

## USE OF PRUNES AS A CONTROL OF HYPERTENSION

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**Background:** Fruits and vegetables are shown to reduce blood pressure. It is not merely the antioxidants contained in fruits and vegetables that have health benefits such as lowered systolic and diastolic blood pressures. This study was undertaken to see the cardiovascular protective effects of prunes. **Methods:** A placebo controlled clinical trial study was designed to see the effects of *Prunus domestica* on blood pressure in 259 pre-hypertensive (Systolic BP=120–139 mmHg, diastolic BP=80–89 mmHg) volunteers. Treated groups drank prune juice and ate the whole fruit (dried plums) while either 3 (about 11.5 gm) or 6 prunes were soaked overnight in a glass of water whereas control group took only a glass of plain water early in the morning on empty stomach. Blood pressure was recorded fortnightly for 8 weeks, and blood samples were taken at 0 and 8 weeks. **Results:** There was significant reduction of blood pressure by single dose of prunes daily group and the controls ( $p<0.05$ ). With the double dose of prunes, only systolic BP was reduced significantly ( $p<0.05$ ). Control group had significantly increased serum HDL whereas test groups had significantly reduced serum cholesterol and LDL ( $p<0.05$ ). Data was analysed by paired-sample *t*-test with 95% confidence interval. **Conclusion:** The data predicts cardiovascular protective effects of prunes.

**Keywords:** Plums, *Prunus domestica*, blood pressure, lipid profile, pre-hypertensive patients

### INTRODUCTION

A high concentration of fruits and vegetables has been correlated with a decrease in cardiovascular disease.<sup>1</sup> It is interesting to note that according to various studies, it is not merely the antioxidants contained in fruits and vegetables that have health benefits such as lowered systolic and diastolic blood pressures. Trial studies have shown that vitamin supplements of these antioxidants do not produce the same results on subjects as do fresh fruits and vegetables.<sup>2</sup>

It is predicted that by the year 2020 Coronary Heart Disease (CHD) along with cerebrovascular disease will rank among the leading causes of death in the world 1<sup>st</sup> and 4<sup>th</sup> respectively.<sup>3</sup> This is mainly due to the rapid increase of death by these causes in the developing world. The pathogenesis of CHD and stroke is intricately linked with elevated blood pressure, and thus to turn away from the dismal state of affairs predicted for the future, we must now turn to limiting the number of victims within the population as well as reducing the severity in individuals already suffering from this primarily idiopathic disease process.

Hypertension has been classified by the Joint National Committee into several subclasses. A newly categorised group of individuals have been termed as pre-hypertensives, with a systolic blood pressure of 120–139 mmHg or a diastolic blood pressure of 80–89 mmHg. These patients require health promoting lifestyle modifications in order to prevent cardiovascular disease.<sup>4</sup> Stage 1

hypertensives are those with a systolic BP of 140–159 mmHg or a diastolic BP of 90–99 mmHg, and stage 2 hypertensives are those individuals exhibiting readings  $\geq 160$  mmHg systolic and  $\geq 100$  mmHg diastolic.

The objectives of the study were to see if the use of prunes is useful in cardiovascular disorders to bring about changes in blood pressure or prevention of atherosclerosis, and possibility of developing new drug from organic source.

### MATERIAL AND METHODS

All pre-hypertensive adult patients (above the age of 18 years) coming in Shifa Foundation Community Health Centre (SFCHC) OPD were included in the study. Two hundred fifty-nine (259) pre-hypertensive patients were selected and divided into A, B, and C Groups randomly. Their systolic BP was 120–140 mmHg and diastolic BP was 80–90 mmHg. Preliminary data such as name, age, sex, address, weight and symptoms like headache, fatigue, exertional dyspnoea, palpitation or chest pain were recorded on individual proformas. Complete general and specific cardiovascular examination was done on all subjects.

Patients with co-morbid factors like Diabetes mellitus, Malignancy, Liver failure, Kidney failure, Pregnancy, and Patients taking Homeopathic or Ayurvedic treatment were not included in the study.

First, dried plums were pitted and packets were prepared each containing 3 prunes weighing about 11.5 gm. One packet constituted single dose and two packets taken as double dose (23 gm). Group (A) was given one packet, and the second group (C) was given

two packets. Control group (B) simply drank a glass of water early in the morning on empty stomach. Study group patients were asked to soak the contents of the packet overnight (approximately 7–8 hours) in a glass of water (250 ml). Next morning the pre-hypertensive patients were requested to drink the prune juice on an empty stomach and eat the whole fruit as well.

Three consecutive BP readings were recorded for each patient. Mean of these readings was tabulated under week 0. The patients were given instructions for use of prune juice and any clarifications necessary were provided. The patients were sent home with the instructions for a follow up visit after every two weeks when mean of three consecutive BP readings was recorded. The patients were regularly monitored fortnightly for 8 weeks. These patients were advised to take a low salt and low cholesterol diet, do regular daily exercise and visit on week 2, 4, 6 and 8 regularly for checkups. All groups were monitored in a similar fashion. These groups were matched for age, gender and weight as much as possible.

To observe the effects of prune juice on the cardiovascular system, patients from each group provided a blood sample at 0 week, and after 8 weeks treatment. Serum cholesterol, HDL, LDL, and triglycerides levels were estimated in all subjects.

Data were analysed with SPSS 10.0 using Paired-Sample *t*-test with 95% confidence interval.

## RESULTS

Study was conducted on 259 pre-hypertensive patients, 11 were missing and 248 were valid. The base line clinical picture is in Table-1.

**Table-1: Baseline clinical picture**

Variables	Total		Control		Single dose		Double dose	
	n	%	n	%	n	%	n	%
<b>n</b>	valid 248		valid 98		valid 98		valid 52	
	missing 11		missing 5		missing 4		missing 2	
<b>Age (Years)</b>	43±10		42±10		43±9		42±12	
<b>Male</b>	98	38.3	30	29.1	42	41.2	26	51
<b>Female</b>	157	61.3	72	69.9	60	58.8	25	49
<b>Asymptomatic</b>	86	34.5	43	44	28	28.4	15	29
<b>Headache</b>	128	51.4	42	43	60	60.6	26	50
<b>Fatigue</b>	126	50.6	45	46	53	53.5	28	54
<b>Exertional dyspnoea</b>	77	30.9	28	28.6	39	39.4	10	19.2
<b>Palpitations</b>	54	21.8	17	17.3	28	28.3	9	18
<b>Chest pain</b>	43	17.4	13	13.3	23	23.5	7	14

Statistically significant ( $p<0.05$ ) reduction in systolic BP. (Paired-Sample *t*-Test) by both treated and control groups after each fortnightly tested BP, i.e., after 2, 4, 6, and 8 weeks treatment with prune or placebo (Table-2).

There was reduction of diastolic BP by all groups which was statistically significant (Paired-

Sample *t*-Test,  $p<0.05$ ) with single dose and control groups after 2, 4, 6 and 8 weeks treatment with prunes or placebo respectively (Table-3).

After 8 weeks treatment there was significant reduction of cholesterol by both single ( $p=0.002$ ) and double ( $p=0.003$ ) doses; and LDL by both single ( $p=0.017$ ), double ( $p=0.009$ ) doses. HDL was significantly increased by control group ( $p=0.026$ ). There was no significant change in triglyceride serum concentration after 8 weeks treatment with prunes or placebo by all groups. (Table-4)

**Table-2: Comparison of fortnightly systolic BP of groups by Paired-Samples *t*-Test**

Group	n	Mean Systolic BP	p
Single dose of prunes	62	wk 0=134.03±1.38 wk 2=130.53±0.97	0.000
	48	wk 0=133.13±1.35 wk 4=130.31±1.14	0.020
	36	wk 0=133.06±1.66 wk 6=127.58±1.37	0.000
	31	wk 0=131.45±1.43 wk 8=126.70±1.02	0.004
Double dose of prunes	43	wk 0=131.98±0.82 wk 2=129.76±0.84	0.012
	45	wk 0=132.11±0.80 wk 4=128.22±0.85	0.000
	45	wk 0=132.33±0.88 wk 6=128.80±0.87	0.000
	41	wk 0=131.83±0.83 wk 8=126.29±0.85	0.000
Control	89	wk 0=133.15±1.08 wk 2=131.44±0.86	0.006
	73	wk 0=133.56±1.29 wk 4=130.78±0.975	0.001
	63	wk 0=133.33±1.40 wk 6=128.88±0.96	0.000
	53	wk 0=133.11±1.61 wk 8=128.33±1.03	0.000

**Table-3: Comparison of fortnightly diastolic BP of groups by Paired-Samples *t*-Test**

Group	n	Mean Diastolic BP	p
Single dose of prunes	62	wk 0=86.45±0.97 wk 2=83.72±0.85	0.000
	48	wk 0=86.56±1.04 wk 4=83.35±0.77	0.000
	36	wk 0=85.56±1.27 wk 6=82.22±0.83	0.009
	31	wk 0=84.84±1.36 wk 8=81.93±0.85	0.056
Double dose of prunes	43	Wk 0=108.26±21.01 wk 2=85.00±1.09	0.272
	45	wk 0=107.33±20.07 wk 4=84.55±0.85	0.265
	45	wk 0=107.22±20.07 wk 6=83.24±0.74	0.241
	41	wk 0=108.66±22.04 wk 8=81.60±0.56	0.228
Control	89	wk 0=86.81±0.65 wk 2=84.39±0.70	0.001
	73	wk 0=86.58±0.74 wk 4=84.10±0.63	0.000
	63	wk 0=87.78±0.79 wk 6=83.85±0.67	0.000
	53	wk 0=86.98±0.84	0.000

		wk 8=81.96 ±0.60	
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wk= weeks of treatment

**Table-4: Comparison of lipid profile of groups by Paired-Sample t-Test**

Dependant variable	Group	n	Mean	p
Cholesterol	Single dose	31	0 wk=189.43±7.46 8 wk=161.36 ±6.60	0.002
	Control	31	0 wk=166.87±8.82 8 wk=182.32±12.74	0.266
	Double dose	27	0 wk=174.18±5.75 8 wk=159.33±6.38	0.003
HDL	Single dose	31	0 wk=35.80±3.07 8 wk=30.06±2.48	0.101
	Control	33	0 wk=29.60±3.08 8 wk=38.63±3.35	0.026
	Double dose	24	0 wk=34.91±2.96 8 wk=30.62±2.14	0.255
LDL	Single dose	31	0 week=101.61±7.20 8 week=82.06±4.61	0.017
	Control	33	0 week=80.57±6.52 8 week=92.87±7.21	0.100
	Double dose	24	0 week=93.37±6.06 8 week=80.20±5.88	0.009
Triglycerides	Single dose	31	0 wk=182.38±18.52 8 wk=194.58±20.01	0.450
	Control	33	0 wk=192.45±19.12 8 wk=65.48±16.01	0.243
	Double dose	26	0 wk=186.07±18.80 8 wk=179.65±16.48	0.749

## DISCUSSION

As time progresses, more and more people are searching for alternate ways for healing the diseases inflicting man. Millions of people around the world spend enormous amounts of money on allopathic medicine. Just imagine if all of this money could be saved. What if the cure for these diseases lies in our very own backyards? This very question is fuelling people to do intense research to find new treatments for these diseases, things which were not known to man a decade or two ago.

According to Mosby's Medical Dictionary, hypertension is defined as a common disorder characterized by elevated blood pressure persistently exceeding 140/90 mmHg.<sup>6</sup> Hypertension is a disease affecting millions of people worldwide. It is one of the leading causes of heart disease and strokes. As a result, scientists are looking for new simpler ways for combating the disease. A study done at Oxford University in the United Kingdom suggests that fruits and vegetables do have a drastic change on blood pressure.<sup>2</sup>

Bainiku-ekisu, the fruit juice concentrate of Asian plum, could represent a potential new therapeutic agent for cardiovascular diseases such as hypertension and atherosclerosis.<sup>7</sup>

Our study shows that there is significant drop in systolic and diastolic BP by lower doses of prunes. At higher doses systolic BP fell significantly,

there was also a drop in diastolic BP from 108.66±22.04 to 81.60±0.56 although statistically not significant. A reduction of 2 mmHg in diastolic blood pressure results in a decrease of about 17% in the incidence of hypertension, 6% in the risk of coronary heart disease, and 15% in the risk of stroke and transient ischemic attack.<sup>2</sup>

Novel results seen are in the control group who took a glass of water empty stomach in the morning showed significant reduction in both systolic and diastolic BP. Control group also had significant increase in serum HDL that was not seen by prune treated groups. May be the water taken on empty stomach early in the morning works, or compliance to instructions for healthy life style like low salt and low cholesterol diet, walk, exercise and reassurance by the physician by fortnightly monitoring are responsible for the effect.

Most plums, lemons, and wild grapes (Eastern Concord variety), cranberries and boysenberries are high in pectin and decrease plasma cholesterol concentration, high density lipoproteins (HDL), triglyceride concentrations and body weight, the viscosity of pectin may determine their cholesterolemic effect in hamsters.<sup>8</sup> Plum puree and prune juice contain dietary fibre and carbohydrates.<sup>9</sup> Fibres extracted from dried plums lower plasma LDL and liver cholesterol in rats and that is not dose related.<sup>10</sup>

In another study, an eight-week crossover trial involved 41 adult men with mild hypercholesterolemia. Plasma LDL-cholesterol was significantly lower after the dried plum (3.9 mmol/L) than the fruit juice (4.1 mmol/L).<sup>11</sup> There was significant reduction in serum cholesterol and LDL by both lower and higher doses of prunes in our study.

Bainiku-ekisu, the fruit-juice concentrate of the oriental plum (*Prunus mume*) has recently been shown to improve human blood fluidity.<sup>12</sup> Bainiku-ekisu may be beneficial against hypertension and atherosclerosis by selectively inhibiting growth promoting signals of Angiotensin-II in the vasculature.<sup>13</sup> Experimental evidence supporting a role for oxidative stress in vascular injury and hypertension is convincing.<sup>14</sup> The supplementation of antioxidants, particularly in the form of fresh fruit and vegetables, reduces blood pressure, supporting a role for free radicals in hypertension.<sup>15</sup>

Many constituents of prunes are identified having antioxidant properties.<sup>16-20</sup> May be it is the antioxidant properties of prunes that they reduce both systolic and diastolic blood pressure and reduce serum cholesterol and serum low density lipoprotein.

In our study BP is reduced by both placebo and prunes but cholesterol and LDL are reduced only by the patients taking both doses of prunes. In our previous study prunes also reduced Serum ALP (alkaline phosphatase) and ALT (alanine aminotransferase).

Alanine aminotransferase predicts coronary heart disease events. A 10 year follow-up of the Hoorn Study strongly suggests that elevation of ALT and non-alcoholic fatty liver disease (NAFLD) are associated with increased risk of cardiovascular disease, and are independent predictors of cardiovascular mortality.<sup>20</sup>

Our study is in agreement with *Unani Tibb* for use of prunes in hypertensive patient. Use of prune is cardiovascular protective by reducing blood cholesterol and light density lipoproteins. They have added blood pressure lowering effects.

## CONCLUSION

Prunes reduce both systolic and diastolic blood pressure that is not different from placebo. One common factor, water, with or without prunes taken early in the morning on empty stomach might be responsible for lowering blood pressure. As prunes also significantly reduced serum cholesterol and LDL, their cardiovascular protective role is predicted.

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