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Clinical evaluation of an Indigenous Compound drug in Hridroga With special reference to Left Ventricular Dysfunction

Research Article

Alka (Babbar) Kapoor[1*], Abhimanyu Kumar[2], Anand Bihari Sharma[3], Prem Chand Sharma[4]

1. Clinical specialist, Department of *Kayachikitsa*, 2. Director,
All India Institute of *Ayurveda*, Mathura Road, Gautampuri, New Delhi -110076.
3. Professor , 4. Reader, Department of Kaya Chikitsa,
M.M.M.Govt. Ayurvedic College, Udaipur

Abstract

Ventricular dysfunction is a state where an adequate cardiac output cannot be maintained even with support of compensatory mechanisms. Left sided dysfunction gives rise to inadequate systemic circulation and congestion of the lungs manifesting as tachycardia, muffled heart sound, gallop rhythm, tachypnea, cough, breathlessness & enlargement of the heart and ultimately leads to cardiac failure. Present study comprehends the selection of patients with left ventricular dysfunction (LVD) and trial of an Ayurvedic formulation coded as Cardi-16 for its efficacy to combat the disorder in comparison with *Digitalis lanata* Ehrh. A total of 24 patients of LVD were selected for the study who were randomly divided into three groups with one group being treated with Cardi-16, second with *Digitalis lanata* Ehrh. and third with combined therapy. 20 patients (8 in group I, 6 in group II and 6 in Group III) completed the course of treatment. Left ventricular ejection fraction (LVEF) was measured to assess the effect of therapy. The effect of treatment on chief complaints and symptoms was also evaluated. Both the treatments were found effective in relieving symptoms and increasing ejection fraction but the results were more pronounced in the groups in which Cardi 16 was given.

Key words*:* Left Ventricular Dysfunction, Hridroga, Cardi-16

Introduction

Heart failure, the most common and important precursor of which is left ventricular systolic dysfunction, is a common cardiovascular condition with rising incidence and prevalence (1). It leads to high mortality and major impairment of quality of life (2-4). It is also a leading cause of healthcare expenditure through repeated hospitalization and high treatment costs (5). About 28% of all deaths in India are caused by cardiovascular diseases (6). Cardiovascular disorders account for roughly 40 million deaths annually (7).

Despite important advancements in the pharmacotherapy of heart failure, the actual percent reduction in mortality associated with the use of these agents has been relatively unpretentious. Moreover the available pharmacological agents are also not free from various side effects (8). Hence there is immense requirement of certain drugs which can increase cardiac efficiency and can increase the

*Corresponding Author:
Alka (Babbar) Kapoor
C-466, Sarita vihar,
New Delhi-110076
Ph. No: +91-9312330249
E-mail: dralkakapoor@gmail.com

performance of compromised heart for healthy living in a natural way with least possible side effects. Present work is an attempt in this direction

To treat left ventricular dysfunction (LVD) on Ayurvedic principles, it is necessary to identify the nature of the disease in terms of its component dosha (humor), dushya (part which is affected) and adhishthana (abode). In LVD, impairment of the cardiac function is brought about by derangement of tridoshas (three humors vata, pitta & kapha) with predominance of vata and kapha. As heart is the root of rasavaha srotas and is the sole organ responsible for rasa-samvahan (circulation), vitiation of rasa-vaha srotas and rasa dhatu by morbid doshas leads to heart disease (9).

The etiological factors which lead to vitiation of this srotas include foods which are guru (not easily digestible), atisheeta (cold), atisnigdha (oily) psychological factors like chinta (worries) etc.(10).When an individual is indisposed through above mentioned aetiological factors; the disease process ensues in the form of tridoshic arrhythmia and vitiation of doshas predominantly 'kapha' in this case. This vitiated kapha owing to its sheeta, guru and manda gunas leads to weakening of koshthagni (digestive fire) and its moiety rasagni. When agni becomes weak, the food does not get the required digestion leading to accumulation of a number of unwanted by-products of digestion and metabolism called ama. The presence of ama renders the body metabolically slow and sluggish along with varying degrees of blockage of channels of the body at different levels from gross to molecular level. During its sojourn in these channels, it tends to adhere to the walls thereby narrowing the passages or causing obstruction, termed as srotorodha. Increased impermeability and sluggishness of the body channels or the rasavahi srotases offer increased resistance and compel the heart to pump blood more vigorously at a rate commensurate with the metabolic requirements of the body. In presence of this hemodynamic burden or increased workload, the cardiac muscles get hypertrophied as a compensatory mechanism to maintain the overall performance. However, if this ama state and excessive hemodynamic burden persists, the heart ultimately fails to perform its function. Secondly if morbid kapha and ama block the channels supplying nutrition to the heart (e.g. coronary arteries) then such obstruction leads to deficiency of nutrition and cardiac metabolism is hampered which in turn affects its performance. It is essential to break this pathogenesis to get the desired results. Thus treatment of LVD aims at i) enhancement of digestive fire and balancing vitiated doshas i) reduction of cardiac workload-both preload and after-load; ii) control of excessive salt and water retention, iii) enhancement of myocardial contractility and vascular elasticity. Selection of ingredients was done keeping these objectives in mind.

Aims and objectives

Present work was undertaken with the objective to clinically evaluate an Indigenous compound drug coded as Cardi-16 in heart disease (*hridroga*) with special reference to left ventricular dysfunction on various scientific parameters.

Materials and Methods

Selection of the Patients

Patients were selected from the outpatient and inpatient department of Kayachikitsa of 'A' class Govt. Ayurvedic Hospital, Motichauhatta and R.V.P.S.S Ayurvedic Hospital, under M.M.M., Govt. Ayurvedic College, Udaipur. A total of 24 patients of LVD, above 18 years, of either sex, satisfying the inclusion criteria were finally enrolled in the study after thorough baseline screening. Informed consent was taken from the patient before including

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them in the trial. They were randomised into three groups using permuted block randomization technique. During the study, 04 patients dropped out and only 20 were followed till the end (8 in group 1, 6 each in group 2 & 3)

Diagnostic Criteria

The patients were subjected to echocardiography to evaluate ejection fraction (EF) to confirm the diagnosis of LVD. The patients having less than normal EF values (i.e. 67±8%) were taken into consideration.

Inclusion Criteria

Following group of patients were taken into consideration for the present clinical study.

(i) Patients between18- 80 years of age of either sex with EF≤ 59%

(ii) Patients with associated: -
Stable, chronic cases of Ischemic heart disease (IHD), Cardiomyopathy, Hypertension (HT), Controlled type 2 diabetic patients without complications and not on insulin, Patients willing to give consent to participate in the study.

Exclusion Criteria

Following group of patients was not taken intos consideration for the present clinical study.

(i) Patients above 80 years of age

(ii) Patients unwilling to participate

(iii)Patients with following associated disorders-
Cardiac: Acute myocardial infarction (Newly diagnosed acute cases), severe valvular defects, congenital heart disease, pericarditis, arrhythmia, patients already on digoxin therapy.
Extra Cardiac: Renal failure, Type I diabetic patients, uncontrolled Type 2 diabetic patients with complications, chronic alcoholics, pregnant/lactating women,

Criteria for Early Withdrawal of Subjects

Failure of subjects to adhere to protocol requirements, subject consent withdrawal, disease progression and subject gets pregnant (in case of female patients)

Drugs Used

An Ayurvedic compound coded as Cardi – 16

A total of following 16 drugs were selected for this compound

S. No.	Name of the Ingredient	Latin Name	Part Used	Proportion
1.	Arjuna	*Terminalia arjuna* Roxb. W. & A.	bark extract	6 parts
2.	Gokshura	*Tribulus terrestris* Linn.	fruit extract	7 parts
3.	Gulab	*Rosa centifolia* Linn.	flower extract	6 parts
4.	Punarnava	*Boerrhavia diffusa* Linn.	whole plant extract	3 parts
5.	Pushkarmoola	*Inula racemosa* Hook.f.	root extract	8 parts
6.	Tamboola	*Piper betle* Linn.	leaf extract	½ part
7.	Karpura	*Cinnamomum camphora* Nees & Eberm	extract	3 parts
8.	Brihad Ela	*Amomum subulatum* Roxb.	Seeds powder	8 parts
9.	Van Palandu	*Urginea indica*	bulb extract	½ part

		Kunth		
10.	Ankola	*Alangium salvifolium* (Linn.f.) ; Wang	root ghan-satwa	8 parts
11.	Pita karveera	*Thevetia neriifolea* Juss.	root ghan - satwa	1 part
12.	Erandakarkati	*Carica papaya* Linn.	leaves' juice.	8 parts
13.	Abhraka	*Mica*	bhasma	12 parts
14.	Jaharmohra	*Serpentine*	pishti	6parts
15.	Shuddha Shilajita	*Bitumen*	extract	25 parts
16.	Mriga Shringa	*Hart's horn*	bhasma	6 parts

Ingredients no.1-9 were procured in dry powder form. The Ghan satwa of ingredient no. 10 & 11 were formed in water after proper purification, as per the process laid down in Ayurvedic texts(11). Both these ghan satwa taken together were impregnated in juice of ingredient no.12. This mixture was then allowed to dry in shade and triturated carefully to get a fine powder. The requisite processing of ingredients 13-16 was done as per the process laid down in Ayurvedic texts (12). Finally all the ingredients were mixed in a pulveriser. The proportion of each ingredient was fixed on the basis of potency of the drug according to principles of *Dravya guna* and *Bhaishajya kalpana*.
Capsules were prepared, each containing 500mg of the prepared compound.
Dosage: 2 capsules three times a day after meals with water i.e., after breakfast, lunch and dinner.

II. Hritpatri (*Digitalis lanata* Ehrh.) Capsules

Hritpatri (*Digitalis lanata* Ehrh.) leaves were made into fine powder and filled into gelatine capsules each containing 100 mg of the prepared *Hritpatri* powder
Dosage: 1 capsule BD after meals with water i.e., after breakfast and dinner

The dose of *Hritpatri* was decided according to its leaf powder doses given in texts of pharmacology (13).

Administration of Drug

(i) Group I - This group comprising of 8 patients, was given Cardi-16 capsules in the dose of 3gm per day with luke warm water for 2 months.
(ii) Group II - This group was given *Hritpatri* capsules with luke warm water for 2 months. 6 patients were included in this group.
(iii) Group III - This group comprised of 6 patients. Both Cardi-16 and *Hritpatri* capsules were given to the patients of this group.

The OPD patients were advised to follow-up initially after a week and then at interval of 15 days. At every visit patients were assessed for their symptoms, pulse, blood pressure, respiratory rate, weight etc.

Criteria of Assessment

The efficacy of the therapy was assessed on the basis of subjective as well as objective criteria.

Subjective Criteria:

All the patients registered for the trial were looked into for any changes in their clinical manifestations and growing feeling of well being if any, after the therapy. Following symptoms were taken into consideration.

1) Breathlessness (*Shwasa*)
2) Fatigability (*Klama*)
3) Chest pain (*Uro-ruja*
4) Palpitation (*Hritkampa*)

Above clinical symptoms were put under functional class according to the criteria laid down by New York Heart Association

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(1964), and were assessed according to the grades-

Grade I - No limitation of physical activity. No symptoms with ordinary exertion

Grade II - Slight limitation of physical activity. Ordinary activity causes symptoms

Grade III - Marked limitation of physical activity. Less than ordinary activity causes symptoms, asymptomatic at rest.

Grade IV - Inability to carry out any physical activity without discomfort. Symptoms at rest.

The assessment was done before starting the treatment and after 60 days of treatment. Improvement and effect of drug was assessed on the basis of relief in number of symptoms.

Relief in 75% or more symptoms - Excellent

Relief in 50-74.9% or more symptoms - Good

Relief in 25-49.9% or more symptoms - Average

Relief in less than 25% symptoms - Below average

Objective criteria

Evaluation of Ejection Fraction (EF) by echocardiography before and after treatment was done & any change in EF percentage was recorded.

Exercise Tolerance in patients measured by calculating the difference in post exertion values of Pulse, B.P. and Respiratory rate. At every visit, patients were subjected to a piece of exercise-climbing a set of 50 stairs and about 50 meters brisk walk on plain surface. After exertion any change in the vitals was recorded. Result was evaluated from the premedication & post medication difference in values of vitals.

Observations and Results

In this study, all the patients selected were in the age group of 18-80 years. However, majority of the patients were between 35 to 50 years of age (55%). Prevalence of this disease was found more in educated (60%) & service class (60%) patients. Almost all the patients registered were addicted either to smoking (60%) or chewing tobacco (40%) or alcohol etc. Most of the patients registered were having *kaphaj (40%) or vata-kaphaj (45%) deha prakriti* and *madhyama satwa* (60%). 35% patients of the registered LVD cases were known cases of ischemic heart disease while 20% were suffering from hypertension. Table 1 exhibits distribution of patients according to different characteristics.

Table 1: Distribution of patients according to different characteristics

Characteristic	No. of patients	Percentage
Age group		
35-50	11	55
50-65	06	30
65-80	03	15
Sex		
Male	11	55
Female	09	45
Educational status		
Educated	12	60
Illiterate	08	40

Work profile		
Service class	12	60
Business Class	08	40
House Wife	07	35
Labour Class	03	15
Diet		
Vegetarian	12	60
Non Vegetarian	08	40
Addiction		
Tobacco Chewing	12	60
Smoking	08	40
Alcohol intake	07	35
Both smoking and drinking	03	15
Others	06	30
Economic status		
Lower & lower middle class (< 5000pm)	05	25
Middle class (5000-15000pm)	06	30
Higher income group (> 15000pm)	09	45
Prakriti		
Vataj	02	10
Pittaja	01	05
Kaphaja	08	40
Vat-Pittaja	00	0
Vat Kaphaja	09	45
Pitta Kaphaja	00	00
Sannipattaja	00	00
Satwa		
Awara	07	35
Madhyama	12	60
Prawara	01	05
Associated disorder		
IHD	07	35
HT	04	20
DM	03	15
Obesity	02	10
Cor Pulmonale	01	05
RHD	01	05
PSVT	01	05
Depression	01	05

Effects of Cardi 16 (group I), Hritpatri (group II) and combined therapy (group III) on clinical recovery of symptoms of LVD are shown in Table 2, 3 &4 respectively. Effect of therapy on exercise tolerance and left ventricular ejection fraction in group I, II and III are represented in Table No. 5-10.

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Table 2: Clinical recovery of Symptoms of LVD in Group I

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Breathlessness	3.12	1.87	1.25	0.46	0.16	7.64	<0.0001
Fatigability	2.75	1.75	1.00	0.53	0.19	5.29	<0.001
Chest pain	2.37	1.37	1.00	0.93	0.33	3.05	<0.02
Palpitation	2.5	1.37	1.12	1.126	0.39	2.83	<0.03

Table 3: Clinical recovery of symptoms of LVD in Group II

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Breathlessness	2.67	1.50	1.17	0.41	0.17	7	<0.001
Fatigability	3.17	1.50	1.67	0.52	0.21	7.91	<0.001
Chest pain	2.50	2.00	0.50	0.55	0.22	2.24	<0.1
Palpitation	3.17	2.00	1.17	0.41	0.17	7	<0.001

Table 4: Clinical recovery of symptoms of LVD in Group III

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Breathlessness	3.17	1.5	1.67	0.52	0.21	7.91	<0.001
Fatigability	3.33	1.67	1.67	0.52	0.21	7.91	<0.001
Chest pain	2.33	1.17	1.17	0.75	0.30	3.80	<0.01
Palpitation	2.67	1.33	1.33	1.21	0.49	2.70	<0.05

Table 5: Exercise tolerance in Group I - difference in post exertion values of pulse, B.P. and respiratory rate.

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Pulse rate	25.75	13.25	12.5	3.817	1.35	9.26	<0.0001
Respiratory rate	6.38	3.13	3.25	1.28	0.45	7.17	<0.001
Systolic B. P.	16.5	6.63	9.87	7.94	2.81	3.52	<0.01
Diastolic B.P.	6	3.5	2.5	5.40	1.91	1.31	>0.2

Table 6: Exercise tolerance in Group II- difference in post exertional values of pulse, B.P. and respiratory rate.

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Pulse rate	27.83	15.33	12.5	21.59	8.82	1.42	>0.2
Respiratory rate	7.33	4	3.33	1.63	0.67	5.00	<0.01
Systolic B. P.	14.5	8.33	6.17	5.46	2.23	2.77	<0.05
Diastolic B.P.	5.67	2	3.67	3.44	1.41	2.61	<0.05

Table 7: Exercise tolerance in Group III- difference in post exertional values of pulse, B.P. and respiratory rate.

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Pulse rate	28.83	16.33	12.5	4.64	1.89	6.60	<0.001
Respiratory rate	6.17	2.83	3.33	1.63	0.67	5.00	<0.005
Systolic B. P.	9.33	7.67	1.67	6.12	2.50	0.67	>0.5
Diastolic B.P.	5.17	4.67	0.5	5.92	2.42	0.21	>0.5

Table 8: Changes in ejection fraction value in Group I

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Ejection fraction	49.17	60.33	11.17	6.047	2.47	4.523	<0.01

Table 9: Changes in ejection fraction value in Group II

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Ejection fraction	47.33	48.83	1.5	1.05	0.43	3.503	<0.02

Table 10: Changes in ejection fraction value in Group III

Observations	Mean			S.D.	S.E.	t	p
	B.T.	A.T.	Diff.		±		
Ejection fraction	46.83	54.83	8	2.83	1.15	6.93	<0.001

Table 11: Symptomatic relief

11a. Group I

S.No.	Category of results	No. of patients	% of results
1.	Excellent	5	62.50
2.	Good	2	25.00
3.	Average	1	12.50
4.	Below Average	-	-
	Total	8	

11b. Group II

S.No.	Category of results	No. of patients	% of results
1.	Excellent	-	-
2.	Good	4	66.60
3.	Average	2	33.33
4.	Below Average	0	-
	Total	6	

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11c. Group III

S.No.	Category of results	No. of patients	% of results
1.	Excellent	-	-
2.	Good	6	100.00
3.	Average	-	-
4.	Below Average	-	-
	Total	6	

On comparing the results, it was observed that the effect of Cardi 16 was better in relieving symptoms of breathlessness ($p<0.0001$), chest pain ($p<0.02$) and fatigability ($p<0.001$). However Hritpatri worked better for palpitation ($p<0.001$). [Table 2], [Table 3], [Table 4] .

Exercise tolerance was also found better in the group treated with Cardi-16 [Table 5], [Table 6], [Table 7].

On comparing the effects of therapies on Ejection fraction, it was seen that the results were better in the group in which Cardi -16 was given [Table 12]

Table 12: Comparative improvement of different criterion of *Hridroga* (LVD) in three groups of patients.

Observations	I group	II group	III group
Symptomatic improvement	t=4.70 p<0.015	t=5.15 p<0.02	t=4.66 p<0.015
Improvement in exercise tolerance	t=5.32 p<0.1	t=2.95 p<0.1	t=3.12 p<0.5
Improvement in ejection fraction	t=4.22 p<0.01	t=3.50 p < 0.02	t=6.92 p<0.001

Fig. 1: Symptomatic relief in three groups

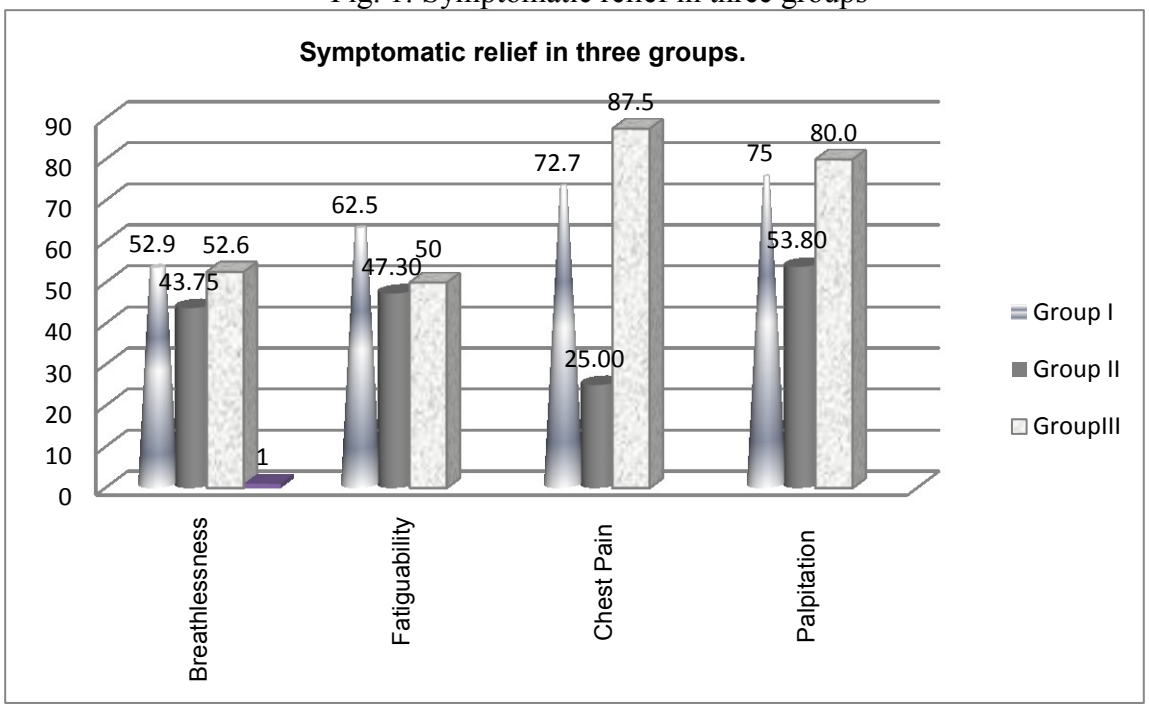

Fig.2: Extent of symptomatic relief in three groups

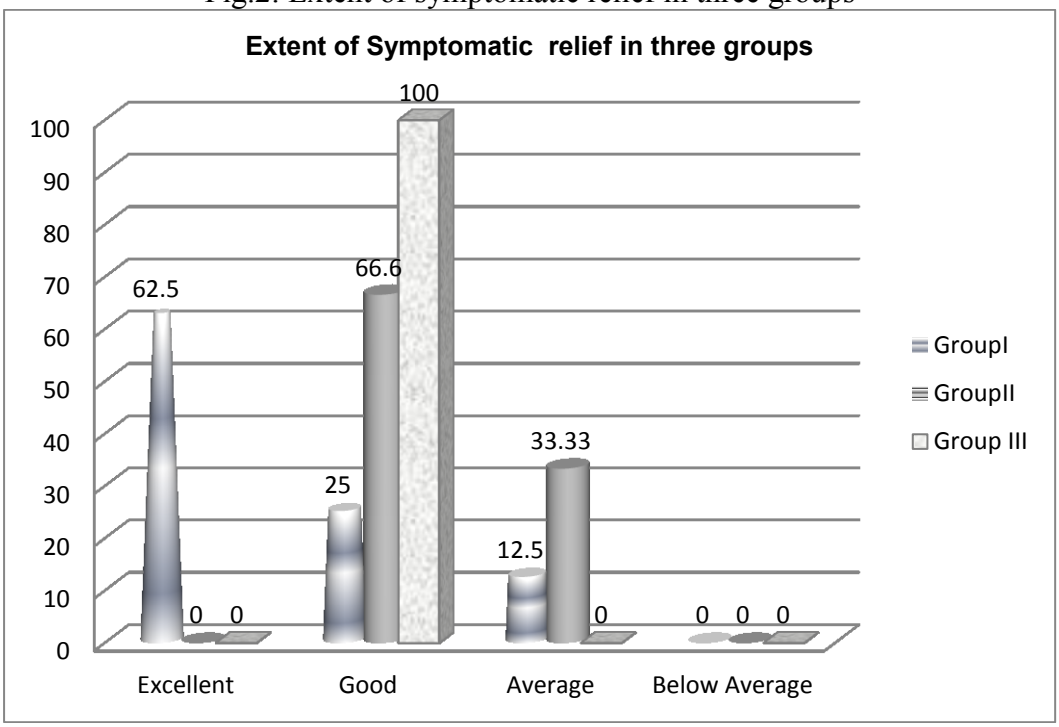

Fig.3: Improvement of Ejection Fraction value in three groups

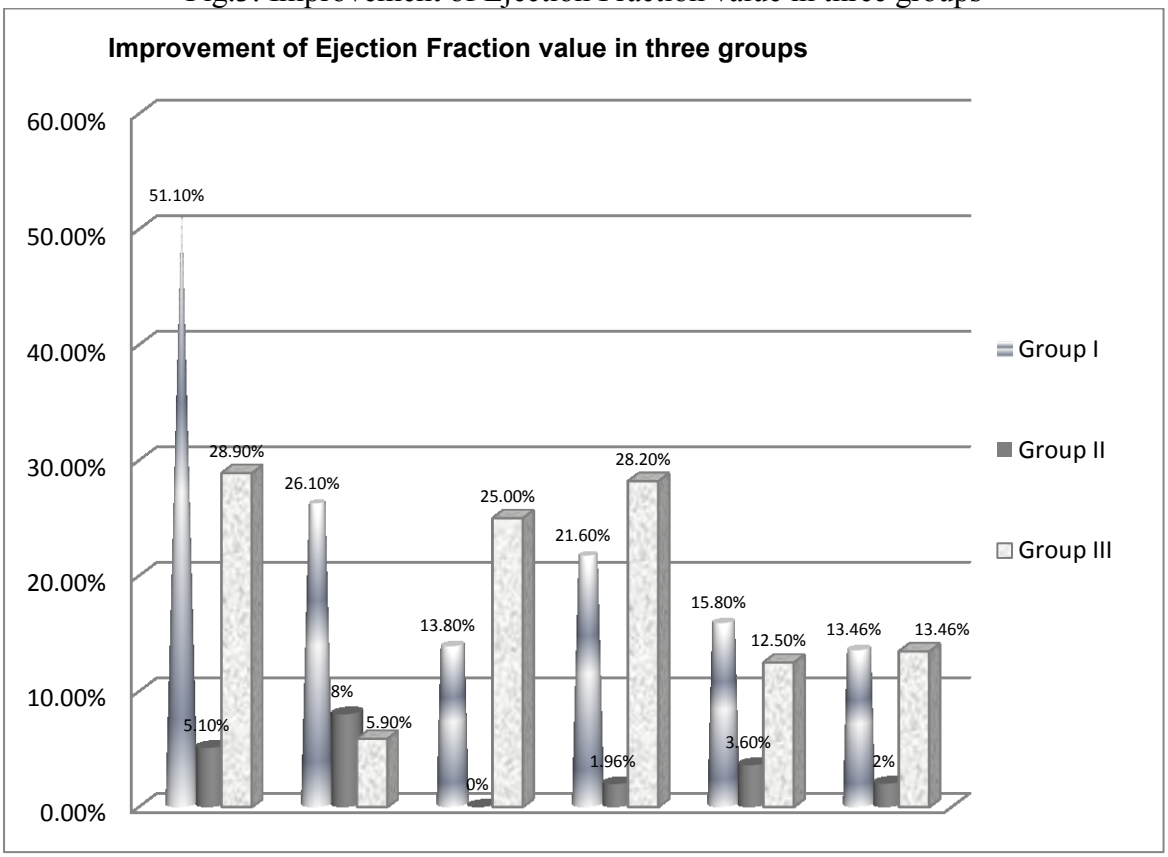

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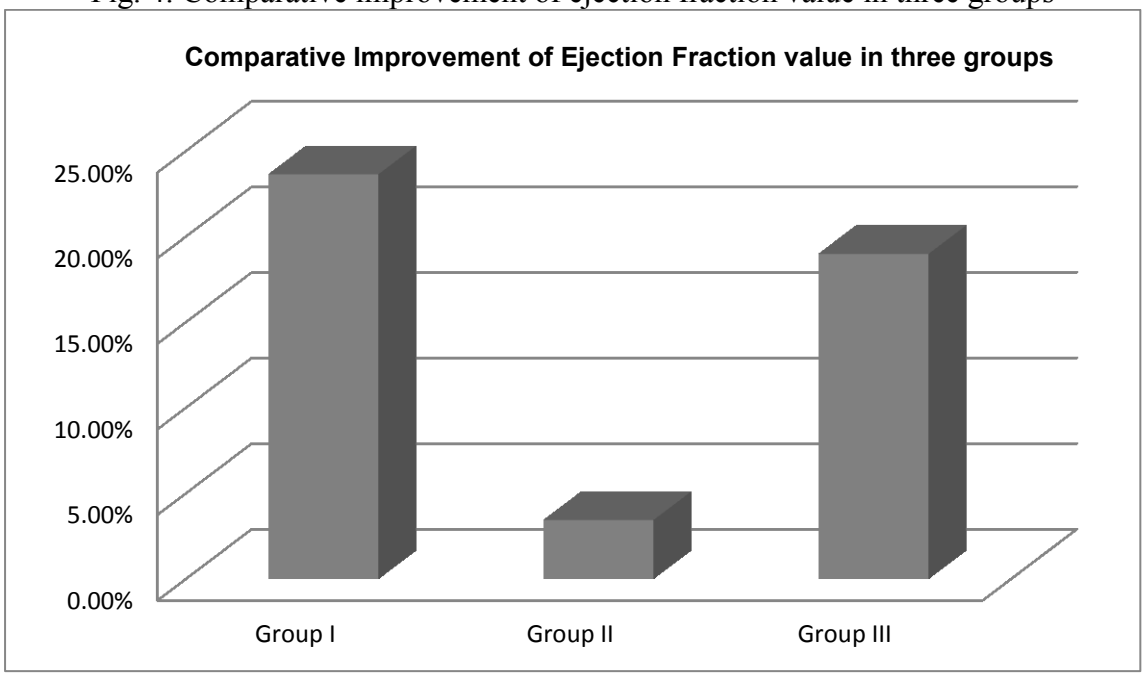
Fig. 4: Comparative improvement of ejection fraction value in three groups



Discussion

The review of Ayurvedic literature indicates that *Hridroga* is described in most Ayurvedic texts in very brief. On the other hand modern description of cardiovascular disorders is very extensive. Various types of cardiac disorders have been described. Out of these cardiac failure is most troublesome to treat and left ventricular dysfunction is the prodromal stage of cardiac failure. In LVD, impairment of cardiac function is brought about by derangement of *tridoshas* with predominance of *vata* and *kapha dosha*, *agnimandya* (weak digestive fire) and *srotosang* (obstruction in body channels). The ingredients of proposed drug were selected to break down this pathogenesis and normalize the function of heart by restoring the balance of *vata, pitta & kapha*.

While selecting the patients, it was observed that most of the patients were in the age group of 35-50 years. Previous studies have shown that this problem is common in old age group (14). However due to increasing stress and lifestyle changes, cardiac problems are increasing in middle and younger age group also. Probably due to same reason, the prevalence of this disease was found more in middle class, educated, competent patients who are always sustained to mental stress so as in service class and house wives. Dietary habits and addictions also play a pivotal role in the prevalence of this disease. Almost all the patients registered were addicted either to smoking or chewing tobacco or alcohol etc. Several previous studies also reveal that drinking alcohol and smoking or chewing tobacco is predisposing factor for the cardiac diseases (15).

The patients were also subjected to *prakriti* (psychosomatic constitution) and *satwa* (psychological qualities*)* examination. Majority of the patients were found to have '*kaphaj*' or '*vata-kaphaj*' type of constitution and *madhyam* or '*awar' satwa.* This can be explained as the disease is *sannipataja* with predominance of *kapha* and *vata*, hence the person with same *prakritik doshas* are more prone, to get the disease. *Madhyam* and *awara Satwa* patients are comparatively emotionally unstable personalities with a

low level of mental stamina and hence are easily afflicted by psychosomatic disorders.

The most important symptoms which the patients presented with were breathlessness on exertion, chest pain, fatigability and palpitation. Syncopal attacks, cough with expectoration, edema of dependent parts, gastro intestinal disturbances were among other important symptoms.

It was observed that there was significant improvement in clinical features of LVD like breathlessness, chest pain, and fatigability after the therapy in Group I & III, in which Cardi-16 was administered. [Table 2, 3 & 4]. Patients subjected to the treatment with Cardi -16 also reported increase in their urine output. Reduction in diastolic blood pressure was also observed in patients with mild hypertension. Probably this way the drug has facilitated reduction in after load and improvement in diastolic function. Drug has also exhibited positive inotropic activity. Significant improvement in EF value was observed in group I ($p<0.01$) and group III ($p<0.001$) [Table 8, 10]. II group patients also reported improvement in clinical features and slight increase in EF ($p<0.2$) [Table 9] but the percentage of benefit was less as compared to Group I. Some patients of Group II developed nausea and anorexia. Cardi-16 was well tolerated by all the patients. No side effects or toxic effects were reported by any patients.

Most of the drugs in cardi-16 have *laghu* (light), *ruksha (non unctuous) tikshna* (sharp) *gunas* (properties), *katu vipaka and ushna veerya* (hot potency). These properties make cardi-16 igneous in nature, *kapha vata shamak and jathragni stimulant.* This stimulation of *jathragni* indirectly stimulates *rasagni* and helps in digestion and removal of *ama* from the *srotases* and thus helps in arresting the *etiopathogene*sis.

Moreover owing to the properties of ingredients of cardi-16, it has probably worked as *'rasayan'*, 'diuretic' *'hridya', 'ampachak'* as well as antioxidant. *Shilajeet and abhrak bhasma* have *rasayana* properties, so they may create an improved nutritional status by acting on the level of *rasa, agni, and srotas. Jaharmohra pishti, arjuna, tamboola, gulab* work by their '*hridya prabhava*' having elective affinity for heart and circulatory system. Punarnava is a potent diuretic and *shringa bhasma*, *pushkarmool & ela* are specially honored for their pain alleviating properties (16, 17). Ingredients like *arjuna, ela, betel leaves, erand karkati* have definite antioxidant, phenolic and flavonoid content which can scavenge free radicals by one way or the other and lower the risk of heart disease.

From the modern concept, the drug should have positive inotropic and diuretic action and should be able to optimize both preload and after load by vasodilatory action. Cardi-16 seems to perform all the three functions to some extent and supposed to have anti-oxidant and preventive action as well. Observations on parameters like Ejection fraction, Blood pressure, heart rate, respiratory rate, and clinical well being prove that medicine surely is a potent cardio tonic. However it is a matter of further research that what the drug did to the myocardial cells—increased their nutritional status regenerated dead cells or increased vigor of resting cells.

Conclusion

LVD is an alarming syndrome which ultimately leads to a serious disease heart failure, having chronic etiopathogenesis requiring long term therapy. This study reveals that Cardi-16 has strong cardio tonic, inotropic and cardio protective properties which help in improvement of LVEF. It also has potent diuretic effect that helps in reducing the after load and improves diastolic function.

Hence it can be used effectively in the management of LV dysfunction to slow down the progress of the disease in prevention of heart failure. This study was done on small sample. Studies with larger samples and long term follow up should be done to confirm our findings.

References

1. Rosamond. W, Flegal K, Friday G, Furie K, Go A, Greenlund K, et al. Heart disease and stroke statistics 2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2007; 115: e69-171, Pubmed
2. The CONSENSUS Trial Study Group. Effects of enalapril on mortality in severe congestive heart failure. *N Engl J Med* 1987*;* 316*:* 1429–1435.Available from: MedlineWeb of Science
3. McKee PA, Castelli WP, McNamara P, Kannell WB The natural history of heart failure: the Framingham study. *N Engl J Med* 1971*;* 285*:* 1441–1446
4. Davis RC, Hobbs FDR, Kenkre JE, Roalfe AK, McLeod S, Hare R, et al . Quality of life in heart failure, as measured by the SF-36 health status questionnaire. *Eur. Heart J.* 1998*;* 19*(abstr* suppl*):* 639.
5. Sutton GC, Epidemiological aspects of heart failure. *Am. Heart J* 1990*;* 120*:* 1538–1540. Available from MedlineWeb of Science
6. Reddy K. S. & Satija A. The Framingham heart study: impact on the prevention and control of cardiovascular diseases in India. Progress in Cardiovascular Diseases, 2010. 53, 21-27. Retrieved from http://www.sciencedirect.com
7. Burden of Disease in India, National Commission on Macroeconomics and Health, Government of India, Ministry of Health and Family Welfare,New Delhi, 2005.
8. Miller LW, Limitations of current medical therapies for the treatment of heart failure, Rev Cardiovasc Med. 2003; 4 Suppl 2: S21-9.
9. Atrideva, commentator, Sushruta Samhita, Uttar tantra 43/4, 5th edition, Motilal Banarsidas Publication, Delhi, 1975, reprint, 1997; 727.
10. Brahmananda Tripathi, commentator Charaka Samhita, viman sthan 5/13, 3ed., Varanasi,Chaukhambha Surabharati Publication, 1994;699.
11. Brahmananda Tripathi, commentator Sharandhar Samhita, madhyam khanda 8/1, 3ed., Varanasi, Chaukhambha Surabharati Publication, 1998; 210
12. Mishra S, Ayurvediya Rasashastra, 5ed., Varanasi, Delhi, Chaukhamba Orientalia, 1994;356,357,676,683
13. Kratz & Carr, Ghosh's Pharmacology, Materia Medica & Therapeutics 22ed. Pharmacological Principles of Med. Practice, 6ed.
14. Lloyd-Jones DM, Larson MG, Leip EP, Beiser A, D´Agostino RB, Kannel WB, et al. Lifetime risk for developing congestive heart failure: the Framingham Heart Study. Circulation 2002; 106: 3068-72.
15. Kenchaiah S, Narula J, Vasan RS. Risk factors for heart failure. 3. Med. Clin North Am 2004; 88: 1145-72
16. Pandey GS, Chunekar KC, commentary on Bhavaprakash of Shri Bhava Mishra, 10th edition, Varansi, Chaukhamba Bharati Academy, 1995
17. Rastogi RP, Mehrotra BN, Compedium of Indian Medicinal plants (Vol. I & IV), New Delhi, CDRI Lucknow and Publication and information directorate, 1995.

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