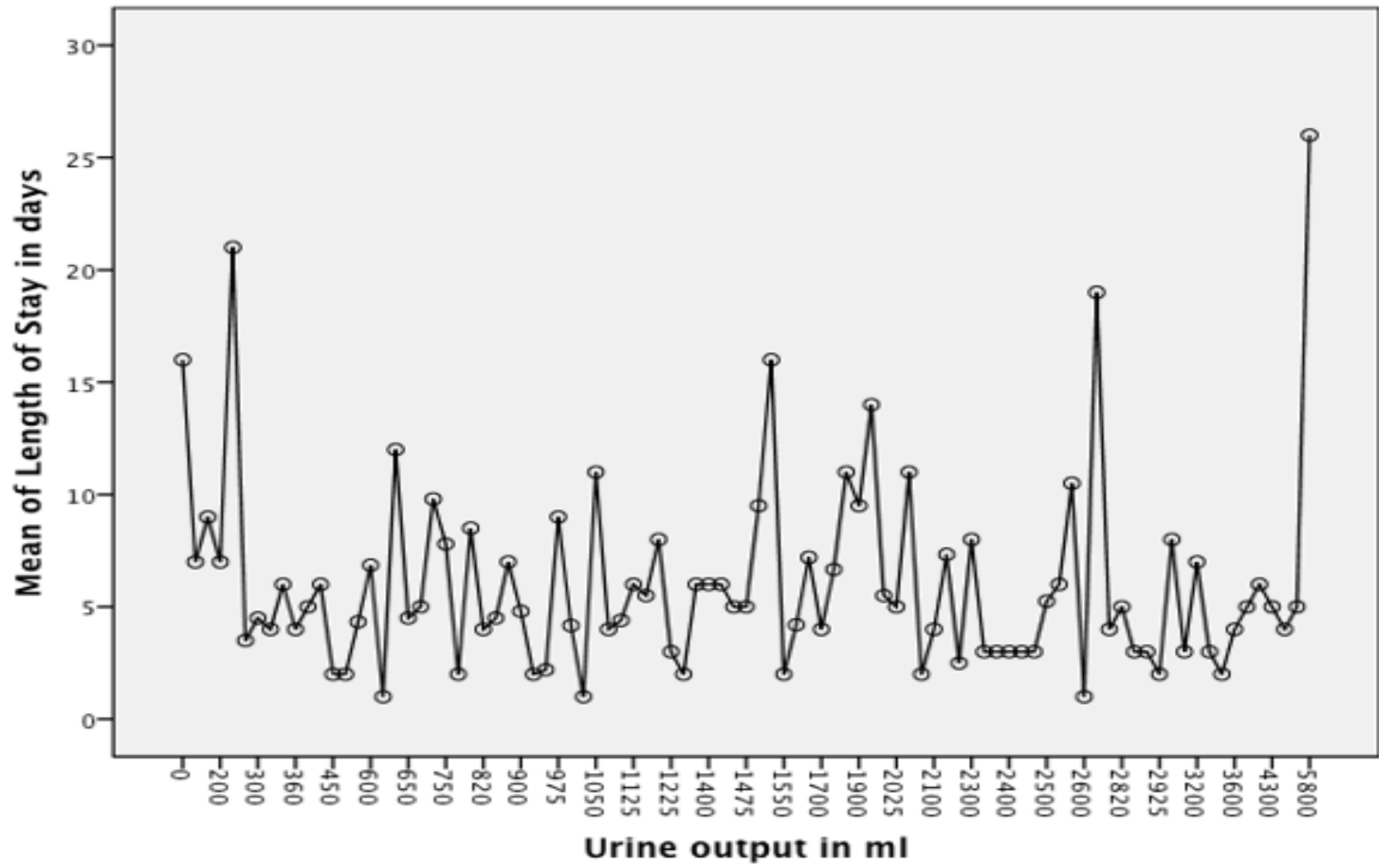
Length of stay

- >2000ml/day

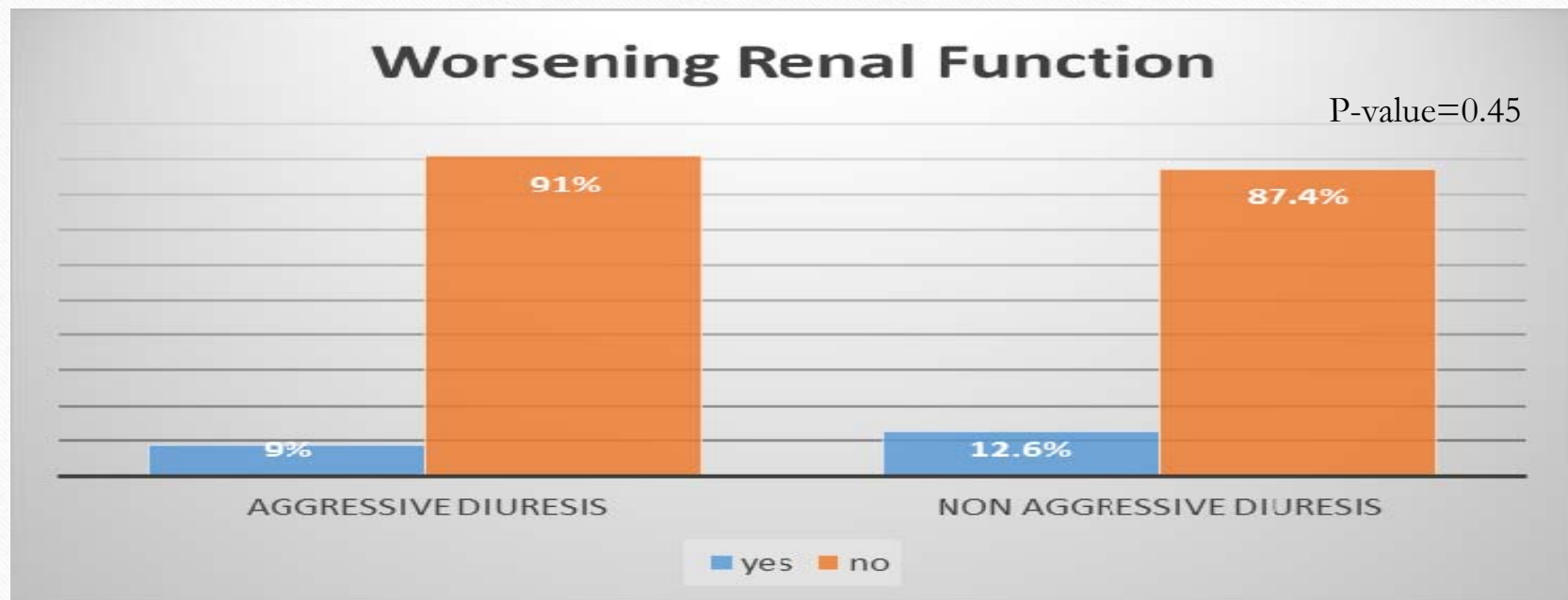
	Urine output more than 2000 ml	N	Mean	Std. Deviation	Std. Error Mean
Length of Stay in days	NO	151	6.12	4.700	.383
	YES	43	5.79	5.139	.784

- >2500ml/day

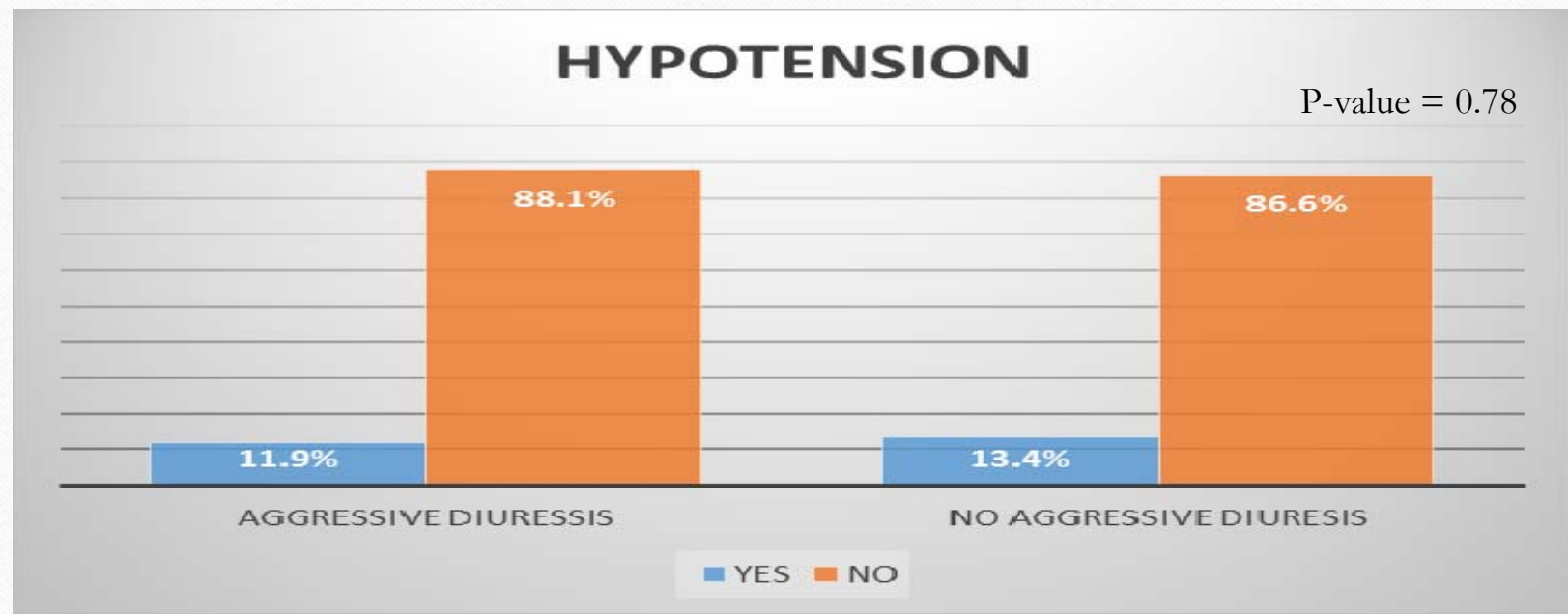
	Urine output more than 2500 ml	N	Mean	Std. Deviation	Std. Error Mean
Length of Stay in days	NO	171	6.01	4.660	.356
	YES	23	6.30	5.772	1.203



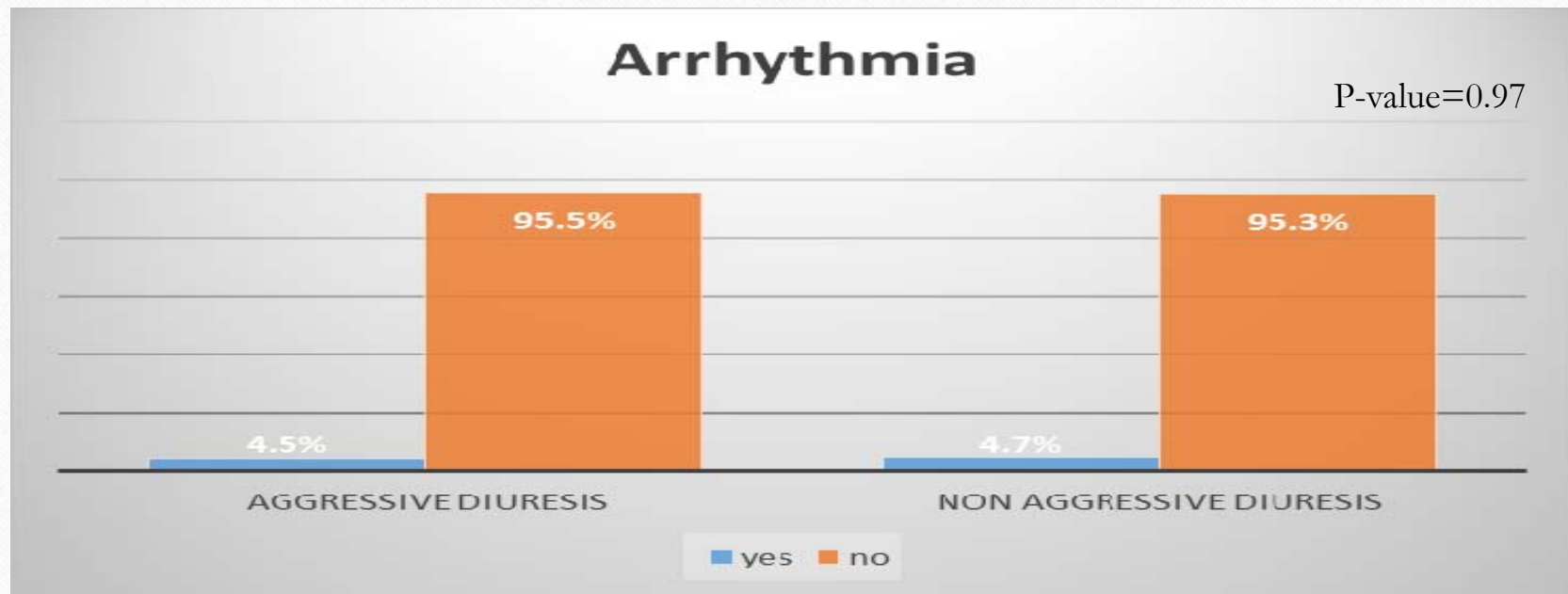
Worsening Renal Function



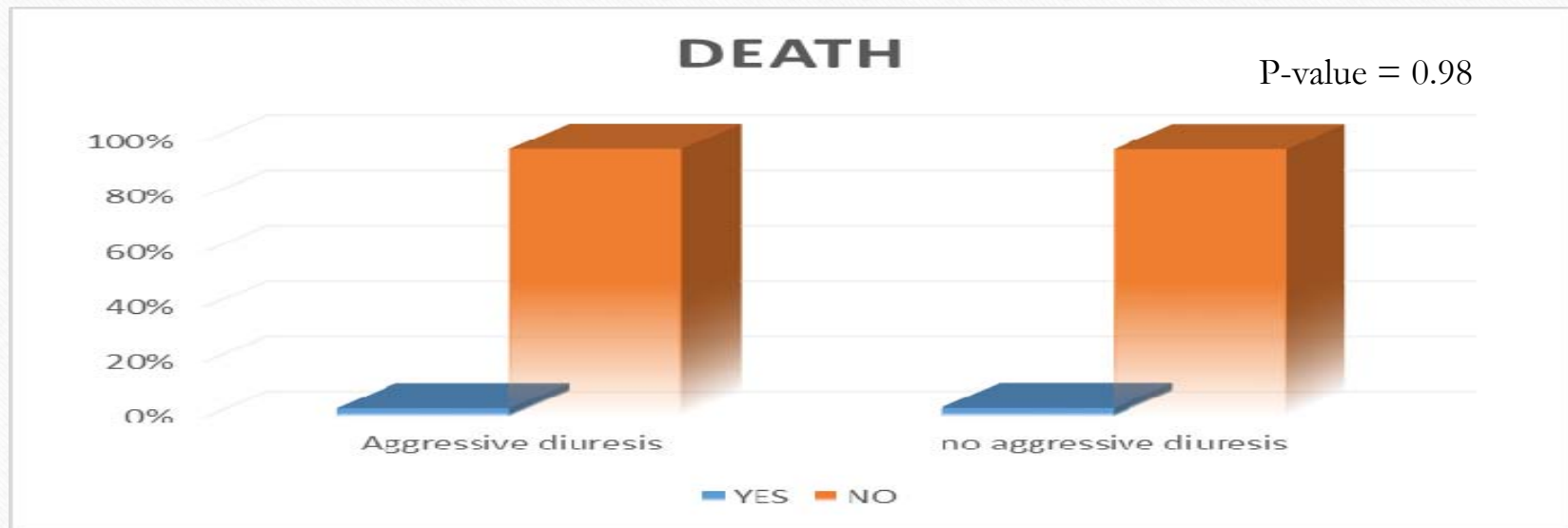
Hypotension



Arrhythmia



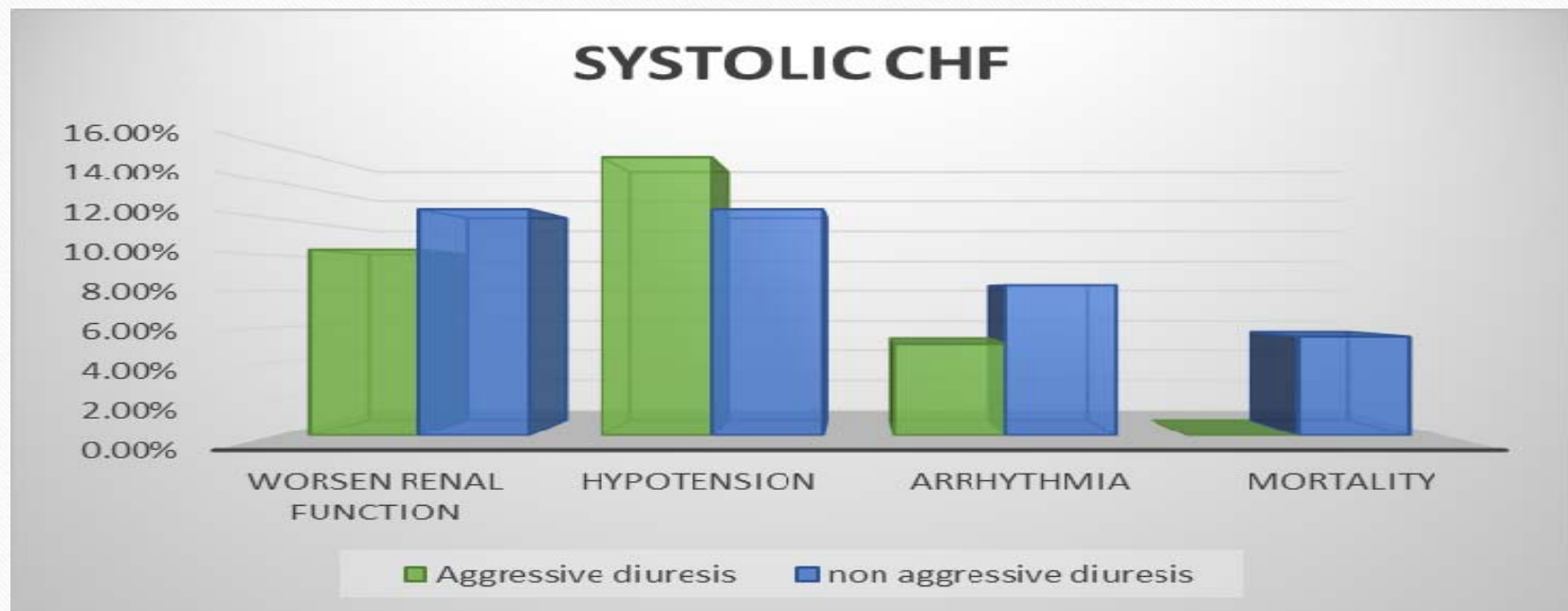
Mortality



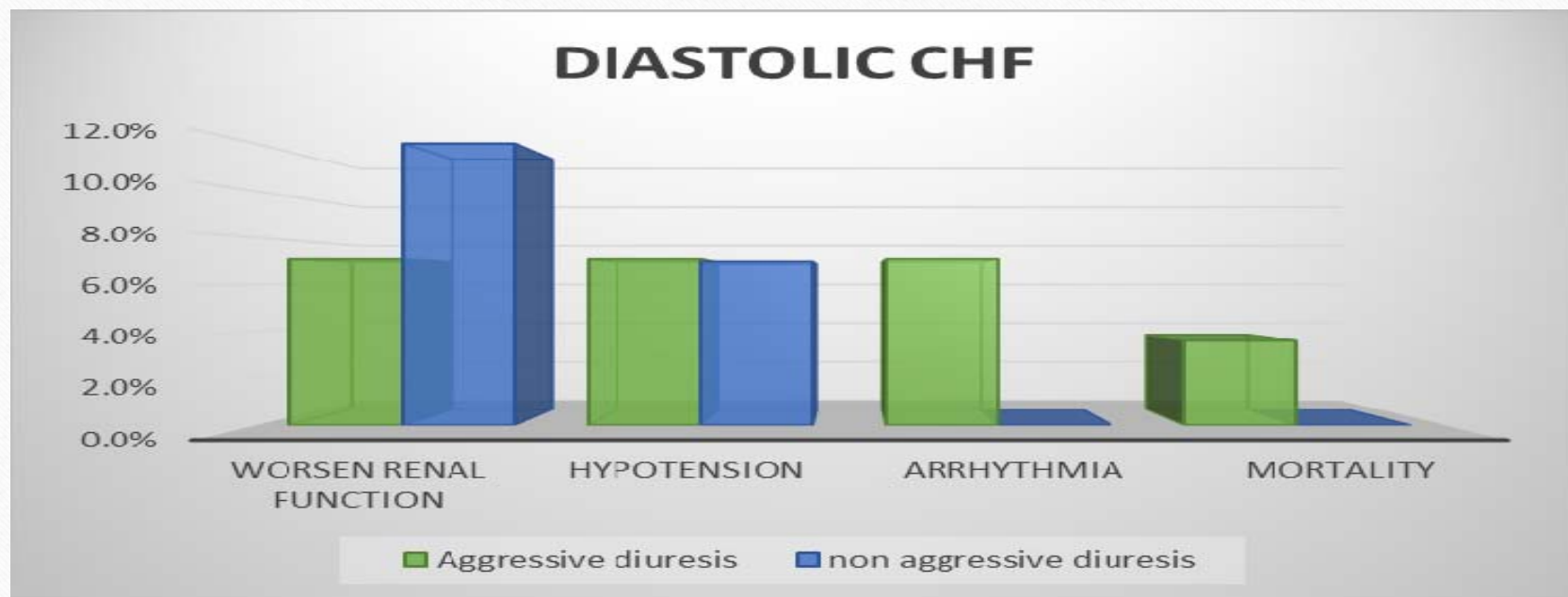
Aggressive diuresis

- Systolic CHF *VS.* Diastolic CHF
- Age groups

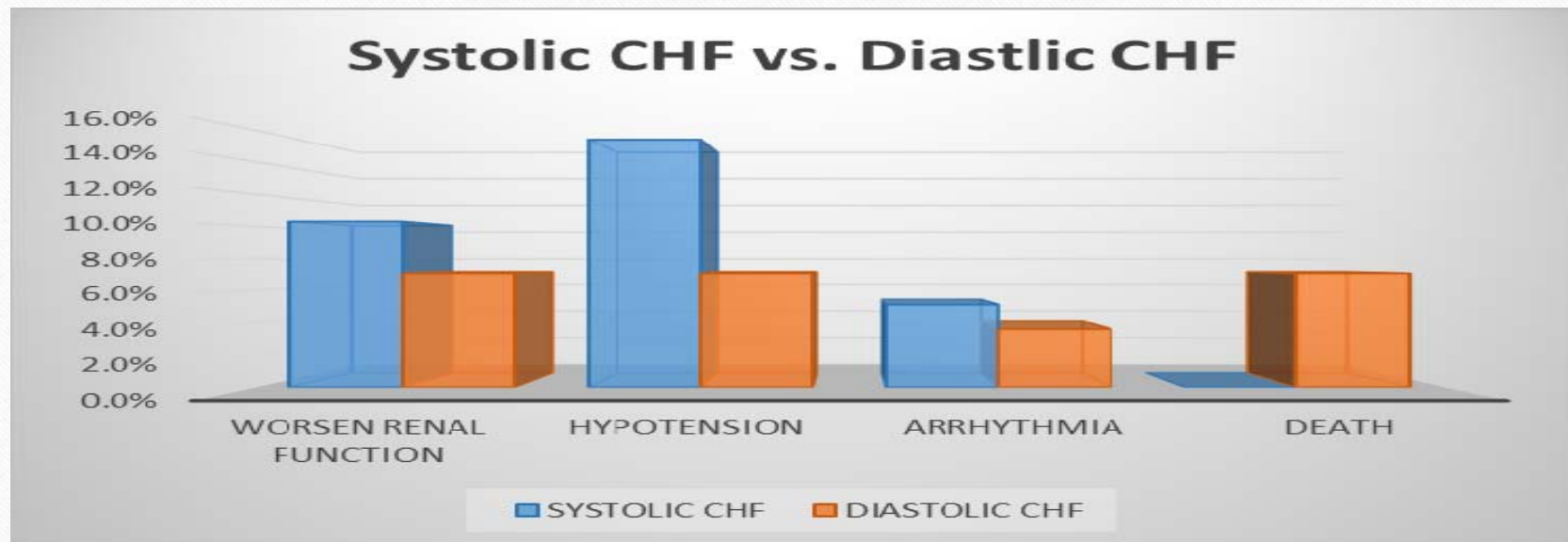
Systolic CHF



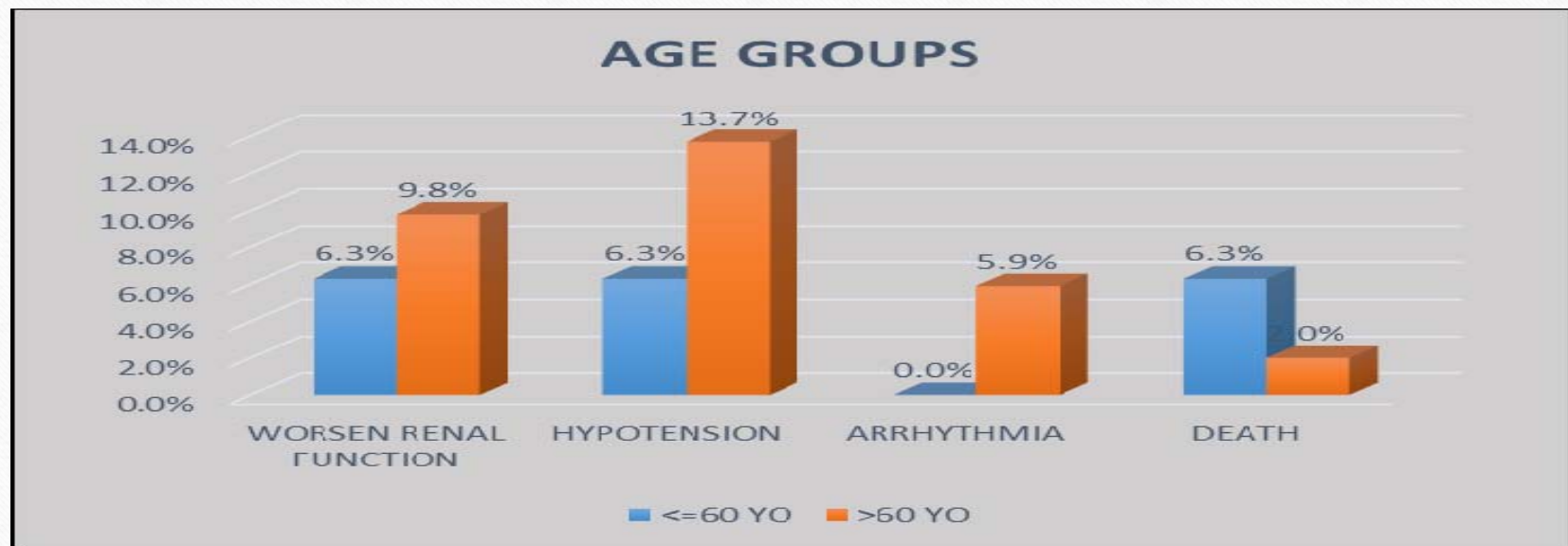
Diastolic CHF



Systolic vs. Diastolic CHF



Aggressive diuresis by age groups



Results Summary

Our retrospective study comparing aggressive vs non aggressive diuresis in patients admitted with DCHF during the year of 2013 revealed:

- No significant difference in the length of stay (5.98 vs 6.18 days) with p-value 0.78
- No significant difference in incidence of worsening renal function (12.6% vs 9%), p=0.45.
- No significant difference in the incidence of hypotension (13.4% vs 11.9%), p=0.78.
- No significant difference in the incidence of arrhythmias (4.7% vs 4.5%), p=0.94.
- No significant difference in mortality (3.1% vs 3%), p=0.98

Results Summary

- When we compared the negative outcomes of aggressive diuresis in systolic vs. diastolic heart failure patients, results showed increase incidence of hypotension , worsening renal function and arrhythmia in patient with systolic CHF, but mortality was higher in patient Diastolic CHF.
- Comparison of negative outcomes of aggressive diuresis by age groups showed that incidence of worsening renal function, hypotension and arrhythmia were greater in patients > 60 y/o, but mortality was higher in patients ≤ 60 y/o.

Limitation of study

- Retrospective medical record review study.
- Sample size in the study was small 194 patients.
- Stages of congestive heart failure by NYHA, and change of patients weight in first 24 hours could not be included in study population, as it was not well documented in the majority of the charts.

Discussion

- This study compared aggressive versus non aggressive diuresis approach in the first 24 hours of hospitalization in patient admitted with ADCHF, results showed no significant difference in negative outcome that included worsening of renal function , hypotension , arrhythmia or mortality. In the mean time there was no significant difference in length of stay between the two groups.
- While comparison of subgroups by age and type of CHF showed difference in negative outcome, these results did not approach significance due to limited number of patients.

Discussion

- A larger prospective control study would be of value to define goal of diuresis in the first 24-48 hours of hospitalization in patients admitted with ADCHF.
- While our study did not show a difference in length of stay with aggressive diuresis, incidence of negative outcomes were similar in the two groups, which address a main concern during the course of managing this population of patients.

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