

Original Research Article

## **Evaluation of the Effect of *Terminalia arjuna* on total Platelet Count and Clinical Parameters in Patients of Coronary Artery Disease**

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**Abstract:** Coronary artery disease (CAD; also atherosclerotic heart disease) is the most common type of heart disease and cause of heart attacks. The disease is caused by plaque building up along the inner walls of the arteries of the heart, which narrows the arteries and restricts blood flow to the heart. Aim of present study was to see the effect of *Terminalia arjuna* on total platelet count and clinical parameter in patients of coronary artery disease. The selected patient were divided randomly into two groups each were comprising of 50 patients. GROUP1.- These patients were taken conventional treatment with placebo and served as the control group. GROUP2.-These patients besides conventional treatment were given *Terminalia arjuna* (Arjuna Chhal) powder and served as the study group. The systolic blood pressure had shown decrease in study group after Arjuna Chhal therapy. The diastolic blood pressure had shown decrease in study group after Arjuna Chhal therapy. The Pulse had shown decrease in study group after Arjuna Chhal therapy. The total platelet count had decrease in study group after Arjuna Chhal therapy. Arjuna chhal mainly used in Ayurvedic Practice is Beneficial for overall health, it is suitable for congestive heart failure, it helps to lower blood pressure and it inhibits platelet aggregation. So it should be advised as continued therapy in patients of coronary artery disease.

**Keywords:** Coronary artery disease (CAD), congestive heart failure, Atherothrombosis

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### **INTRODUCTION**

Coronary artery disease (CAD; also atherosclerotic heart disease) is the most common type of heart disease and cause of heart attacks [1]. The disease is caused by plaque building up along the inner walls of the arteries of the heart, which narrows the arteries and restricts blood flow to the heart.

Coronary artery disease has been defined as "Impairment of heart function due to inadequate blood flow to the heart compared to its needs, caused by obstructive changes in the coronary circulation to the heart" [2].

An Indian shrub, known as Arjuna, has been mainly used in Ayurvedic medicine to support cardiovascular health [3]. This Extract contains a variety of flavonoids and polyphenols, which help to reduce inflammation that cause plaque in the arteries [4].

*Terminalia arjuna* is native to the Indian subcontinent. The deciduous tree could grow up to a height of 90 feet. For more than three hundred years, the bark of the Arjuna tree is used in ayurvedic medicine as a cardiac tonic. The White to pinkish gray colored bark of the tree contains flavonoids, tannins, gallic acid, oligomeric proanthocyanidins, triterpenoid saponins, phytosterols, ellganic acid, magnesium, calcium, copper and zinc. Experimental studies and clinical trials indicate the usefulness of the active constituents of Arjuna bark in treating coronary artery disease and congestive heart failure. Intake of *Terminalia arjuna* bark powder is associated with improved cardiac muscle function, which eventually boosts the pumping function of the heart.

Oligomeric proanthocyanidins and flavonoids boost the natural antioxidant defense system of the heart and strengthen the vascular system of the body. *Terminalia arjuna* might prevent atherothrombosis by inhibiting platelets aggregation in coronary artery disease patients [5, 6].

Arjuna has been a part of ayurvedic medicinal system. It is an herb that is of cool temperament and is Kapha and pitta modulator. It is cardiac restorative, promotes healing, helpful in treating ailments like tuberculosis and poisoning in the body and is effective in condition like overweight and urinary tract disturbances. Use of arjuna with milk in conditions like cardiac disorders, indigestion, fever, hemorrhages and bleeding and most importantly the fractures and related injuries.

## MATERIAL AND METHODS

This study was conducted in the Department of Physiology, S.P. Medical College, and Bikaner. One hundred patients of coronary artery disease were selected for this study attending the Haldiram Moolchand Govt. Center for Cardiovascular research of P.B.M. Hospital and Mohta Rasayan Shala, Bikaner within 15 days baseline investigation were completed. The selected patients were divided randomly into two groups each comprised of 50 patients.

GROUP1. These patients were taken conventional treatment with placebo and served as the control group.

GROUP2. These patients besides conventional treatment were given *Terminalia arjuna* (Arjuna Chhal) powder and served as the study group. Patients included in this study were asked to take 3gm of Arjuna chhal powder mixed in 250ml of milk and the milk were heated till it boils, and it was taken twice a day for one month regularly. Before starting Arjuna Chhal Powder baseline parameters were taken of every patients i.e. pulse, weight, blood pressure, total platelet count. After one Month above parameters were estimated again.

## PROCEDURE

1. Measurement of Blood pressure – By Sphygmomanometer.
2. Measurement of Pulse
3. Platelet Count: - By REES-ECKER METHOD.

Draw freshly filtered diluent to the mark 0.5 in the RBC pipette. Get a finger-prick and draw blood in the pipette so that the diluent reaches the mark 1.0 Wipe the tip and fill the pipette with diluent once again to the mark 101. This gives a dilution of 1 in 200.

Roll the pipette gently between your palms for 3-4 minutes. (Taking the diluent first in the pipette prevents clumping and disintegration of platelets which occurs if blood is taken directly into the pipette). Discard the first two drops and charge both sides of the chamber in the usual manner. Place it on a wet filter paper and cover with petri dish, and wait for 10 minutes to allow the platelets to settle. Count the platelets

(which appear as bluish, round or oval bodies, highly refractile on racking the microscope) in 5 groups of 16 squares each, as was done for red cells. Calculate their number in  $1\text{mm}^3$  of undiluted blood.

## RESULTS

Table -1 show the demographic profiles of both groups. Out of the 100 patients of coronary artery disease, 50 were in control group (Group-I) and 50 were in study group (Group-II). Within the Control group 35 were male and 15 were female patients. In the study group 31 were male and 19 were female patients.

Table-2 shows effect of Arjuna Chhal on the systolic Blood pressure in patient of coronary artery disease. In the control group, the total mean systolic blood pressure at initial and final were  $152.26 \pm 18.38$  mmHg and  $148 \pm 17.85$  mm HG respectively. There was a decline of 2.790%; the value shows statistically insignificant difference ( $p=0.265$ )

In the study group the total mean systolic blood pressure before and after the Arjuna chhal therapy were  $163.22 \pm 19.91$  mmHg and  $146.44 \pm 18.64$  mmHg respectively. There was a decline of 10.28%. These values shows a significant statistic difference ( $p=0.0001$ ).

Table-3 shows effect of Arjuna chhal on the Diastolic Blood Pressure in patients of coronary artery disease. In the control group, the total mean at initial  $92.5 \pm 7.24$  mmHg and  $89.24 \pm 8.36$  mmHg respectively. There was a decline of 3.52%; the value shows statistically significant difference. ( $p=0.038$ ).

In the study group, the totals mean Diastolic Blood Pressure before and after the Arjuna chhal therapy were  $93.74 \pm 10.86$  mmHg and  $89.02 \pm 10.71$  mmHg respectively. There was a decline of 4.80%; these values shows a highly significant statistic difference ( $p=0.031$ ).

Table-4 shows effect of Arjuna Chhal therapy on the pulse of the patients in patients of coronary artery disease. In the control group, the total means pulse at initial  $82.4 \pm 5.48$  and  $84.0 \pm 4.42$  respectively. There was a change of 1.94%, the value shows statistically insignificant difference ( $p=0.11$ ).

In the study group, the total means pulse before and after the Arjuna chhal therapy were  $82.46 \pm 3.63$  beat per minute and  $78.46 \pm 3.97$  Bpm. There was a decline of 4.85%, the value show statistically significant difference. ( $p=0.0001$ ).

Table-5. Shows the effect of Arjuna chhal therapy on platelet count in patients of coronary artery disease. In control group, the total Mean platelet count

at initial and final were  $4.66 \pm 0.66$  lacs/ $\mu$ L and  $4.53 \pm 0.67$  lacs/ $\mu$ L respectively. There was a decline of 2.78%; the value shows statistically insignificant difference. (p=0.33)

In the study group the total mean platelet count before and after Arjuna chhal therapy were  $4.429 \pm 0.83$  lacs/ $\mu$ L and  $3.95 \pm 0.71$  lacs/ $\mu$ L. There was a decline of 10.81%. This value shows a significant statistic difference. (p=0.002).

1. The systolic blood pressure had shown decrease by in study group after Arjuna chhal therapy.
2. The diastolic blood pressure had shown decrease in study group after Arjuna chhal therapy.
3. The pulse had shown decrease in study group after Arjuna chhal therapy.
4. The total platelet count had decrease in study group after Arjuna chhal therapy.

**Table 1: Comparison between two groups according to their age and sex**

Age group (yrs)	Controls		Cases		Total	
	Male	Female	Male	Female	Male	Female
41-50	4	1	2	0	6	1
50-60	9	6	8	7	17	13
61-70	14	5	13	5	27	10
>71	8	3	8	7	16	10
Total	35	15	31	19	66	34

**Table 2: Systolic Blood Pressure**

	Pre Treatment	Post treatment	t/p
Control	152.26 $\pm$ 18.38	148 $\pm$ 17.85	1.12/0.265
Cases	163.22 $\pm$ 19.91	146.44 $\pm$ 18.64	4.35/0.0001

**Table 3: Diastolic Blood Pressure**

	Pre Treatment	Post treatment	t/p
Control	92.5 $\pm$ 7.24	89.24 $\pm$ 8.36	2.10/0.038
Cases	93.74 $\pm$ 10.86	89.02 $\pm$ 10.71	2.18/ 0.031

**Table 4: Pulse**

	Pre Treatment	Post treatment	t/p
Control	82.4 $\pm$ 5.45	84.0 $\pm$ 4.42	1.61/0.11
Cases	82.46 $\pm$ 3.63	78.46 $\pm$ 3.97	5.25/0.0001

**Table 5: Total Platelet count**

	Pre Treatment	Post treatment	t/p
Control	4.66 $\pm$ 0.66	4.53 $\pm$ 0.67	0.97/0.33
Cases	4.429 $\pm$ 0.83	3.95 $\pm$ 0.71	3.10/ 0.002

## DISCUSSION

In our study it was observed that all the clinical parameters, platelet count and should decline in study group after *Terminalia arjuna* (Arjuna Chhal) bark powder therapy. It was observed that aortic prostaglandin E2 like activity was enhanced after administration of *Terminalia arjuna*. PGE2 is known to produce coronary vasodilation and increased coronary flow in patients of coronary artery disease [7]. Some evidence suggests that T. Arjuna may have blood vessel - relaxing properties [8].

Improvement of cardiac muscle function and subsequent improved pumping activity of the heart seems to be the primary benefit of Terminalia. It is thought the saponin; glycosides might be responsible for ionotropic effects of Terminalia, while the

flavonoids and OPCs provide free radical antioxidant activity and vascular strengthening [9]. *Terminalia arjuna* mechanism appears to be different, as a decrease in the decay time during relaxation and an increase in the rise time during contraction [10].

### Role in Blood Pressure:

The extract of T. Arjuna might contain active compound possessing adrenergic  $\beta_2$ -receptor agonistic action and/or direct action on the heart [11].

One months of treatment of 500mg/Kg Arjuna bark powder extract to normal and diabetic rats, reflex bradycardia (a reduction in heart rate in response to high blood pressure, which attempts to normalize blood pressure) was improved in the diabetic rats [12]. The alteration in reflex tachycardia (an Increase in heart rate

in response to low blood pressure) was not improved by Arjuna over 30 days [12].

#### Role on Platelets:

Substances in this plant have anti-platelet activity, meaning they can thin the blood. The bark of T. Arjuna decrease platelet activation and may possess antithrombotic properties. The possible mechanism of action could be by desensitizing platelets to the agonist by competing with platelet receptor or by interfering with signal transduction. Attenuation in  $Ca^{+2}$  release and expression of CD62P was also observed with T. Arjuna. Coagulation, Bleeding and prothrombin time can be reduced by oral administration of an aqueous suspension of the bark powder [13].

Arjunolic acid is known for its cardio protective effect over centuries; experimental studies have proved function such as prevention of myocardial necrosis, platelet aggregation and coagulation and lowering of blood pressure, heart rate and cholesterol level [14].

#### CONCLUSION

1. In our study we found that total platelet count had shown decrease in study group after Arjuna Chhal Therapy.
2. In our study we found that all the clinical parameters including weight, pulse, systolic blood pressure and diastolic blood pressure had shown decrease in study group patients after Arjuna Chhal therapy.
3. In our study we found that there is more decrease in systolic blood pressure than diastolic blood pressure in study group after Arjuna Chhal therapy.

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