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The Effect of Dapagliflozin in Improving Ejection Fraction

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ABSTRACT
This project is about to evaluatethe effect of Dapagliflozin in improving ejection fraction and observe the effect of dapagliflozin in hospitalization of cardiovascular diseases like Heart failure.It was a Prospective observational studyconducted from October 2023 to April 2024 at Lalitha Super Specialty Hospital Guntur. A sample size of 60 patients were taken, all the necessary and relevant data was collected from the patient case notes, treatment charts and laboratory reports.
Heart failure is a serious, progressive condition that occurs when heart muscle can't able to pump enough blood to meet body needs for blood and oxygen.Between 1990 and 2000, the number of deaths in India from cardiovascular illnesses increased from 2.26 million to 4.7 million annually. The amount of blood that the left ventricle pumps out with each contraction is measured and represented as the ejection fraction. Guidelines strongly advise using SGLT2 inhibitors to treat individuals with HF who have a decreased ejection fraction.
In our study among 60 patients during and after therapy the considerable changes have seen in cardiac function through ECHO, ECG and symptomatic relief. The positive aspects towards the EF and symptomatic relief have been observed. The patients who are admitted with heart failure have shown positive response towards SGLT2 inhibitors.
KEYWORDS: Heart failure, Hypertension,SGLT2 inhibitors, symptomatic relief,ejection fraction.

I. INTRODUCTION

Heart failure is a long-term condition that gets worse over time. Although the name sounds like heart has stopped working, heart failure means your heart isn't able to pump blood as well as it should. Heart failure continues to be a prevalent and relevant clinical problem. The current prevalence of heart failure in the adult population is estimated to be 1-2%. Approximately 50% of these cases can be attributed to heart failure with reduced ejection fraction, referring to a left ventricular ejection fraction of 40% or less[(1)].

Traditionally, guideline direct medical therapy(GDMT) for HFrEF has been focused on renin angiotensin aldosterone system and sympathetic pathways through agents including: ACE inhibitors, ARBs, ARNI, beta blockers and mineralocorticoids. More recently, sodium glucose cotransporter 2 (SGLT2) inhibitors have shown further reduction in hospitalization of heart failure, cardiovascular events and mortality, especially for HFrEF patients.

EF is a measurement of the percentage of blood leaving the heart each time it squeezes. 2D-Echo, CMR, CT, cardiac catheterization are most commonly used methods for EF estimation. Among these methods, echocardiogram is non-invasive and mostly used of its short-time and bedside properties along with its ability to create 2 and 3 dimensional images, which provide useful information about shape, size and other volumetric information.

- Ejection fraction is calculated as:

$$Er = \frac{SV}{EDV} = \frac{EDV\text{-}ESV}{EDV}$$

Were,
Er=ejection fraction.
SV= stroke volume.
EDV= end diastolic volume.
ESV= end systolic volume.

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DAPAGLIFLOZIN

Dapagliflozin is a sodium glucose cotransporter 2(SGLT2) inhibitor. The usually recommended daily dose of dapagliflozin is 5mg once daily at afternoon, in addition to recommended therapy. SGLT2 inhibitors are originally developed as glucose lowering agents in patients with type 2 diabetes mellitus.they selectively and reversibly inhibit SGLT2, which is selectively express in PCTs of kidney and responsible for reabsorption of glucose from the glomerular filtrate back into the circulation as shown in the fig no:1

The mechanism underlying the clinical benefit in heart failure is not well known. Different studies suggest that the reduction of hospitalization of heart failure could be explained by structural and functional improvement of the left ventricle.

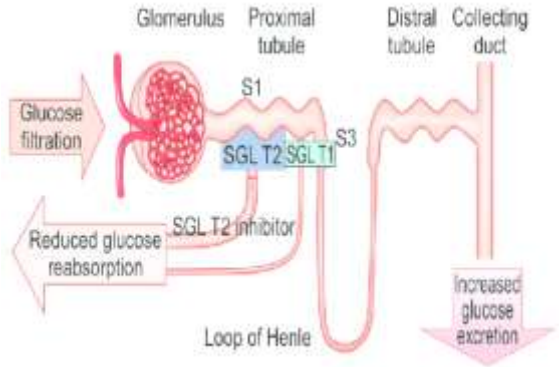

Fig.no.1 MECHANISM OF ACTION OF DAPAGLIFLOZIN

II. MATERIALS AND METHODS

Study design: A prospective observational study was carried out to assess the effect of Dapagliflozin in improving ejection fraction.

Study sample: The sample taken for the study was 60

Study criteria:

Inclusion criteria:

- Both male and female patients of age >18years.
- Patients with left ventricular ejection fraction <40%.
- Patients with heart failure with type-2 diabetes mellitus.

Exclusion criteria:

- Patients with type-1 diabetes mellitus.
- Patients with Chronic kidney Disease.
- Patients with LVEF >40%.
- Both male and female patients of age<18years.

III. III. SOURCE OF DATACOLLECTION

Data was collected from the patient case files. Additional information was collected from the patient by using an interviewer-administered questionnaire. If the participant was unable to understand the questions, he/she was explained in detail in the local language. The participants were encouraged to provide answers to questions without assistance from the family, to avoid bias

IV. RESULTS

A total of 60 patients were included in the study during the period from October to April. We have conducted an analysis on how dapagliflozin in increasing ejection fraction in cardiac patients who had decreased EF less 40 percentage.

TABLE.5.1 DIFFERENT AGE GROUPS

AGE INTERVAL	NO. OF PATINETS	PERCENTAGE
35-45	8	13%
46-55	15	25%
56-65	17	28%
66-75	18	30%
76-85	2	3%

Observation: From the table it is observed that, there are 8 patients within the age group 35-45, 15 patients within the 46-55, 17 patients within the 56-65 age group, 18 patients within the 66-75 age group, 2 patients within the 76-85 age group.

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GRAPH

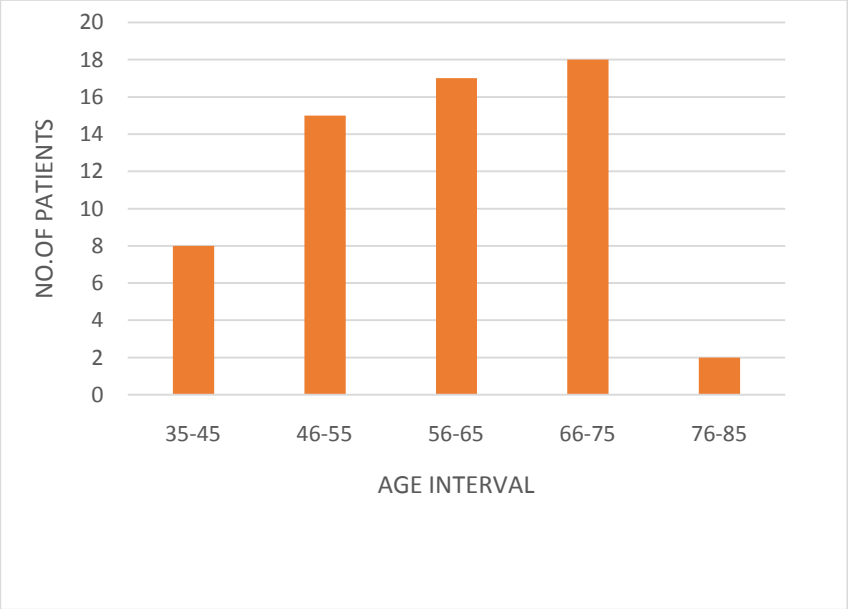

Fig.no 5.1 DIFFERENT AGE GROUP PATIENTS

TABLE.5.2 DISTRIBUTION OF GENDER DIFFERENTIATION

GENDER	NO. OF PATIENTS	PERCENTAGE
Male	39	65%
Female	21	35%

Observation: From the table we can observe that number of male patients are 39 and the female patient are 21 out of 60 patients

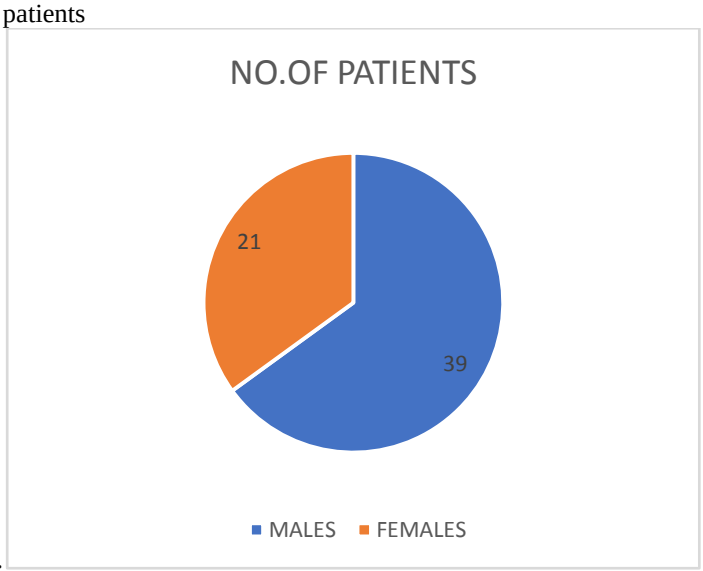

Fig no.5.2 REPRESENTATION OF GENDER

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TABLE.5.3 TOTAL NUMBER OF PATINETS RECEIVING DAPAGLIFLOZIN

NO. OF PATIENTS	EF BEFORE TREATMENT	EF AFTER TREATMENT	INCREASE IN EF
1	40	50	10
2	25	48	23
3	35	48	13
4	30	43	13
5	35	56	21
6	35	50	15
7	38	50	12
8	30	48	18
9	32	48	16
10	36	56	20
11	40	50	10
12	34	49	15
13	30	45	15
14	28	40	12
15	34	47	13
16	35	50	15
17	30	50	20
18	35	42	7
19	38	48	10
20	20	45	25
21	32	45	13
22	25	39	14
23	25	35	10
24	28	38	10
25	25	45	20
26	29	40	11
27	20	45	25
28	35	50	15
29	30	45	15
30	32	42	10
31	30	43	13
32	40	55	15
33	32	43	11
34	32	45	13
35	30	45	15
36	30	50	20
37	34	46	12
38	40	50	10
39	35	49	14
40	35	52	17
41	30	46	16
42	38	43	5
43	40	56	16
44	35	52	17
45	35	49	14
46	25	40	15
47	28	42	14
48	25	43	14
49	25	40	18

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50	40	50	15
51	38	52	10
52	30	48	14
53	40	52	18
54	30	49	12
55	34	50	19
56	28	47	16
57	35	50	19
58	20	43	15
59	20	45	23
60	33	48	25
Mean	31.31	46.62	15
STDEV	5.688	4.006	

Observation:A total of sixty samples were analysed. The ejection fraction is higher in patients who received dapagliflozin (46.62+4.006) compared to those who did not receive it (31.31+5.688).

GRAPH

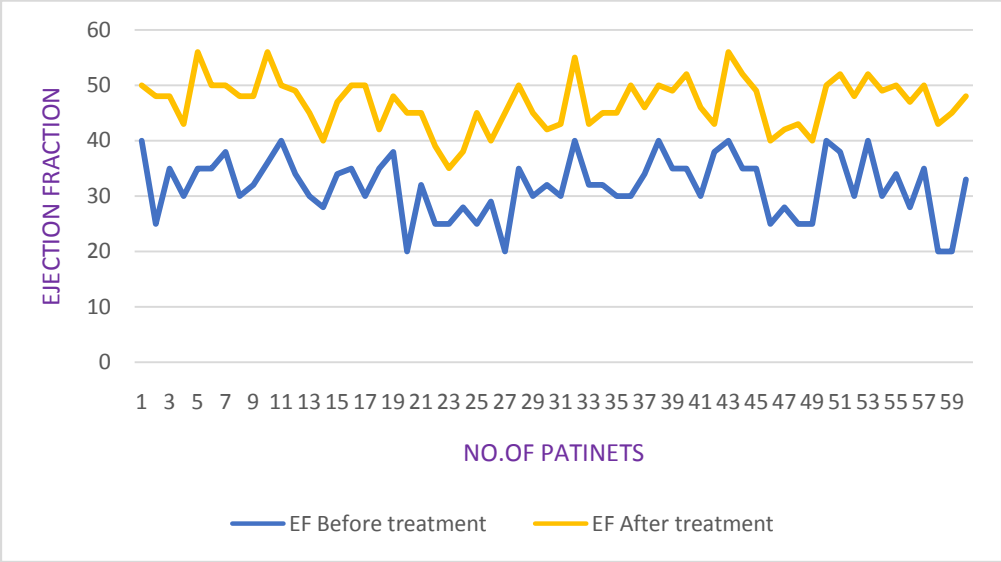

Fig no.5.3 EJECTION FRACTION TOTAL NO. OF PATIENTS

TABLE.5.8 GRBS LEVELS OF PATIENTS ADMININISTERING DAPAGLIFLOZIN

NO. OF PATIENTS	GRBS BEFORE TREATMENT (mg/dl)	GRBS AFTER TREATMENT (mg/dl)
1	136	116
2	220	200
3	156	136
4	165	145
5	148	128
6	246	226
7	178	158
8	134	114
9	234	214
10	112	92
11	223	203

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12	130	110
13	200	180
14	157	137
15	167	147
16	200	180
17	240	220
18	234	214
19	143	123
20	156	136
21	226	126
22	146	134
23	164	112
24	154	132
25	174	110
26	130	126
27	146	124
28	144	120
29	140	115
30	135	115
31	162	108
32	128	150
33	170	130
34	160	130
35	180	144
36	164	130
37	150	127
38	147	123
39	143	123
40	135	115
41	158	128
42	164	134
43	172	152
44	126	106
45	134	114
46	142	122
47	132	122
48	120	100
49	146	123
50	164	143
51	172	153
52	175	154
53	175	155
54	175	156
55	160	138
56	140	129
57	130	110
58	146	126
59	148	128
60	160	145
MEAN	**160.98**	**139.50**
STDEV	**31.767**	**30.547**

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OBSERVATION: It was observed that the patients who received dapagliflozin (n=60) are diabetic and there shows a decrease in serum glucose levels and no patients has hypoglycemia even when other anti-diabetics were being administered.

GRAPH

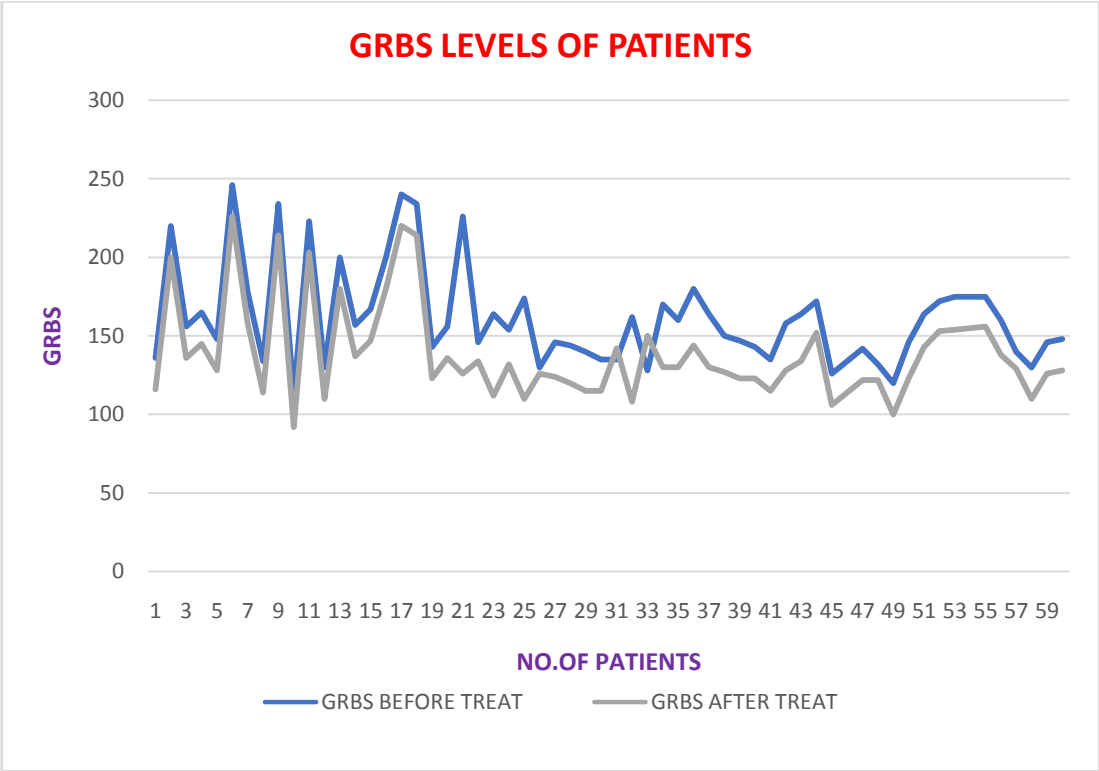

Fig no.5.7 GRBS LEVELS OF TOTAL NO. OF PATIENT

V. CONCLUSION

There are sixty individuals with type 2 diabetes mellitus and HF in our study. Most of the patients had a history of cardiovascular disease that spans approximately two to three years. Patients who are experiencing a reduced ejection fraction respond positively to dapagliflozin.

Improvements in EF and symptom alleviation are seen in HF patients taking dapagliflozin as opposed to those who did not get medication. It was observed that all the patients are diabetic in our study. When they received dapagliflozin there shows a decrease in serum glucose levels and no patients had hypoglycemia even when other anti-diabetics were being administered. Dapagliflozin administration results in higher EF, symptomatic alleviation, and reduced hospitalizations in Heart Failure patients.

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