



Research Article

Safety And Efficacy Of Diuretics With Reduced Ejection Fraction In Heart Failure Patients- An Observational Cohort Study

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ARTICLE INFO

Received: 11 Aug 2023
Accepted: 19 Aug 2023
Published: 24 Aug 2023

Keywords:

Heart failure, Cardiovascular diseases, Diuretics, Diuretic therapy, Symptomatic relief, Ejection fraction, NYHA scale

DOI:

10.5281/zenodo.8280229

ABSTRACT

Heart failure is a serious, progressive condition that occurs when the heart muscle Don't pump enough blood. Annual number of deaths, raised in India from 2.26 million to 4.77 million in between 1990 to 2020 due to cardiovascular diseases. Diuretics are an integral part of heart failure treatment, along with other medications to treat the underlying cause of heart failure. Diuretics help the kidneys flush out the excess fluid and maintain normal blood volume. The elimination of excess fluid reduces pressure in the veins and the overload of venous blood into the heart. The study is aimed to assess the efficacy and safety of diuretics in heart failure patients by improving the symptoms like SOB, palpitation e.t.c and observing any occurs side-effects occurs after the administered of Diuretics. A group of 100 patients who meet the inclusion criteria were taken. All the necessary and relevant data were collected from the patient case notes, treatment charts, and laboratory reports .In these study we have categorized into before drug therapy and after drug therapy of same patient and observed the ejection fraction , symptomatic relief by using the NYHA scale and also observed the electrolytes imbalance in the blood .In these study, majority of patient were males with decreased cardiac function was observed The patients who are admitted with cardiac complication have shown positive response towards diuretic therapy as it shown major efficacy with minimum side effects.

INTRODUCTION

The cardiovascular system is a collection of blood arteries including the heart that pumps blood throughout the body. The muscular heart pumps blood throughout the circulatory system. It has two higher atria and two lower ventricles, totalling four

chambers. More muscle tissue is thicker in the ventricles than the atria. When the heart muscle doesn't pump enough blood, a deadly, progressive condition known as heart failure results. As a result of the heart's failing ability to pump enough

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



blood and oxygen to the body's cells, heart failure causes weakness, SOB, and in some cases cough. Several forms of heart failure exist.

Heart failure is caused by damage to the myocardial cells brought on by conditions such as hypertension, ischemic heart disease, and diabetes mellitus. Numerous compensatory measures, such as boosting cardiac output, ventricular volume, and wall thickness, as well as activating neurohormonal systems (which maintain tissue perfusion and increase mean arterial pressure), are initially beneficial but eventually worsen heart failure in a vicious cycle.

Diuretics are used in the treatment of heart failures patient, along with other medications. for the better improvement in the condition. It decreases the preload effect on the heart and increases ejection fraction indirectly and shows symptomatic relief in patients.

Diuretics are classified into different types. In that mainly the loop diuretics and potassium sparing diuretics are used in the treatment of heart failure condition.

METHODOLOGY

Study design: - Prospective observational cohort study

Study site: - Multicentered hospital, Guntur.

Study period: - This study is carried out for period of six months.

Study population: - 100 patients

Inclusion criteria: -

Men and women greater than 18 years of age.

People with comorbidities like Diabetes Mellitus, Hypertension, Thyroid problems. People with Ejection fraction of below 50

Including parameters are ECG, ECHO, EF, ELECTROLYTES.

Exclusion criteria: -

Male and female patients less than 18 years of age.

Pregnant women are excluded in the study.

Creatinine who is having more than 2 mg/dl.

Drugs like ARB, S and ACE inhibitors are excluded.

STUDY PROCEDURE

The Study was a prospective observational study being carried out from January 2022 to June 2022 in Multi center hospital, Guntur. The study was conducted in the medical cardiology department of the hospital under the guidance of Dr. P. Seetharamaiah, Pharm.D Director, OSD, Department of pharmacy practice.

Participants are recruited if they meet the Inclusion criteria. Participants should have been diagnosed with Heart failure.

Information provided by the data collection will be further analysed to draw the conclusions on the mentioned outcomes.

Statistical Analysis: - The obtained data was statistically analysed using Microsoft word 2010 and Microsoft excel 2013 and SPSS.

Sources of the data: -

All the relevant and necessary data will be collected from

- Treatment charts lab reports
- Interviewing the patient and patient caretaker.
- Collecting data from physician and nursing staff
- Any other relevant sources.
- By taking NYHA classification into consideration.

Table 1 Distribution of Gender Differentiation

Gender	No.of. Patients	Percentage
Male	69	69%
female	31	31%

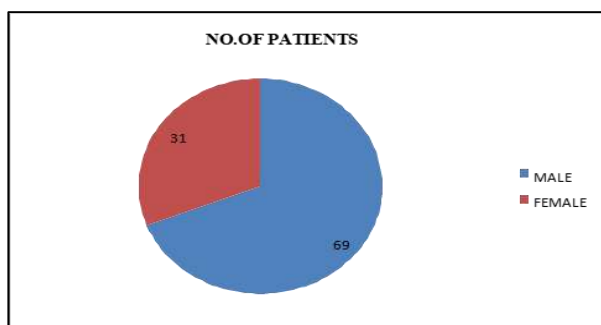


Figure 1 Representation of Gender Differentiation

INFERENCE: From the figure we can observe that number of male patients is 69 and the female patients are 31 out of total of 100 patient.

Table 2: Distribution Of Patients With Age

Age group	No.of patients	percentage
18-35	13	13%
36-53	29	29%
54-71	42	42%
72-88	16	16%

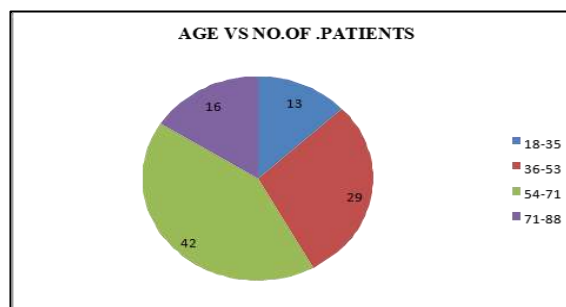


Figure 2 Representation Of Patients With Age

INFERENCE: From the above figure, we can observe that there are 13 patients within age group of 18-35, 29 patients fall under the 36-53, and 42 patients fall under the age group 54-71 and 16 patients fall under the age group of 71-88.

Table 3 Distribution Based On Patients Disease Condition

Types of disease	No.of .samples	percentage
I. Myocardial infarction		
a) AAMI	29	29%
b) PWMI	2	2%
c) IWMI	19	19%
d) LWMI	1	1%
II. Angina	11	11%
III. CHF	24	24%
IV. CAD	9	9%
V. Valve replacement		
AVR	4	4%
MVR	1	1%

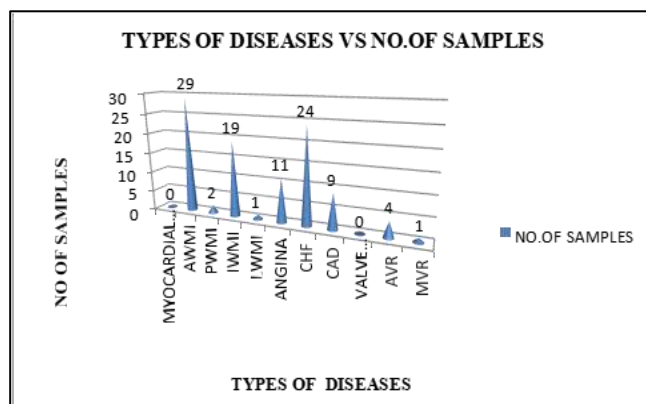


Figure 3 Representation Based On Patients Disease Condition

INFERENCE: From the above data 51 patients fall under the myocardial infarction, 11 patients fall under the angina, 24 patients fall under the Congestive heart failure, 9 patients present under the CAD and the 5 patients fall under the valve replacement.

Table 4 Distribution Based On Type Of Diuretics Taken

Types of diuretics	No.of samples
Furosemide	18
Torsemide	33
Torsemide+ Spiranolactone	49

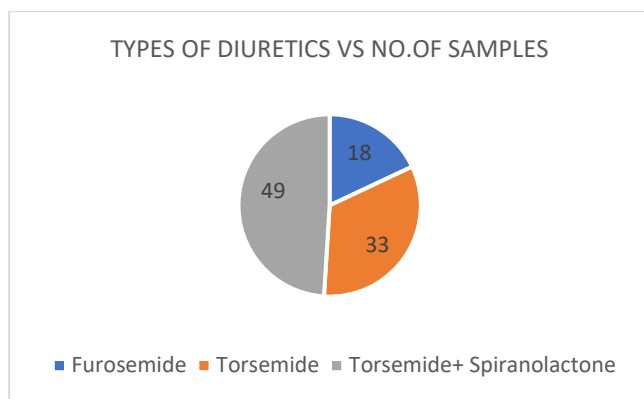


Figure 4 Representation Based On Diuretics Taken

INFERENCE: From the above figure 18 members are taking furosemide ,33 members are taking Torsemide,49 members are taking Torsemide + Spiranolactone.

Table 5 Distribution Of Diuretic Doses

Diuretics	Doses	No.of samples
Torsemide + Spiranolactone	10 mg	31
Torsemide + Spiranolactone	5 mg	18
Torsemide	10 mg	17
Torsemide	5 mg	16
Furosemide	20 mg	6
Furosemide	40 mg	12

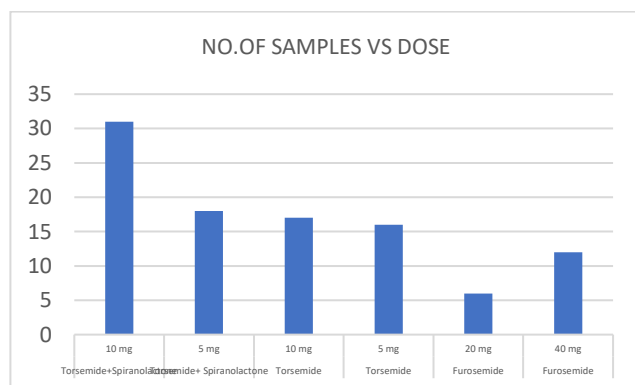


Figure 5 Representation Of Diuretic Doses

Table 6. Distribution based on symptomatic relief in untreated people according to NYHA

Grade	No.of people	percentage
Grade-I	2	2%
Grade-II	17	17%
Grade-III	36	36%
Grade-IV	45	45%

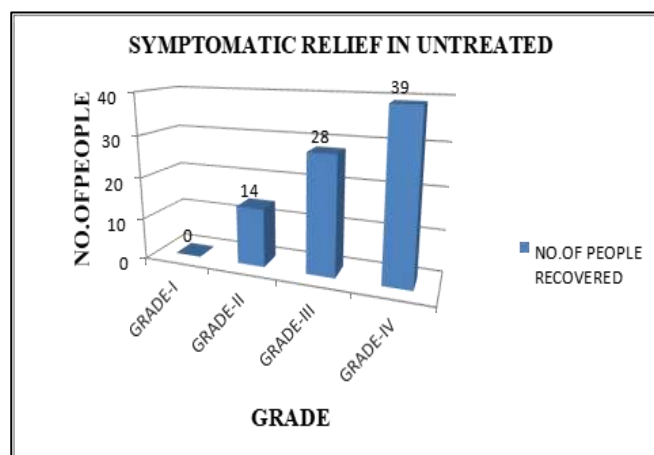


Figure 6 Representation Based On Symptomatic Relief In Untreated People According To NYHA

INFERENCE: From the figure(n=2) members fall under the grade-I ,and (n= 17) members fall under the Grade-II, and(n= 36)members fall under the Grade-III and(n=45)members fall under the Grade-IV.

Table 7 Distribution Based On Symptomatic Relief In Treated People According To NYHA

Grade	No. of people recovered	Cumulative frequency	Percentage of cumulative (%)	No. of people not recovered	Cumulative frequency	Percentage of cumulative (%)
Grade-I	0	0	0	2	2	2
Grade-II	14	14	14	3	5	5
Grade-III	28	42	42	8	13	13
Grade-IV	39	81	81	6	19	19

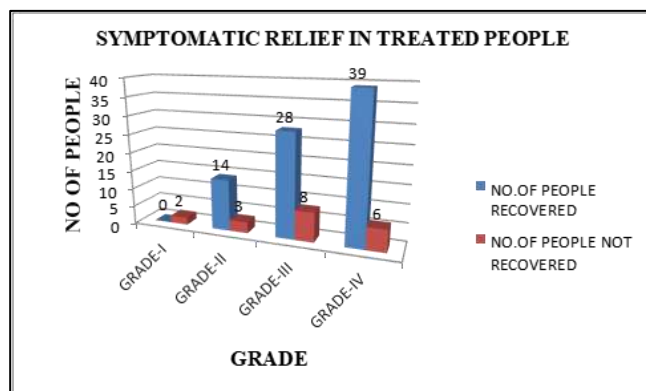


Figure 7 Representation Based On Symptomatic Relief In Treated People According To NYHA

INFERENCE: From the figure a total number of 100 people taken in that (n=81) members shown the symptomatic relief and remaining (n=19) members does not shown any symptomatic relief in that in recovered patients Grade-II IS (n=14) members present ,In GradeIII(n=28) members present ,Grade-IV (n=39) members present . In not recovered patients (n=2) members fall under the Grade-I (n=3) members fall under the Grade-III ,(n=6) members fall under the Grade-IV.

AFTER DRUG THERAPY

Table 9 Distribution Based On The Ejection Fraction In Treated People

EF%	EF improved frequency	Cumulative frequency	Cumulative percentage %	EF not improved	Cumulative frequency	Cumulative percentage %
1-10	0	0	0	0	0	0
11-20	0	0	0	2	2	2
21-30	11	11	11	8	10	10
31-40	21	32	32	11	21	21
41-50	42	74	74	5	26	26

BEFORE DRUG THERAPY

Table 8 Distribution Based On Ejection Fraction In Untreated People

EF%	Frequency	Percentage %
1-10	0	0
11-20	2	2
21-30	19	19
31-40	32	32
41-50	47	47

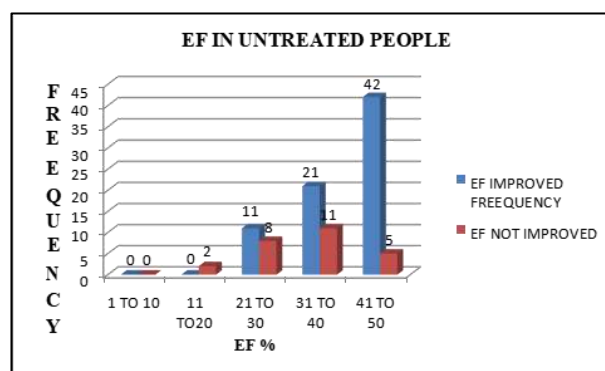


Figure 8 representation Based On Ejection Fraction In Untreated People

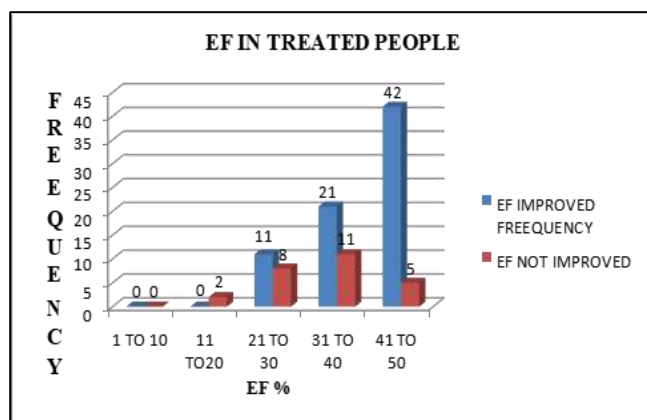


Figure 9 Representation Based On The Ejection Fraction In Treated People

INFERENCE: From the figure, A total no. of 100 people are participated in that (n=74) people show the improvement in the EF. and remaining (n=26) people does not show any improvement. In that recovered patients (n=11) members fall under the 21-30%, 21 members fall under the 31-40% & 42 members fall under the 41-50% and in that not recovered patients (n=2) members fall under the 11-20%, and (n=8) members present under the 31-40%, (n=5) members fall under the 41-50%.

Table 10 Distribution Based On The Safety Of Drugs

parameter	No. of patients	Percentage %
Hypokalemia	12	12
Hyponatremia	9	9
Urinary tract infection	5	5

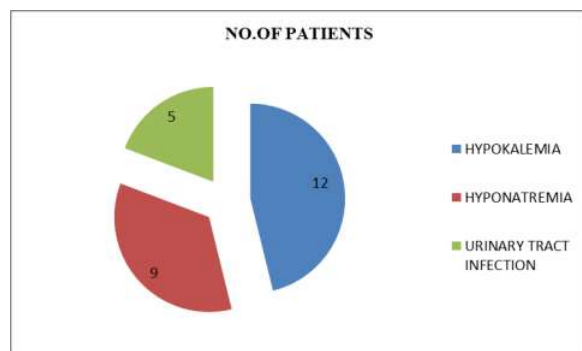


Figure 10 Representation Based On The Safety Of Drugs

INFERENCE: From above figure, (n=2) members fall under the Hypokalemia, (n=9) members fall under the hyponatremia, (n=5) members fall under the urinary tract infection in total of 100 members.

DISCUSSION

From above figure, (n=2) members fall under the Hypokalemia, (n=9) members fall under the hyponatremia, (n=5) members fall under the urinary tract infection in total of 100 members.

Our results indicated that symptomatic improvement is shown in SOB, chest pain, oedema, decrease in the preload by eliminating the excess water and electrolytes from the body.

By taking NYHA classification into consideration in the treatment of various cardiac failure conditions seen whether it shows improvement or not. Cardiac changes in the follow up of ECG, ECHO and symptomatic relief in the cardiac failure patients are observed when compared to previous investigations.

After the diuretic therapy the symptomatic relief in the cardiac failure patients is 81% and not recovered is 19% (no improvement in symptomatic relief) is seen.

In total 100 people we have encountered after diuretic therapy in cardiac failure patients the 74% has shown increased ejection fraction and remaining population of 26% has shown less response (no improvement in ejection fraction) in that (n=74) members shown the positive response and (n=26) members doesn't show the positive report.

The result showed that there is a statistical significant difference ($p < 0.05$) in symptomatic relief and ejection fraction when compared in before and after therapy and also safety of diuretics.

In some aspects our results in agreement with other related published studies. In the article Gavino casu and peutuigi merella, July 2015 42-47. European journal of cardiology, diuretic therapy in

heart failure current approaches in that article's flows that loop diuretics are used more in heart failure patients than the other diuretic because it has the potent action on heart failure patients. In our study also loop diuretics are used more when compared to other diuretics. Most patients with advanced heart failure requires diuretics daily in order to maintain heart failure. Sushah's, Anjum, WA litler, 2004 use it Diuretics in cardiovascular disease.

In this article fluid retention is a consistent finding in almost all acute to chronic heart failure patient's and Diuretics also used to improve pulmonary and peripheral oedema and signs and symptoms of congestion same as in our study the fluid retention is seen in almost all acute to chronic heart failure patient's and diuretics shows positive effect towards the Diuretics in improving the pulmonary and peripheral oedema.

S. Gupta, L. Neysus volume 26, Issue 7, 2005 direct usage in heart failure a continuing conundrum. In these review article the diuretic induced improvement in ECG Marker of cardiac Contractibility is seen, the major changes are seen but in one study a few changes in the ECG markers are seen. That parameter does not show more positive effects towards the Diuretics in our study. When compared between genders the males are more probably having cardiovascular disease than females and out of the entire population age group 54-72 years are majorly affected with heart failure and related heart complications.

In this study the ECG parameters also seen but it doesn't shown any positive effect towards the Diuretics and we also encountered with minor side effects after usage of diuretic therapy which are easily monitored and managed with alternative therapy. The major side effect we observed the electrolyte imbalance hypokalemia, hyponatremia were the most type of electrolyte imbalance in the usage of diuretics.

CONCLUSION

In our study among 100 patients are present in that majority of patients were males with decreased cardiac function. The majority of patients having history of 2-3 years of cardiac failure have shown less response for usage of diuretic than newer patients before and after drug therapy the considerable changes have seen in cardiac functions through ECHO, Symptomatic relief and ECG the positive aspects towards the EF and symptomatic relief has been observed.

The NYHA classification are taken for measuring the symptomatic relief in patients in these patients at starting with one grade and after the drug administration the patient conditions are improved so the patient grade is increased to another for EX: - Grade – IV before the drug therapy, after drug therapy the Patient is entered in Grade – III

In ECG parameters it doesn't have positive effect on it since diuretic doesn't show any direct action on the cardiac muscle, so it doesn't show any improvement in ECG parameters in patients.

Electrolyte imbalance have encountered with few patients who are administered with diuretic therapy in this condition administration of NACL and adding the potassium sparing diuretic and potassium supplements should be given.

The patients who are admitted with cardiac complications have shown positive response towards diuretic therapy as it shown major efficacy with minimum side effects.

REFERENCES

1. Mann, Zipes, Libby, Bonow 'BRAUNWALDS HEART DISEASE' – A Text Book of Cardiovascular Medicine, 10 TH Edition, Chapter 3 Page no- 613- 615, Chapter 38: 799-801.
2. Vaterie C. Scanlon ,Tina Sanders Essentials of Anatomy And Physiology 5 TH Edition Page no– 219-317
3. HL Sharma And KK Sharma – Principles of pharmacology 5 TH Edition Section 4- Drugs



- affecting renal and cardiovascular system and related autocooid page no :- 230- 237
4. BD Chaurasia Human Anatomy Regional and Applied Dissection and clinical volume 1 chapter 18 Page no: 239 - 255
 5. Parts of the heart by Anatomy Next – THE HEART cited at : Anatomy .app
 6. Gavino Casu and Pierluigi Merella.Diuretic Therapy in heart failure recurrent approaches.2015 jul;10(1)42-47.
 7. Rajaa F Faris, Marcus Flather ,Henry Purcell, Philip A poole Wilson,Andrew Js Coats.Diuretics for heart failure.2016 Apr.
 8. S Gupta et al. Diuretic usage in heart failure.2005 Apr,volume 26,Issue 7,2005
 9. MICHAEL M.BRAUN, DO.WILLIAM A.STEVENS, MD, AND CRAIG H. BARSTOW, MD, Stable coronary Artery disease, Stable Coronary Artery Discus: Treatment published March 15, 2018;97 (6) : 376 – 384
 10. 1Barry R. Davis, MD.Ph.D, Linda B.Piller, MD. MPH, Jeffary A. Cutler, MD, MPH, Curt Furberg, MD.PhD, Kay Dunn, Ph.D Stanley Franklin, MD, David Goff. MD., Ph.D Frans, Linen, MD, PhD, Syed Mohiuddin, MD Vasiliaspapadine triou, MD, Micheal Proschan, Ph.D Allan Ellsworth, Pharm D, John Golden, MD, Pedeo Colon, MD, Richard Crow, MD, Pedro Colon MD, Richard Crow, MD and for the Antihypertensive and Lipid Powering treatment to prevent Heart attack Trial (Allhat) Collaborative Research Group. Originally published 1 May 2006. *circulation*, 2006; 113:2201-2210.
 11. Centers for disease control and prevention. Coronary Artery Disease. Page last Reviewed; July 19, 2021.
 12. Emily Ford,Jon Adam,Nicholas Graves (2012).Development of an economic model to assess the cost effectiveness of hawthorn extract as an adjunct treatment for heart failure in Australia .*BMJ open* .2.10.1136/bmjopen-2012-001094.

HOW TO CITE: G. Anjani Tejaswi, P. Shaheera, A. Navya Sree, M. Bala Tripura Sundari, P. Seetaramayya, Velaga Mahesh, Safety And Efficacy Of Diuretics With Reduced Ejection Fraction In Heart Failure Patients- An Observational Cohort Study, *Int. J. in Pharm. Sci.*, 2023, Vol 1, Issue 8, 215-222. <https://doi.org/10.5281/zenodo.8280229>

